



The Sandvik journey has been an extraordinary one – passing not only through time but also through developments in materials technology, product areas, and customer segments. It's a journey that has stretched over the entire globe, reaching people of all cultures. Throughout Sandvik's first 150 years, the combination of development and change has been the driving force behind the company's success. The journey into the future continues!

The SANDVIK JOURNEY
The first 150 years

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SANDVIK

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FOREWORD

Dear reader,

150 years is a long time. Not many companies can lay claim to such a lasting and successful history. It is a measure of the company's strength that it has been able continuously to grow and develop, at times during periods of major internal change and strongly shifting external conditions. Sandvik has made an exciting journey in all respects, as is fully revealed in this book.

One of the reasons for this success has been the company's ability throughout the journey to spot business opportunities in the technical progress taking place in society. I would like here particularly to stress the position of strength achieved by the company's consistent and far-sighted investment in research and development. Another reason is that Sandvik has operated internationally for a very long time and has steadily strengthened its presence on the global marketplace.

The openness to change exhibited over the years has been a key factor for the company's success. Now that Sandvik from 2012 onwards will be pursuing a new strategy with a more market-oriented organization, we shall be continuing the journey with the same welcoming of change and development that has ensured our success in the past.

We have every reason to be proud of what many generations of employees have accomplished. Sandvik has passed its first 150 years and developed into a world-leading engineering group with the aim of generating significant return and high value growth for all its stakeholders.

From this position of strength the company moves forward to meet constantly fresh challenges and chances. Our task is to make Sandvik into an even more attractive company for customers, employees and shareholders.

Olof Faxander
President and CEO

THE WIDE WORLD OF SANDVIK

Since the beginning of 2010 the Chinese cities of Wuhan and Guangzhou have been linked by a high-speed train that travels more than 1,000 kilometers in three hours. The streamlined train rushes through the countryside on its own separate track faster than any other train in the world, a symbol of the new China with an economy that has already grown by ten percent a year for three decades. Such a growth rate doubles a country's economic activity every seven or eight years, which means that China is already more than 20 times richer now than in Chairman Mao's time.

It is natural that the technology company Sandvik, as it celebrates its 150th anniversary, regards China as one of its newest expansion markets, and that it has significantly increased its presence in the country. That is where the biggest and fastest growing market exists.

Everywhere in the world where engineering products, machinery, cars, airplanes or ships are made, Sandvik is present with its advanced-material components, its tools and its knowledge of manufacturing processes. Sandvik is present at the construction sites of power plants, pulp and paper mills, and plants for chemical and petrochemical products. Sandvik also has an established presence wherever there is mining, rock drilling or the construction of roads or hydroelectric dams. In short, China is an obvious and significant market for Sandvik.

The Chinese economy has overtaken its Japanese counterpart as the world's second largest. Germany is no longer the world's leading exporter. Investment analysts will find that never before have there been such substantial investments in any country in a year as in China in 2010. All the statistics of the new five-year plan to 2015 are staggering. An additional 40,000 kilometers of high-speed rail links and more than 80,000 kilometers of freeways will be built here. The country's nuclear power program is the biggest in the world after that of the U.S., and investment in electric cars and solar and wind power is massive, to say the least.

It is impossible to travel through China without constantly seeing black, newly paved roads or shiny high-rise buildings. You can hardly look in any direction without discovering a construction crane or a truck.

China has the world's largest population, about 1.3 billion, which explains some of this immense strength. But for what length of time can an economy

A network of high-speed trains is developing rapidly in China. Here, a train leaves the capital, Beijing, destined for Shanghai, around 1,300 kilometers away.

Beijing's heavy traffic is proof of China's economic leap.



Shanghai, one of China's fastest growing cities.

keep growing so fast? Japan, whose population is about one-twelfth the size of China's, made a similar journey after World War II. That journey, though not as fast, continued right up to 1989. The question is whether China is where Japan was in the 1960s or the 1980s. No one can know for sure, not even the central rulers in Beijing or the local politicians who are eagerly promoting such projects.

Whatever the future path of growth looks like, Sandvik is investing resolutely in China, not to manufacture cheap products, but to participate in the largest collective industrial investment ever made. Sandvik needs China and China needs Sandvik.

Commercial relations between Sandvik and China stretch far back in time. The company opened its first representative office in Beijing in 1985, but not until 1993 was time ripe to have a wholly owned subsidiary plus a strategic reorientation, after sales had surpassed 100 million kronor. Since then, sales have increased more than tenfold and the number of employees fivefold. In the early 2010s, Sandvik had a very different presence in the Chinese economy, with about 2,000 employees, a dozen factories, and a distribution network spread over 80 cities.

To China's growing companies manufacturing engineering products, airplanes, cars and other industrial goods, Sandvik supplies cemented-carbide

tools for turning, milling and drilling. In addition to selling its products, the company also provides training in how Chinese industries can increase their productivity and efficiency. Some of the products are manufactured in China, some for domestic use and others for export.

To China's mining and construction companies, Sandvik markets drill rigs, loaders, crushers and rock tools, supported with training and after-sales service. Most of this equipment is manufactured in Jiading outside Shanghai in one of the Group's largest production facilities of their kind in the world.

Finally, to China's energy, aviation, petrochemical, and automotive industries, Sandvik sells specialized products made of stainless materials, including high-alloy tubular products and strip steel, plus resistance materials and heating elements.

To achieve the same presence in China as in Europe's industries and infrastructure, Sandvik would have to grow three times its current size in China, and in order to keep up with the country's dynamic growth a further doubling of size might be required every decade. Expressed in terms of the number of employees, the challenge to Sandvik's leaders in China is therefore to recruit and train a very large number of individuals each year both in order to replace employees who leave and to be able to expand quickly enough. Many more people must be interviewed. This extensive recruitment process of thousands of young Chinese people has begun and substantial resources have been transferred to the local organization. The challenge is complex, because a number of other companies are competing for the same engineers. Fortunately, in China two million new engineers graduate each year.

Nowhere in the world is more effort required within the Sandvik organization. But benefits can result from representing a large integrated group of companies. It doesn't matter if the new employees will be working with advanced stainless materials, cemented-carbide tools or mining equipment—they can share the same introductory courses and programs.

There are advantages to sharing the same basic values and common systems across all business operations. New employees can be put through standardized training programs, and everyone uses the Group's infrastructure when dealing with technical problems.

Sandvik has a strong, distinctive corporate culture that developed in Sweden, a country that, with its long history of independence, is also distinctive. Cultures, organizations, and languages that are given time to develop in this way become healthy and informal. It can be difficult for the newcomer to understand what's going on, because so much is implied, developed over a long period of time. An informal structure is built up alongside the formal organization chart, and this improves overall strength. Decisions are often not made from the top down, but may develop in contexts other than formal meetings.



Investments in industry and infrastructure in China generate business opportunities for Sandvik.





To meet growing demands in China, Sandvik has expanded its production capacity extensively. The Zhenjiang plant does cold rolling and finishing of seamless stainless steel tubes.



Qingdao is the site for Sandvik's production of die-cutting steel.



The facility in Jiading, close to Shanghai, produces drill rigs, crushers, and loaders.



The factory in Langfang, near Beijing, produces cemented-carbide tools. The facility opened in 1994 and has been expanded since.

Wuxi, China, is home to several Sandvik factories for cemented-carbide cutting tools, drill bits, and components.

The Sandvik organization displays clear examples of these characteristics. Often the heroes of the organization have not been people at the very top of the hierarchy, but rather engineers, salesmen and other employees directly involved in the company's day-to-day operations.

The advantage of this meritocracy has been that talented people have been able to work their way to the top, and this knowledge corps has been very loyal. For those who were sent out alone into the outside world, there have been communication links back into headquarters, and friendships to call on if problems arose. The political game at the top, to the extent it existed, has been more long-term. Patience with various technical and marketing projects has been extensive and clearly visible to the organization.

Of course, there are also disadvantages with this type of culture, and they become particularly apparent when a successful national export organization grows to become a truly global corporation. More and more people within the Group come from outside Sweden, and fewer work at locations in the home country, where the corporate culture developed. There are fewer bonds of friendship, and the informal organization often works slowly because it cannot keep up with all the projects and initiatives.

"Sandvik must quickly embrace greater diversity," comments Olof Faxander, who became the new CEO in February 2011, and who during his time with the

company has implemented extensive strategic work with many participants from various parts of the Group. "It is natural that a company that developed in Sweden over the decades has had Swedes in its top jobs, but that era is over. In future, more and more employees from the Group's international organization will take over the top jobs and open us up even more to world-wide developments. We must become a truly global company – in our approach, our local presence, our corporate culture, our diversity, and our career- and business opportunities."

Faxander is Sandvik's first chief executive in three decades to be recruited externally, but he has spent his entire career within the industry cluster of steel expertise that gave birth to Sandvik.

As late as 1991, after a period of consolidation, Sandvik had about 10,000 employees in Sweden and 16,000 outside the country. Exports from Sweden constituted just over 40 percent of the company's sales. Much of what was manufactured outside of Sweden was produced in assembly operations. Sandvik, however, was already leaving behind its earlier character as an export company.

Twenty years later, Sandvik has only marginally increased the number of employees in Sweden, relatively speaking, but it has more than twice as many outside the country. Only 30 percent of goods sold outside Sweden were produced in the country. The trend is clearly towards a global company with employees of all nationalities and manufacturing operations spread over many countries. Control does not have to come from Sandviken, or even from Sweden.

How can a growing and increasingly international organization be made to function? First, the old organization must become clearer and more distinct. For better or worse, the decision-making process must become transparent. The informal network must give way to the formal.

Global companies must learn to master diversity, both culturally and linguistically. This requires more than instructions and regulations; corporate values must be made clear. As early as the start of this millennium a development program was initiated to describe and clarify the values that managers and employees of the Sandvik organization must live up to. It was decided that three values were central and would always be used to guide decisions, and could be cited if a decision was questioned.

"Team Spirit" is the first motto of Sandvik's culture and values, a reference to both cooperation within the company and partnership with customers. Sandvik's team spirit is about being able to work across boundaries, be they geographic, organizational or anything else. Team spirit means that you will act as a single team focused on the company's interests. The members of Sandvik's organization must trust each other and seek close cooperation and relationships with their customers worldwide. Team spirit also includes continually demonstrating leadership.



Olof Faxander, president and CEO of the Sandvik group since 1 February 2011.



In-house education on the Group's core values started in 2004. Photo is from a seminar in Singapore, 2006.





Modern simulation and modeling are carried out at the research and development center in Pune, India.

The Group's subsidiary Sandvik Asia has been active in India for more than 50 years.

“Fair Play” is the hallmark of Sandvik’s way of doing business. Everything the company does must be based on high ethical standards, fairness, accurate accounting, equal opportunities, environmental responsibility and rules for proper behavior.

“Open Mind” is the prerequisite for Sandvik to maintain its reputation for innovation. An employee of Sandvik will continually seek new opportunities and improvements, and be positive about change. Pursuing novel initiatives and trying new ways of working will be encouraged, not obstructed.

Training in these corporate values has been implemented internally and continues to be implemented within the Group’s global operations. The intention is that managers from different cultures will understand and rely on this approach. If they have based a decision on the company’s values, they can feel secure regardless of whether they have decided yes or no to a project.

The strategic work during 2011 initiated a new stage in the Group’s globalization process. That was when the Group hired executives from within China and India to be, respectively, the new presidents of Sandvik’s subsidiaries in those countries. As an indication of these companies’ growing importance to the Group, these executives will join the expanded Group management team and will in future report directly to the executive board.

At the same time, the organization was streamlined to enable faster deci-

sion-making and integration across the business units. The new strategy called for swifter processes.

Sandvik must maintain its world-class status in everything it does, and this requires greater focus within selected operations.

In India, Sandvik’s other market with more than one billion people, the company has a more substantial tradition than in China. The city of Pune, which is southeast of Mumbai and has 3.5 million inhabitants, is home to one of Sandvik’s most interesting companies, Sandvik Asia Ltd. The company has been there for more than 50 years, first as a half-owned company and now as an almost wholly owned subsidiary. Keep an eye on this company, because it will be a test case for how the global business community will operate in the future when the Indian economy accelerates.

Anyone visiting this vast country understands perfectly well that the road to prosperity will be bumpy. The highway network is not yet worthy of a developed country, the rail system is obsolete, and other infrastructure is feeble. A shockingly large proportion of the population is poor and undereducated or illiterate. Religious conflicts and political tensions sometimes give cause for pessimism.

India, though, has its free enterprise, its democracy, its elite education, its

Sustainable development, such as the recycling of natural resources, is an important part of Sandvik’s strategy. Pictured is the recycling of cemented carbide at the modern facility in Chiplun, India.

Following spread: Sandvik offers a wide range of products for the mineral-exploration market. Pictured here is exploration drilling with Sandvik equipment at Olympic Dam, north of Adelaide, Australia.





Productivity Center in São Paulo, Brazil.

millions of English-speaking citizens, and its broad-based age pyramid. As recently as at the beginning of the 1990s, politicians began liberalizing the economy under the influence of developments in Southeast Asia. Since then, the nation's dynamism has emerged just as expected—patchy and with great force. Now, in the early 2010s, there is the potential for even greater, broader and more sustained growth as politicians gradually remove obstacles. The indications are that India will be the next growth miracle, as China leaves the first, most dynamic stage.

Sandvik has about 2,000 employees in India, triple the number of a decade ago. Sandvik Asia has grown into an export organization. It is only a matter of time before Sandvik has more employees in India than in North America, for example.

Sandvik, just like other international companies, is thus turning inexorably towards Asia. The world's consumers will see ideas and technologies roll in not only from China but also from India, in the form of both products and services.

This trend has already begun and has been described in a fiftieth anniversary book for Sandvik Asia Ltd., published in 2009. Swedes have already trained several generations of employees, but it was only when the subsidiary

became wholly owned in 2001—and free from political constraints—that it could compete on equal terms with the rest of the Group.

“What we saw was a change within our people,” writes one of the executives of Sandvik Asia in the book. “When we became an export center, something happened to our self-esteem.”

He describes how the organization virtually exploded with energy.

“It wasn't hard to do a good job!” Employees acquired computers and cell phones. They communicated by e-mail and used the very latest engineering technology. A previously highly regulated production company developed rapidly.

Welcome to Sandvik's global market! In the very first decade of this new century, everything has already been turned upside down. In 1994, Sandvik raised its growth targets to six percent a year, influenced by what was expected to happen in the global economy, in particular China's hunger for technology and raw materials. An impatient chairman of the board, Percy Barnevik, and an enthusiastic new CEO, Clas Åke Hedström, perceived new opportunities everywhere. It was time to launch an aggressive acquisition program and establish more new production units. Since then, the growth objective has been raised to eight percent a year; that is, a doubling of sales every decade.

The dramatic financial crisis that stemmed from the U.S. in the autumn of 2008 may be followed by a new crisis after a brief economic recovery. At the time of this writing, no one can know what will happen. But countries that were previously called ‘developing economies’ account for much of the growth. Sandvik is surfing on this wave: in Asia, eastern Europe, and parts of Latin America.

China's expansion has not only affected Sandvik via the Chinese market. The world's mining industry as a whole is expanding. Australia, a strong mining nation, now accounts for approximately ten percent of Sandvik's sales. The Group has about as many employees in its Australian operations as it has in China or India. Chinese demand for base metals and other raw materials is making the Australian labor market so hot that it is difficult to find skilled employees. Labor costs are soaring.

The gap between Europe and Asia plus Australia with regard to their percentage of Group sales has narrowed significantly in recent years. After sales double again, Sandvik's operations will be much more evenly spread across the continents.

Nonetheless, in the early 2010s, the Sandvik world map that graced the cover of the company's annual reports in the 1970s revealed that most locations are still in Europe. They are reminders of the company's early youth. In the large, densely populated corridor down through Germany, Benelux,



The factory for cemented-carbide tools in Moscow, Russia.



Headquarters for the American subsidiary Sandvik Inc., Fair Lawn, New Jersey.

Following spread: Sandvik throughout the world. The Group has sales in more than 130 countries. The map displays operations in October 2011.







France, and northern Italy runs a string of plants and offices, about 50 in total. In the industrial belt of central England lies another string of factories, which are both a reminder of history and evidence of a sophisticated knowledge of materials.

It was British capital and technology that helped to launch the first incarnation of Sandvik in 1862. International from the very start, this northern company found its first markets in continental Europe and Russia. More than a century later, in 1990, 60 percent of Sandvik's sales went to Europe, but this percentage has since fallen significantly. The new eastern Europe has certainly injected a new dynamism, but nothing can compare with China, India, Brazil or Australia.

The United States, with what is still the world's biggest economy, has been present on Sandvik's map almost from the start. However, it took until the 1980s before Sandvik and Seco Tools jointly became the market leaders in cemented-carbide tools. Earlier generations of Sandvik engineers would have had difficulty imagining that American competitors like Carboloy and Valenite might one day be open to acquisition.

Sandvik's Latin America operations only really took off after the Scandinavian airline SAS opened its South American route from Stockholm via Madrid in 1949. The big breakthrough, though, came in the 1990s, when Sandvik established the Mining and Construction business area following a number of acquisitions. In 2010, South America's share of Sandvik's total sales was seven percent, and more than 2,600 people were employed there—figures that are comparable to the company's presence in India and China. Expansion, particularly in Brazil with its high population, indicates that South America should retain its share.

Africa, finally, became a market for Sandvik when the company began producing rock tools and collaborating with Atlas Copco in the late 1940s. So far, Africa is a continent of resource extraction and development projects. The future of the industry will probably depend in part on developments in India. If Asia can lift itself out of poverty and low technology, why shouldn't Africa be next in line?

"We cannot know where the changes and growth will be greatest," Olof Faxander says. "But we must maintain enough tempo in our work and be flexible and responsive enough that we always have time to adapt and keep up. Our competition includes not only our previously established rivals from Europe and the U.S. but also, and perhaps even more, a new type of nimble and dynamic company that is being developed in the new industrial nations."



Sandvik works closely with its clients the world over—here in a platinum mine in South Africa.

Sandvik is a multicultural corporation, with employees worldwide.

SANDVIKEN—THE TOWN THAT REFLECTS THE COMPANY'S DEVELOPMENT

For the town of Sandviken, two hours' car journey north of Stockholm, the news in the autumn of 2011 that the Group's head office will relocate was unwelcome but not entirely a surprise. The company has always played a central role in the town—which grew up around the company's steel operations dating back 150 years.

Today, though, that era is long gone, and Sandviken is more like one of Sandvik's many other business locations around the world. Well, not really, perhaps. The steel operations, more than half of which focuses on sophisticated tubes, will still be run from here in the future. That is where many of Sandvik's employees in the town work. The business area of Sandvik Machining Solutions will also retain its head office in Sandviken.

Sandvik's former head office is situated in a 150-year-old park with a large number of leafy trees. It is a verdant oasis, which was built as part of the steel plant, close to the growing town of Sandviken. The trees have grown slowly and aged gracefully in the harsh climate: oaks, lindens and elms that do not easily spread naturally so far north without human help. A statue of the founder stands in the park, but an even more prominent sight in the town is the big steam hammer that was imported from the U.K. for the first ironworks. It must have been a technical feat just to transport the heavy structure here.

The Group's head office was built in stages, the first of which was finished in 1891. Even before the Group management left this historic building, the company has continuously decentralized its decisions, and the actual decision-making power has been shifted gradually closer to Sandvik's major customers.

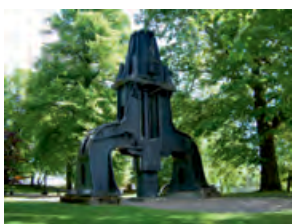
Sandviken is home to one of Sweden's largest industrial sites, where more than 6,000 people work. Here, Sandvik has extensive production operations and research on advanced metallic materials and special alloys. No other global technology company has such a strong presence as far north, at the latitude of northern Canada, Alaska and Siberia. However, many viable industrial companies have developed away from capitals and financial centers, as big cities' congestion and rapidly rising land prices do not fit well with the requirements of production.

Coincidences paved the way for the Sandvik project. It was up here in the extension of the Siberian pine forest that the world's best charcoal and high-

Following spread: Sandvikens Jernverk, with the growing mill town in the background.

Sandvik's plant in Sandviken, with the company's former head office along with older buildings in the foreground. The industrial site is one of the largest in Sweden.

A steam hammer: the symbol for Sandvik in its early years, and today a part of Sandviken's municipal coat of arms.





SANDVIKENS JERNVERK
1897.



Sandvik's first subsidiary outside Sweden was established in 1914, at Easy Row, Birmingham, England.

est-grade ore were to be found. British industrialists were willing to help fund a variety of steel mills in Sweden to develop new steel processes. They began near the market town of Gävle at 61 degrees north latitude. The Baltic Sea outside the town was blocked by ice for a few winter months, but the quality of iron led to a lively trade during the rest of the year. What's more, significant steel expertise already existed here.

What distinguishes Sandviken from other similar industrial locations is that its inhabitants have managed to turn their disadvantages into advantages. The idea of bringing together skilled employees in a remote location to avoid competition for their services and try to maintain their loyalty had come to the company's founder Göran Fredrik Göransson in 1862. Of course, this new location had to generate enough export revenue so that new projects could continually be developed and launched.

For more than a century, until the 1970s, the town's population grew. It then shrank considerably, partly due to rationalizations and job reductions at Sandvik, but has stabilized in recent years.

The map of the industrial site shows how the company expanded out into the lake, filling in the shallow bay in many large stages, the biggest in about 1930, 1950, 1960 and 1980. In contrast, the new factories producing cemented-carbide tools were built in another, even smaller locality, Gimo in the province of Uppland, where closures had created an available workforce. When sales of the Group's cemented-carbide tools grew in the world market, it was Gimo rather than Sandviken that prospered. Gimo is therefore Sandvik's second-largest worksite anywhere in the world, with about 1,700 employees.

In the modern period of its history, Sandvik has built or acquired factory after factory in all the world's major markets. The relative importance of Sandviken and Gimo has continually declined.

The world has shrunk thanks to high-speed trains, airplanes, and new IT solutions. No one could have predicted this in the 19th century. Back then, the new steel plant was located in "one of the corners of the earth" and was restricted to the European market and to products with reasonable shipping costs.

The Group's employees in Sandviken are thus reminded every day of their history, but constant change and new products are the very essence of Sandvik's operations, in contrast to the situation in most other major listed companies. At Sandvik, customers and their technological requirements are the starting point for all discussions about the Group's direction.

Sandvik sells products and services exclusively to other businesses, not to consumers. Customers use the Group's products in their operations or as components in their own products.

Virtually all meetings with customers focus on answering various techni-



Sandvik Machining Solutions' headquarters in Sandviken.

The Sandvik plant for cemented-carbide cutting tools in Gimo, Sweden. The factory is the company's next largest production facility and the largest of its kind in the world.

cal challenges: rock must be processed more efficiently, metal must be drilled, turned or milled faster, materials must last longer, and so on. The development process is both constant and unending. The requirements often seem extraordinarily demanding, yet it is still rare to experience quantum leaps. The business rarely raises headlines in the media, even though the Group's expertise and products often play a role when new aircraft types are launched, new oil wells opened, energy plants built, infrastructure expanded, mines opened, materials shipped, or implants surgically inserted. Anyone who has a pacemaker probably also has inside their body a wire, one-fifth the diameter of a hair, from Sandvik. Responding to customers' new and varied demands has an inherent logic that is tough but down to earth.

Far-reaching decentralization with independent business area management teams from the beginning of the 1980s is considered to be the main reason why Sandvik has been able to expand profitably across such a broad front and in so many niche markets. The Group broke up its country-based organizations and distributed much of the head office resources to the business areas.

This strong presence in so many places is also the foundation of Sandvik's ability to survive. It is not possible to know in advance what will be the Group's next big growth area, or what might become a new independent business area. But it is probable that Sandvik is already present in the area and has strong customer relationships.

Sandvik operates only in demanding niche markets, where products are born, make a breakthrough, and become everyday products (commodities) or even die within five to ten years. The life cycle is often shortest within the tooling sector. Likewise, the requirements for rock tools have increased dramatically due to more powerful machines and techniques. On the mining side, Sandvik is continuously launching new machines.

Sandvik's stainless steel products do have comparatively longer life cycles, but the stainless steel sector does not aim now, if it ever did, at having a few high-volume products to utilize the company's metallurgical production capacity. That is why the Group focuses so much on research and development, creating value for customers through technology, knowledge and logistics.

In the autumn of 2008, the Sandvik organization shared a new experience with most of the world's manufacturing companies. The financial crisis in the United States sent such a strong shockwave through the international banking system that no one dared lend money to anyone. The crisis was liquidity driven, not demand driven. The availability of money collapsed; customers could simply not get paid. Sandvik's customers in the gold industry, for example, had the best prices ever, but still had to cancel their orders for min-





A pilot plant for metal powder technology was opened in Sandviken in 2009.

ing machines because no bank could provide financing. The worst aspect is that three years later, this crisis does not seem to be over. Strong turbulence in the financial markets linked to huge debt problems in a number of European countries and increased political uncertainty in the summer and autumn of 2011 are making it harder to assess the economic future.

Is there anything good about a crisis?

Representatives of Sandvik's management report that they have finally gained the trade unions' agreement to adapt working hours to the economic situation. This makes it quicker to adjust production costs during both downturns and upturns, at a time when good and bad news follow quickly on each other's heels.

It is also easier to deal with structural problems. During the strong period of expansion before the crisis, the Group had made a large number of acquisitions, all of which required structural interventions and adjustments to thrive. It had not been possible to make some rationalizations because they threatened to disrupt relations with the Group's customers, who were impatient to get their supplies. After the crisis it has been possible to tackle these problems with greater force. The new strategy bears witness to this.

Such are the conditions for Sandvik and its birthplace of Sandviken. The town will certainly play a smaller role in the future. The whole of the European market is also gradually decreasing in importance to the Group as it expands in Asia and other rapidly growing markets. Over the first 150 years, Sandvik's map has gradually been redrawn. Just like before, the Group's survival strategy will be adaptation and continual change.

THE LONG EVOLUTION

One of Sandvik's most spectacular facilities, the unit for the manufacture of umbilical tubing, is a marvel of size, efficiency and precision. Tubes are rolled ever thinner in huge industrial buildings in a continuous process and then welded together and rewound in coils several kilometers long. In between these stages, incomprehensibly strong water jets spray away all impurities.

There cannot be a single impurity or joint in these tubes, which will be used in pipelines from oil platforms to oil wells, far down in the depths of the ocean. There they must function for decades, containing fiber optics and channeling the hydraulic oil that controls oil production down in the depths. This system is much like a car's braking system, but with many thousand times longer tubes and power transmission. The actual weight of the pipe alone is an almost unimaginable challenge. So are the pressure and the corrosive environment underneath the masses of water. Stainless steel needs oxygen or it will lose its protective coating.

A combination of materials expertise, process engineering and follow-up inspections makes the unimaginable possible.

Sandvik began to produce seamless tubes back in 1888. We can imagine that a technician from that time could easily identify and explain the various process steps in the shiny new factory. But he would probably be dumbfounded by the sophistication and complexity of the new process. Many, many thousands of improvements to the process have led to these shiny and chemically pure tubes of the slenderest dimensions. Discoveries of hundreds of new materials have enabled products of a quality and workmanship that no one could have imagined back in the late 19th century.

It is this slow, long-term miracle that economic growth and business development are all about. Sandvik has journeyed through an environment that has changed enormously. Economists have calculated that in today's global economy, work is done about 30 times more efficiently than in the 19th century.

In fact, we can question this numerical relationship as being too modest. Almost all the products available today are new, and those that existed when Sandvik's journey began were only the embryos of what would develop. Thanks to all this innovative power, people in developed economies live much longer and do not constantly worry that their children will die prematurely.

Production of tubes for umbilicals at the plant in Chomutov, Czech Republic. The tubes, up to 30 kilometers long, are wound onto giant spools.

Cross-section of umbilical tubes used for controlling oil extraction in the oil and gas industry.



This factory in São Paulo, Brazil, produces tools for metalworking.

All the surveys show they also live a happier life. How can we attach reasonable numbers to such benefits?

A more relevant numerical comparison might focus on the difference in complexity, but this would be difficult to assess. If we count the number of contacts between people in the world, the number of components in stock, or the number of products and services in markets, it is not enough even to talk about changes in the tens of thousands.

Sandvik's first employees were uneducated sons of farmers from central Sweden, who dug with shovels and chopped with hand axes to make way for a new industry while they were freezing and poorly nourished. They lived in small, crowded timber huts around smoky open fires. In contrast, today's Sandvik employees belong to a knowledge elite that has acquired a world-class expertise in both materials and technology in the fields of industry and mining—and that workforce now operates worldwide.



The company's archives contain detailed statistics depicting this evolution or journey through time. The figures shed light on such aspects as sales, surpluses, investments, number of employees, level of equity, dividends to shareholders and the value at which shares traded. To these we can apply macro-economic historical statistics to put the company in perspective.

What do the outlines of such a statistical study look like?

Let us set the global economy's real output and Sandvik's real sales at an index of 100 for about the year 2010 and then travel backwards, stage by stage.

The first stage ends when the global economy was at 50, half of what it was in 2010. That turns out to be at the beginning of the 1990s—a time when Sandvik only sold a quarter as much as in 2010 in real terms. Since then, via organic growth and acquisitions, the Sandvik Group has thus expanded roughly twice as fast as the global economy. Not bad for a 150-year-old company!

Sandvik's new business operations serving customers in mining and construction are behind this great advance. During this last stage, mining and construction became a vital part of the economies of the newly industrialized nations. But much more happened as well.

In the early 1990s, there was no Internet. The cell phone had just begun its triumphal march and laptop computers were barely even envisaged. The Soviet Union had just fallen and the Indian government was considering a new strategy. Japan had suffered a banking crisis, while China's confidence was growing. A new kind of savings funds and new theories of risk were revolutionizing the financial markets. A new world trade order, the Uruguay Round, was being negotiated and the EU was taking its great, decisive leap forward. It was a new world.

To find the next halving of the global economy, we go back to about 1973. On this occasion, Sandvik followed the pace of the global economy, neither more nor less. Misguided ventures and growing pains disrupted or halted development. A high inflation rate plus a radically higher revaluation of the stock market in the 1980s would have hidden the actual state of affairs from contemporary observers.

The global economy was thus evolving rapidly even before the era of the BRIC countries—Brazil, Russia, India, and China. The 'Asian tigers' led by Japan were already keeping economic growth strong, and China's rise was beginning. Oil profits were being plowed back in the Middle East.

There was talk of the First, Second and Third Worlds, the last of which comprised the countries that would later become the developing economies. The United States was testing Reaganomics and the United Kingdom was introducing a general liberalization. Silicon Valley in the U.S. was developing the new information technology and the Nordic countries were doing the same for the new mobile telephone technology.

The third halving of the global economy takes us to 1955. Again, there was a doubling within about two decades. Times were booming in the economies that were rebuilding everything that had been destroyed during World War II. Germany, the Eastern Bloc and Japan were reporting previously unheard-of growth rates. The global economy was also being stimulated by a transportation revolution involving pallets, containers, trucks and new types of ships. The petrochemical industry, nuclear power, hydroelectric power and transport links—construction projects were everywhere.

Sandvik managed to exploit the new markets and expand more than twice as quickly. It was mainly the rock drills and cemented-carbide tools that permitted this big advance in the global market. The world was building infrastructure and drilling in rock. Workshops around the world were investing in improved productivity, and Sandvik could help them.

We might expect that yet another halving of the global economy would take longer. World War II did destroy growth in much of the world, even though the armaments build-up required steel. And true enough: back to 1925 is a leap of three decades, and yet on average total global GDP grew by two and a half percent a year. In particular, it is the period before World War II that is often underestimated. How did Sandvik perform at this time, when more and more had to be sold on the Swedish domestic market? The answer is surprisingly that Sandvik performed well, because the armaments build-up boosted growth to six percent a year. That's why the company's engineers had to make two major expansions to its steel capacity. For a while it looked as if Sandvik would become a volume producer rather than a niche manufacturer.

We must then go back three more decades to find another halving of the global economy, based on the poor statistics that are available. At that time, the Swedish economy was growing significantly faster than the rest of the world's. World War I led to seemingly spectacular sales increases for Sandvik, but they were blown up by inflation. Otherwise, this was one of the company's worst periods, a time when competitors were catching up. It was a fantastic era of innovation in engineering mechanics, electricity, engine technology and telephone technology—advances that changed the global economy.

During its earliest infancy, the company grew just a little faster than it did in the early 20th century. We can thus conclude that it takes 150 years, even with good real growth, to create a large enterprise such as Sandvik. It is also clear that Sandvik is a company that has sped up rather than slowed down the pace after its early years.

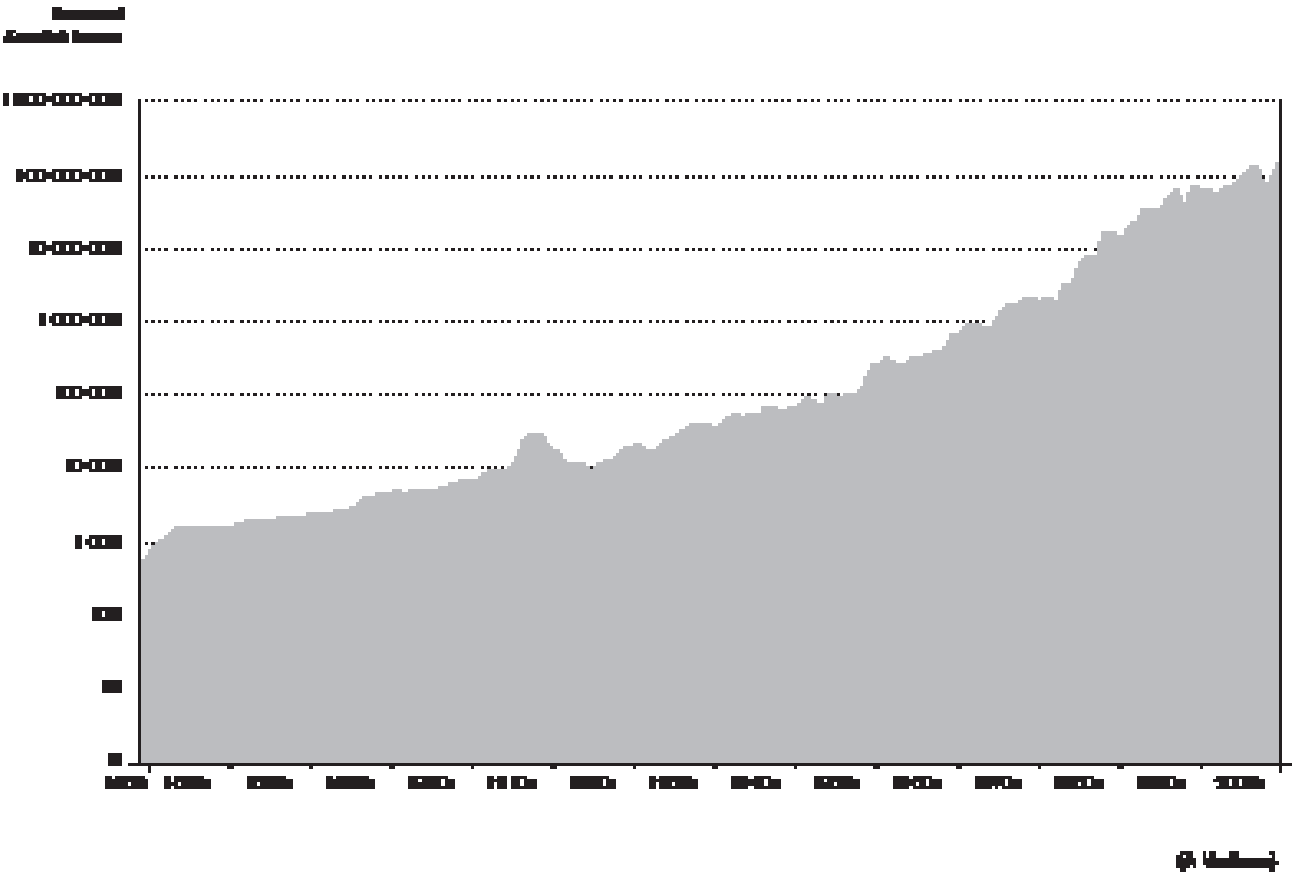
One day 150 years ago, a group of Swedish merchants or trading house owners and financiers set out on the long journey that would lead all the way to today's

global Sandvik. At first, their investment was a disaster for the owners, because the company went bankrupt.

But then began a private enterprise journey that illustrates why more and more entrepreneurs were founding companies. Sandvik's sequence of figures is almost unique. A precise time sequence for Sandvik shares can be calculated over a duration of no less than 141 years. A Sandvik owning family who had invested 5,000 kronor in one of the few initial shares in the reconstructed company of 1868 and then held it until 2010 would find a nest egg worth 241 million kronor. What's more, that amount is greatly increased by the present value of all the dividends paid out every year since the beginning. The reason Swedish families who own companies are unaware of this generous return is that wealth taxes, inheritance taxes and taxes on dividends have absorbed most of the profit during this long journey.

Even after taking inflation into account, shares in Sandvik are a formidable investment, with about four percent real growth in value every year, plus a

The development of Sandvik's total market capitalization from 1868 through 2010.



The market capitalization has increased from 0,5 million Swedish kronor 1868 to 156 billion kronor at the year-end 2010, which means a growth of 9% per year on an average. A share which cost 5 000 kronor in 1868 has increased to 241 000 000 kronor in 2010 after value growth and emission of bonus shares.

An ad from the 1920s stressing experience and quality as Sandvikens Jernverk was recovering from a major recession.

constant dividend of three percent. Sandvik is one of the companies that explain why the Stockholm Stock Exchange was crowned the world's most successful stock market of the 20th century.

This is not to claim that all investors have always profited from Sandvik shares. For example, the share price was inflated during World War I. Investors were willing to pay about twice as much for the shares in relative terms, if we take into account the company's net asset value and profitability. Just a few years later, two-thirds of the share value vanished when the market turned overly pessimistic instead.

The market value of Sandvik has naturally never been an objective measure. In a spectacular period of adjustment, the mood on the stock exchange in the mid-1950s led to Sandvik being valued as a business in crisis rather than as a growth company. The founding family was forced to relinquish power. The next wave of pessimism came in 1983, forcing a dramatic new change of ownership.

All this means that the Sandvik share price increased modestly during the company's first century and then took off dramatically, as a kind of compensation for both Sandvik and the Swedish stock market. For a long time after the Kreuger crash in 1932, Swedes were skeptical of shares. This was partly attributable to the fact that dividends were taxed at an almost confiscatory rate compared to the tax on interest income.

As a result, those people who were farsighted or lucky enough to buy shares in Sandvik in 1983 saw their investment grow by nearly ten percent a year in real monetary value. They could also steadily collect a dividend every year of a further approximately three percent of the share's market value. This substantial growth in value defied everything that had gone before, and can hardly be expected to occur again.

How old can a company become and how big can it grow? No one can say for sure. Most companies die or are acquired at an early stage, when they have few employees. New companies are constantly replacing them. Countless market leaders have lost their hegemony.

A few companies, however, continue to grow, either by conquering new customers and markets or by acquiring companies and thereby market shares. Some companies manage to defend their global leadership for long periods despite the constantly increasing number of competitors in all sectors. Hundreds of thousands of companies of various kinds currently operate in the international market. Most were founded after World War II. Compared to them, Sandvik is almost unique.

There are only a few hundred companies in the world that are exposed to competition and that are larger than Sandvik if they're ranked according to what they refine or the profits they report. Only a few of the really large ones are older than Sandvik.

There are only one or two surviving and independent banks, china manufacturers, timber businesses, textile firms, or insurance groups that can boast of a greater age. Former state monopolies in the postal and telecommunications sectors also belong to this category.

Sandvik matured and survived without any protection from its small domestic market. True, for a long period until the 1960s, Sweden was one of the world's fastest growing economies. Despite this, Sandvik had to look for its customers and growth outside Sweden right from the start.

The fact that about 95 percent of Sandvik's sales are now made outside its domestic market makes the company one of the few true multinational companies. Such companies must constantly change and adapt, not least to local conditions. But there must also be a kind of continuity in transmitting knowledge, plus an understanding of what the company is really all about. One successful company is never like another; each has a unique combination of experiences. These 'genes' are often associated with a particular country and its culture. Within Sandvik, most of the people who have handed down their knowledge have been Swedes, but this is changing. The Group will be recruiting more and more senior executives from countries other than Sweden.

Many of the giant engineering companies and metals producers, whose presence was so strong in the 1970s, have been split up or shut down. Over the

Following spread: "On the eve of a new century." The celebration commemorating Sandvik's 100-year anniversary in 1962 took place in the new extrusion press facilities. The company had just launched a bold expansion plan.

SANDVIKSTÅLET



1927		AUGUSTI						1927	
Söndag	Måndag	Tisdag	Onsdag	Torsdag	Freitag	Lördag			
	1	2	3	4	5	6			
7	8	9	10	11	12	13			
14	15	16	17	18	19	20			
21	22	23	24	25	26	27			
28	29	30	31						

*F*ör att göra kvalitetsstål fordras framförallt erfarenhet. En kvarblivande uppövad stab av medarbetare — alla kategorier inberäknade — är därför en faktor av den allra största betydelse för ett verk som Sandviken. Dessa äldre äro bärare av kvalitetstraditionen och meddela den till de yngre. Ovanstående bild visar några veteraner i Sandvikens tjänst. Rekordet innehaves av de två främst stående, som båda varit anställda sedan 1868, alltså i 59 år. Alla männen i denna grupp, inalles 22, hava varit hos oss i 50 år och mer. 864 personer, d. v. s. ungefär 27 % av vår till c:a 3200 personer uppgående styrka, kunna räkna en anställningstid hos oss av 20 år och mer.

SANDVIKENS JERNVERKS AKTIEBOLAG, SANDVIKEN, SVERIGE

Kalend. tryckt med vederb. tillst. av S. Vet.-akadens utest. priv.

inför ett nytt sekel





past three decades, Sandvik has increased its sales almost three times as fast as many of these huge global conglomerates. Only a few companies are higher than Sandvik on the industrialized world's growth list, and most of them have large domestic markets.

Since its reconstruction in 1868, Sandvik has only reported an annual loss on three occasions: in 1921, 1983 and 2009. This fact indicates a robust development program of knowledge and new ideas. Through two world wars and more than 20 recessions in the global economy, Sandvik's profit has increased exponentially, albeit unevenly. It is rare for major changes to happen within the space of a few years, but over the course of decades changes can be revolutionary.

Few other companies have delivered a greater number of advanced components for the production of virtually every innovative product in the modern industrial age, from the bicycle and automobile to the cell phone and wind turbine.

The long evolution began amidst one of the largest financial crises of the 19th century.

A parade celebrating Sandvik's centennial anniversary featured, naturally, a steam hammer.

A BUSINESSMAN AND HIS INNOVATION

O*ne spring day in 1857*, Consul Göran Fredrik Göransson, 38 years old and head of the trading house Daniel Elfstrand & C:ie in Gävle, arrived at the German commercial city of Hamburg. Göransson was suffering from the after-effects of rheumatic fever and must have walked carefully down the gangway, but there was no mistaking that the man arriving with his luggage and ordering a horse-drawn cab was important. Tall, well-dressed and self-assured, he was one of Sweden's leading merchant capitalists and ship-owners. Bearded, like most men of the time, he had blue gunpowder stains on one side of his face—the result of shooting practice—and an urbane air from years of foreign travel.

This was a man in his prime and at the height of his success. The firm of Elfstrand, which had been founded in the 18th century by his maternal great-grandfather, was one of Sweden's most prestigious. Never had the company been as expansive as it was now, under Göran Fredrik's direction. The trading house was an investor and financier of a number of small steel producers in central Sweden. Elfstrand's own seagoing vessels—a dozen full-rigged ships, brigs, and yachts built at its own shipyard—carried steel rods, timber and planking out into the world and returned home with a wide variety of commodities, from coffee to fertilizer. By tradition the firm belonged to an international network of similar trading houses, which were able to purchase and pre-finance the entire annual production of a foundry.

Göran Fredrik did not, like his predecessors and colleagues, call himself a 'grosshandlare,' which was the Swedish name for a trading house owner. The reason was that for a while he had run the company together with his father, who believed that a firm should have only one person with this title at a time. A small commission for Brazil's foreign ministry as its vice consul was intended to resolve the issue of Göran Fredrik's title temporarily, but everyone had now become accustomed to calling him 'consul.'

The medieval Hanseatic city of Hamburg, at the time an autonomous state within the German Confederation, was buzzing with activity. Everywhere ships were moored at piers, often with bowsprits pointing in over the street, which was crowded with people and fully laden wagons.

The city was still being rebuilt after a major fire, and the trading houses were dealing with the effects of the world's first great capitalist breakthrough



Sandvik's founder, Göran Fredrik Göransson, a leading commercial-capitalist who later became one of Sweden's major industrialists.

Sailing ships in Hamburg's harbor transported goods to and from northern Europe. Much of Göransson's loans came from Hamburg and much of his business was based there.

following the failed bourgeois revolutions of 1848, after which national rulers allowed more free trade. The fact that railroads and telegraph lines were being linked to create networks between this big seaport and cities like Kiel and Berlin further accelerated the pace of change. The railways made it possible to build an economically cohesive Germany out of a large number of small principalities and free commercial cities.

It was as if the Industrial Revolution coming from Britain and Belgium had finally broken through the embankments of other nations after 70 to 80 years of erosion. True, British and Belgian technology had spread before, but now innovations were surging into France, the Netherlands, northern Italy, the Ruhr, Silesia, Scandinavia, and the United States. Hamburg was getting new business from many sources, and this was visible in the port's many stately warehouses. Some of the sailing ships were built on iron hulls.

The great Crimean War between Russia and the allied countries of Britain, France, and Turkey was now over. The Baltic was once again a sea of peace, but only two years earlier it had been home to a large Allied fleet, with

a support base at the Swedish town of Fårösund on northern Gotland. A thousand cannons had been fired at the fortress of Suomenlinna (Sveaborg) outside Helsinki in Finland. The war had created unrest but it had also increased trade.

What did the end of the war mean for business? That thought must surely have crossed the mind of the newly arrived Swede, who gave the address of one of Hamburg's trading houses to the coachman. Göransson had big contracts, loans and accounts due with middlemen in the warehouse districts—firms with Swedish ties like Ullberg & Cramér and Johns Söner, as well as others.

There were other visits to make, to the commercial streets. Another reason for Göran Fredrik's visit was to buy quality furniture and other household items. The family house in Gävle was being extended to accommodate larger reception areas. A man in his position had to entertain lavishly.

The consul had big plans for his firm. Steam-powered sawmills were popping up like mushrooms along those northern Swedish rivers that had by now been cleaned up for log driving and steamer service. A new breed of industrialists who made direct contact with their customers had taken the lead. The old foundries and their trading houses had probably seen their heyday. It was best to think in new ways.

Göransson had already helped to found Sweden's first joint-stock limited liability company—the textile company Strömsbro—and then the timber company Korsnäs. He was a member of the board of one of the country's first private railroad projects, Gefle-Dala. He had also recently bought the small ironworks at Högbo near Gävle in Sweden in order to acquire the forests. His father-in-law, Nils Jacob Sehlberg, who also owned a trading house, used to grumble about his young and impatient son-in-law and competitor, saying that the lad's bold business deals were endangering what his ancestors had so laboriously built up. To the older generation, the trading house and the family comprised a single organic unit. A limited liability company with limited personal responsibility was a risky invention.

As business meetings in Hamburg succeeded one another at a rapid pace, Göransson found all the more reason to worry about his financial predicament. Old business colleagues showed obvious pleasure at meeting him, but the talks quickly took a terrifying turn. He began to understand that this was not a good time to furnish his new reception rooms. With each meeting, his concerns grew. Trouble was looming.

The merchants told him of the unrest that had already lasted for six months in the United States and that seemed to be coming inexorably closer. It did not resemble a normal storm, but rather a hurricane in the offing. If the trading houses in Hamburg felt they were in danger, there was every reason for a



Tower Bridge, London, England:
An immense project that required new steel technology.





The giant steamer Great Eastern was a tour de force of the British maritime industry.



Pontus Kleman, the Sweish financier who first invested in Henry Bessemer's invention; he later recruited Göran Fredrik Göransson.

The 1851 Great Exhibition in London, England, heralded a new era of more open trade and development.

financially fragile company from Gävle to protect itself. It was necessary to promptly settle all outstanding transactions and contracts.

To do so, Göransson hastily continued on to London. He wanted to get a clearer picture of the risks and to secure new loans. Thus it came about, says the family tradition, that in this eventful spring Göransson traveled to what was then the global hub of capitalism.

London was the heart of the optimism that characterized the 1850s. It was here that ideas of free trade had triumphed. Prince Albert himself had led a project that would showcase the global distribution of labor: the Great Exhibition, which was held in 1851 and was soon succeeded by the similar but even more lavish Exposition Universelle in Paris in 1855.

When Consul Göransson arrived in London, an entirely different monumental work was the subject of universal conversation. The giant Great Eastern steamship was a veritable monster of steel plating. It is almost impossible to imagine how the technology of those times could be used to build an iron hull of more than 6,000 tons and as long as two soccer fields.

In London, Göransson's two-year-old business associate Pontus Kleman was working at the firm of Hoare, Buxton & Co. A fan of progress, Kleman had been working in Britain since the 1830s, but it was during the latest economic boom that his reputation as a merchant and financier had truly grown. He had made fabulously large profits from dealing in forest products, and his acquaintances described him as "the most daring speculator of the age." He seems to have been closely allied with one of the foremost bankers, Giles Loder, an investor in Russian railroads. Kleman's latest idea was to revolutionize the production of steel. He predicted that the new ships, bridges and railroads would devour copious amounts of steel, and Loder thought the same.

The widely renowned English inventor Henry Bessemer had unveiled a new method of producing steel on a large scale, which promised to transform the entire industry. The inventor, however, was experiencing problems with early licensees, who could not duplicate the results he had achieved with the new technology. Kleman and his friends were already active in the small foundry at Dormsjö in the Swedish province of Dalarna. The financier now persuaded Göransson, known for his bold decisions, to become involved. Göransson was not really in a position to take on additional risk, but this became a slightly desperate maneuver in a tight spot.

May 20, 1857 is an important date in the history of Swedish steel. That is the day it was confirmed that Consul Göransson from Gävle in Sweden had bought a fifth of Henry Bessemer's incompletely developed patent.

After his return home, Göransson's workers and Kleman's engineer John Leffler urgently began testing the new method at the Högbo ironworks' new blast furnace in Edsken, slightly further west in the province of Gästrik-





English inventor Henry Bessemer.

land, where two small Bessemer converters sent from England were set up.

The initial experiments yielded uneven results. About every third attempt resulted in excellent steel. So what was going wrong with the others?

Quality control, however, was not the most acute problem as Göransson barely had the time to visit his experimental facility. The situation worsened when the international crisis reached the Elfstrand company. In early October, nearly all of New York's corporate banks suspended payments. A series of corporate failures in Europe then led to the exhaustion of most of the reserves of the Bank of England. The British government was compelled to step in and change the banking regulations. Within a week, the old Hanseatic region's many trading houses were toppling like dominoes, one after the other.

There was no chance of saving Elfstrand, which was financially intertwined with both Hamburg and London. On November 29, the Gävle company was forced to suspend payments after generations of toil. Many other companies did the same, including all those named here. But there were also more cautious merchants who managed to ride out the crisis.

More creditworthy business friends from Gävle, including Per Murén and Robert Rettig, were able to help to bring Elfstrand into receivership, and the bankruptcy administrators then decided after some anguish to pay the remaining debt on the patent and allow the Edsken trials to continue. In January, the administrators also obtained a loan of 50,000 riksdaler (an old Swedish currency) from Jernkontoret, (the Swedish Ironworks Association, today the Swedish Steel Producers' Association), which extended the short respite.

Göransson's future as a great businessman now hung on an invention that needed to be transformed into a fully developed innovation and an industrially useful form of technology.

Anyone who has seen the operation of a Bessemer converter or any of its more refined successors will not forget it in a hurry. First, liquid pig iron is poured into the pear-shaped furnace as it lies horizontally. The furnace is then raised and at the same time air (later, oxygen) is forced into it through the bottom under intense pressure. A huge shower of sparks billows from the furnace mouth, indicating that silicon and manganese are first being burned to cinders. This magnificent fireworks display cleanses the iron of impurities.

Next comes a deafening roar as the carbon in the iron is burned and gradually oxidized into carbon dioxide. The flame changes color as the carbon content decreases. Iron becomes steel only at a specific carbon content: not too brittle and not too spongy. It is therefore vital to stop the process precisely when the steel in the converter has achieved the desired carbon content. The blower is then promptly shut and the steel is tapped off into molds to solidify into ingots.

The craftsmanship of the blacksmiths at Edsken resided partly in their gut

feelings, color perception and experience to determine exactly when to stop the casting process. This was a highly responsible task in a dramatic and awe-inspiring setting, and it made the exploits of traditional blacksmiths pale in comparison. The blacksmith who was in charge of the Bessemer converter followed the oxidizing process by studying the flame, and raised his hand when the converter needed to be tipped over to tap off the molten metal. One mistake and the result was ruined.

It was also necessary to produce a correct raw material right from the beginning—that is, from the ore itself via the blast furnace stage to the pig iron—that was suitable for Bessemer 'blows,' as the process was called. Some types of pig iron were good enough; others were not.

How could such crucial factors depend on simple craftsmen in a nation where Jernkontoret, with all its metallurgists, had already existed for a century, and where knowledge about steel had gradually become better and better? Why didn't the scientific world's new metallurgists enter the picture until the 1860s?

The answer has to do with iron's almost incomprehensible complexity. As a pure element, it is technically uninteresting, not least because it oxidizes so easily. Only when it is combined with other elements does iron adopt its varied and useful forms. Iron with a carbon content below two percent is called steel and is malleable. When the carbon content is higher, the iron is called pig iron. Many other alloy materials, such as manganese, can alter the properties of iron

The invention of the Bessemer converter made possible the production of inexpensive steel. Competing methods, such as the Martin and Thomas processes, pushed the development further.

Following spread: Bessemer blowing at Jernverket in 1908. It was quite a sight to see.





In the summer of 1858, at the Edske blast furnace in the county of Gästrikland, the Bessemer process was first tested. The date, 18 July 1858, is commemorated as the birth of the industrial application of the Bessemer process.

and steel. There are also residual impurities, such as sulphur and phosphorus, which can ruin everything.

But that is not all. Two specimens of finished steel with exactly the same chemical composition can differ dramatically depending on how their molecular structure and carbon distribution are processed by forging, rolling, heating or cooling. Faced with this kind of complexity, scientific knowledge in the 19th century was very inadequate, and in some ways still is today.

Swedish success with steel dates back almost to ancient times. The combination of charcoal and ore from certain mines in the Bergslagen region of central Sweden provided a low content of sulphur and phosphorus. Because of this, the Swedes could produce the best bar steel in the world, and sometimes had almost a global monopoly. No one knew quite why Swedish steel beat the competition, but Swedish ironworks owners built many stately mansions that are still scattered across central Sweden as memorials to a long-lasting and favorable export period.

Unlike the 18th century, the 19th century was no longer characterized by progressive thinking. Mill owners who skimmed on wages, investments and

maintenance could generate money for stately homes and a rich social life that fended off the boredom of rural living. In contrast, their interest in technological development was often meager.

Experienced and self-assured blacksmiths wearing long white shirts pounded out the steel in the different ways they had learned from their predecessors, who were often skilled immigrants. As early as in the 17th century the Swedish kings and their advisers had opened the door for entrepreneurs and blacksmiths to move to Sweden. The idea was that such men would increase production efficiency and improve metal refining. The general aim was to finance Sweden's dreams of becoming a great power. The metallurgists who managed small-scale ironworks and forges gave way to the new, larger ironworks. Some twenty ironworks were established in Gästrikland alone. Volumes rose sharply until the end of the 18th century. Steel was no longer as expensive as precious metal, and this paved the way for the industrial age.

'Lancashire forging' was the name given to the Swedish steel that was typically produced in the 1850s. The name came from study visits made by two Swedish delegations to Lancashire in about 1830. By then, competition from Britain had already begun to be troublesome. Afterwards, many hundreds of 'Lancashire hearths' were built in Sweden, and the last was not closed until well into the 20th century.

When the men of Edsken were fighting against the clock to solve the deficiencies of the Bessemer invention, they could only use various practical tests to find out how different ores, grades of pig iron, and variants of the processing method worked. The owners of the ironworks did not really discover until later that the solution lay in the carbon content and the alloys, even though they knew about these to some extent. This trial and error system was rather like the knowledge behind producing cheese and wine.

The great advantage of the new Bessemer method was that by injecting air into the red-hot molten iron, you could instantaneously reduce the carbon content so that the iron was turned into prime steel. Many of the industry workers, whose professional skills lay in the never-ending heating and pounding processes, remained skeptical. That the process also required a specific type of pig iron meant that for a long time the conservative critics appeared to triumph.

Swedish steel engineers, though, proved to have the best conditions for getting the Bessemer process to work because they had access to the best ore and charcoal. The Bessemer method subsequently made a broad breakthrough in Sweden. In contrast, it met with considerable opposition in Britain, at least until a basic variant (the Thomas-Gilchrist process) could remove impurities from the steel and coke.

Every time a trial went well, hope stirred again in Edsken, but then new



setbacks would come. On 18 July 1858, when total failure was close at hand, the results were finally so improved that the patent holders chose to signal that the problems were now solved. However, the change of fortune was hardly dramatic. To produce good Bessemer steel, all stages in the processing chain still had to function. Complete control of the entire process was not gained until about 1860.

This delay does not, of course, in any way diminish the feat of the Edsken engineers. On the contrary. A team of Swedish metallurgists, with Göransson as catalyst and innovator, had transformed the steel world's most crucial invention ever into a commercial innovation. The event was of global significance.

The capitalist trader from Gävle and his merchant friends again began to see a glimmer of hope for the bankruptcy estate.

Sweden's industrial history is populated by imaginative financiers. Without their dreams and willingness to take risks with their own and others' money, many projects would never have seen the light of day. But they also left bankruptcies and crashes in their wake, often losing everything they owned in the end.

Pontus Kleman and Johan Holm were two such financiers who are now forgotten by all but a few historians. They mustered up capital in Britain and Sweden respectively, and invested boldly in one project after another, usually a decade too early.

As mentioned above, Kleman, who was described as an outgoing, intelligent and optimistic charmer, had made a large fortune in Swedish timber products. He was also the first person to seriously attempt to open iron ore mines in Swedish Lapland with the help of British co-financiers. He even tried to build a railroad to Luleå from Gällivare, and was finally prevented by the Swedish establishment in a way that caused offense in London.

Also involved in Kleman's various projects were the above-mentioned banker Giles Loder and the trading firms of Hinde & Gladstone and Thomson T Bonar & Co., which had similar backgrounds. All three took part in various projects to extract natural resources in Sweden in the 19th century. One of their biggest projects, worth some six million riksdaler in funding, was to found the company Högbo Stål & Jernwerks AB (Högbo Steel and Ironworks).

Without Kleman and his British business friends, Sandvik would not have existed today.

The Stockholm city broker Johan Holm, who was the same age as the other men, had followed a similar career path in Stockholm's more limited financial market. Being a city broker originally involved dealing in a complex currency exchange system, but the work later changed into acting as a credit intermediary. Holm displayed an ability to obtain short-term deposits, which he then

channeled to large projects and companies in the capital-hungry new industries. His small office increasingly came to resemble a bank or brokerage business. The big trading houses and various foundations and credit societies that had money to invest wanted a return on their capital, and Holm made it happen in a way that quickly inspired confidence.

During 1860, then, the Elfstrand bankruptcy estate sorted out the company's production issues in Edsken, and Consul Göransson made several sales trips. Originally, he had hoped to buy out Högbo and Edsken from the estate, and then produce and export steel ingots via a trading house. It would have been a prudent way out of the bankruptcy that had robbed him of the family business.

As time went on, however, the economic climate improved and Göransson understood ever more clearly that Edsken was too small to properly exploit the head start of having the world's most important steel technology. Bigger competitors would quickly seize control of the Bessemer steel market. Instead, what was needed was a mill of a size never before seen in Sweden. He discussed his idea with financiers and bankers in both Hamburg and London. Kleman was the one who took the bait, and his network already included Johan Holm in Stockholm.

That Christmas, there was talk about "the Storsjö Company"—a merger of some Swedish foundries plus investment in a new steel company that would focus on the growing railroad sector. British experts traveled to Sweden to investigate the assets. Soon there was talk of share capital comprising 450,000 pounds, or approximately eight million riksdaler, a mighty sum for the time.

A year of delays and disappointments passed before the company finally made its appearance at the beginning of the following year with a total of 200,000 pounds in equity. Some of the new owners invested their own property as capital contributed in kind. The mill owners Michaeli and Bergendal, as well as the owners of Elfstrand, contributed small ironworks, as did the two financiers Kleman and Holm. The ironworks were primarily used as assets against which to borrow money for a huge investment in Sandviken on the shore of Lake Storsjön. Most important to the project, though, was that the well-known financier Holm undertook to supply the new company with liquidity for five years.

To be part of the project, Consul Göransson was forced to issue guarantees and promissory notes to the heirs of his fellow part-owners of Elfstrand, who had recently died.

It was a straggling company, with uncertain assets and large borrowing needs. But on 31 January 1862, the Swedish Crown could confirm the articles of the newly incorporated Högbo Stål & Jernwerks AB.

That day is regarded as Sandvik's birthday.

Following spread: At the Högbo mill, just north of Sandviken, the world's first Bessemer steel was forged. The old manor and the church are visible in the background.



BUILT UPON SAND

In the early spring of 1862, after the ground had finally thawed, Göran Fredrik Göransson traveled every morning by horse and cart with his lunch basket along the nearly ten-kilometer-long forest road from his mansion in Högbo down to the construction project at Lake Storsjön. There, the first workers were digging a canal and excavating simple earthen-walled huts in the embankments they had formed. They were also building simple wooden huts like the ones that loggers used. The area resembled the gold-digger camps that had sprung up in California a few decades earlier. Timber was plentiful when the forest was being cleared to make way for the ironworks.

The consul made a careful selection from the workers who poured in from central Sweden to the nearby small railroad station, some of whom were too ill and frail to qualify as workers. Many workers' meager daily food rations included hard liquor. The small railroad lineman's hut served as temporary headquarters.

Not until late every evening did Göransson return home.

He and his family had moved to Högbo three years earlier from his large, extended residence in Gävle. Hosting fancy events was no longer part of their life. The consul also needed to be closer to his Bessemer trials in Edsken, which was now his operational base.

His eldest son, Anders Henrik, who was almost 20, would follow later. He and his brothers John and Ernst had studied at a boarding school in Lausanne, Switzerland. Anders Henrik had then gone on educational excursions and done internships, and was now having his first real test at his father's side.

The construction work was done with remarkable energy and persistence despite all the difficulties. This was largely due to the ever-present and detail-oriented Consul Göransson. He now demonstrated the practical qualities that distinguished him from many other visionary entrepreneurs. When he returned home in the evening, he had inspected the day's performance and knew what new campaigns needed to be implemented, not just the next day but also in the following days, weeks and months.

Why did he choose Lake Storsjön's western shore as the place to establish Sweden's largest steel mill, and not some place closer to the port of Gävle? The mill was built dozens of kilometers into what was basically wilderness.

It is likely that Göransson, with his extensive experience of Gävle's ship-

Valhalla, the meeting hall in Sandviken, built by Jernverket in 1908.

The company hotel, later called Bruksmässen, in Sandviken around 1910. A coachman waits on his passenger.



Digging the canal from the Jädraån River took 16 months of intensive labor using the technology of the day.

yard activities, wanted to retain a monopoly over the workers once they were on the spot. A workplace would preferably be located farther than walking distance from the city's various temptations, and from competing employers.

The proposed industrial site was on land belonging to Högbo and therefore cost nothing. It offered both good connections by water to the port of Gävle via Lake Storsjön and the Gavleån River, and proximity to the newly opened railroad between Gävle and Falun. It was also slightly closer than Gävle to the mines and forests that would supply the ore and charcoal. Imported coke was not included in the calculations. In addition, the Jädraån River, which flowed into Lake Storsjön here, could be exploited to power some machines via water turbines. Electricity, however, had barely reached the drawing board stage.

This, then, was the optimal set-up in late winter 1862. The sandy bay of Lake Storsjön had not been chosen at random.

In a full report by the board, dated 10 October 1863, Göransson himself describes how the large construction project was finally completed. There is no mistaking his pride in having satisfactorily completed his task.

"On 14 March 1862, after the Board managed to overcome all the aforementioned difficulties, the digging of the Canal began, at first with a small labor force, which gradually increased as we were able to obtain workers," he

writes. "In April, as soon as the first blueprints for the mill were drawn up, planning work for it also began."

In the report, Göransson describes the various stages in detail. The canal would be dug from the Jädraån River for two or three kilometers. Water had to be brought in to drive turbines connected mechanically to various machines.

Digging through the frozen ground began in an upland area in the wilderness. Göransson and his engineers were hoping for easily worked sand further on, but the laborers soon had to drive their pointed iron-bar levers into hard clay and compacted moraine and blast the bedrock. Then came soft clay, which constantly fell back into the canal unless the sides were lined with piles. Finally, after 16 months of digging by hundreds of men, this Sisyphean task was completed, but at twice the expected cost.

Two branch lines also had to be built to connect to the new railroad. Work on the mill began a few months later than the canal, after all the blueprints had been approved. A woman called Dal-Britta took part in the work and became legendary in Sandviken. According to the stories, she acquitted herself "like a man." Indeed, the question was whether there were many men who could outdo her.

In the summer of 1863, after just over a year of construction work, the largest blast furnace in Sweden to that date could be 'blown in.' It could produce about 15 tons of pig iron a day when everything went well, almost three times more than the average of the country's more than 200 blast furnaces.

'Blows' at the next production stage, the Bessemer steel converters, began a few weeks later in August. During the trials in Edsken, it had been decided to abandon Henry Bessemer's concept of tiltable converters, and fixed ones were installed in the new steel mill. But already during the first year of operation the switch was made back to the tiltable steel converters associated with Bessemer. Although the converters were tiltable they could be loaded with five tons, which was a radical change from before, and 30 times more than other steel furnaces of the day.

The benefits of the new steel mill were its economy of scale and the large work-pieces it could handle. This focus was accentuated even more at the mill's next production stage. From Britain, the company imported a steam hammer weighing 15 tons. Building the foundation for this huge hammer was costly, to say the least: the price was 100,000 riksdaler at a time when a worker's wage was twelve öre (twelve-hundredths of one riksdaler) an hour.

On top of a waterlogged sand pit were built layers of timber and sandstone topped by a thick sheet of iron. A new sheet weighing 50 tons soon had to be cast on the spot when the first one was too weak, and cracked. Even worse was that the piston rod broke off and no Swedish ironworks could handle such a large forging job. Everything finally worked out during 1864 for the legendary



Sandvik ran an agribusiness up until the 1990s, and forest management up to the turn of the 21st century.

Following spread: A giant steam hammer and workers, 1865. Daylight streams in through a hole in the ceiling caused by a recent fire.





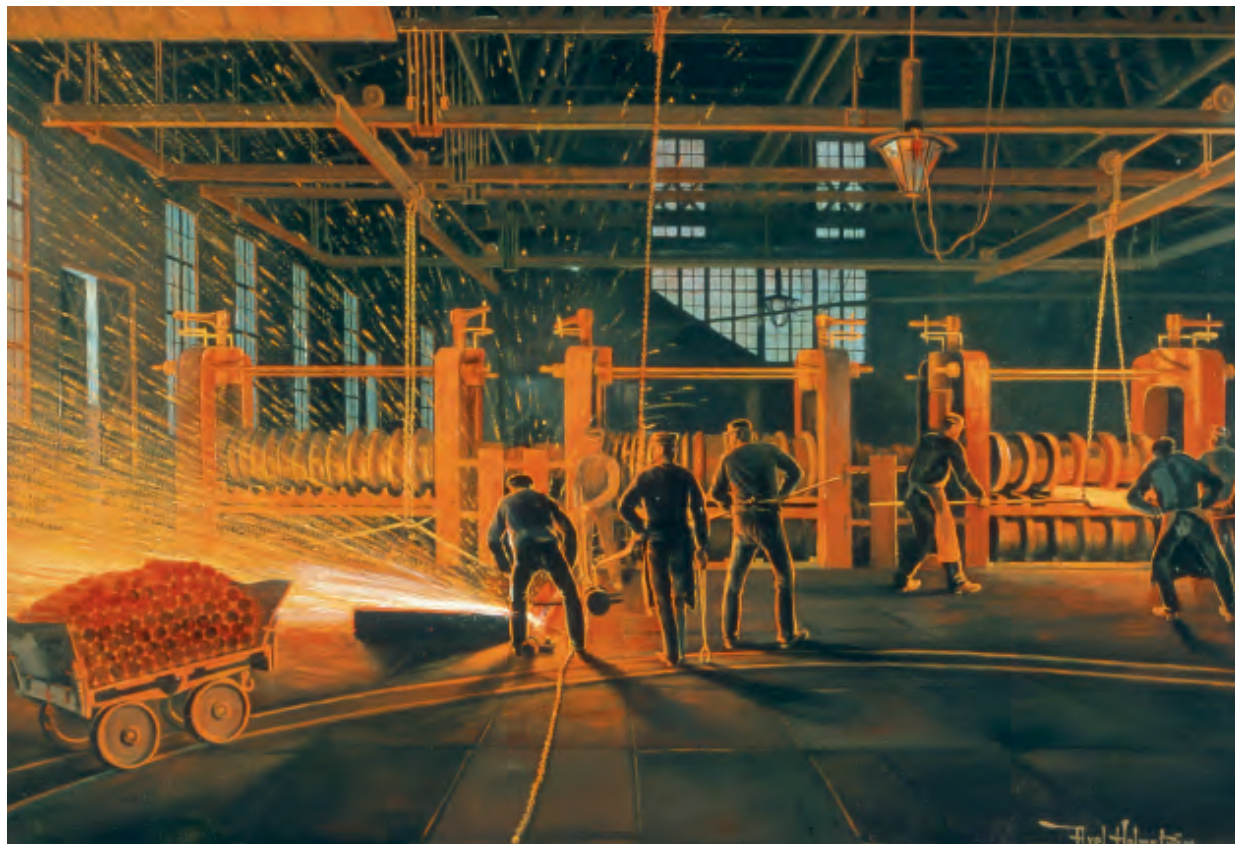
Painting by Axel Holmström for the Stockholm Exhibition 1897, depicting a hot-rolling mill.

giant sledgehammer, which went on to pound on large red-hot workpieces.

The next production stage, which was mainly the rolling mill for producing the important steel ‘tyres’ to fit on the wheels of railroad engines and carriages, defied contemporary concepts of ‘normal’ size. Previously, blacksmiths and their assistants had used manual force, standing up and rolling small, manageable workpieces into bar steel in primitive water-powered rolling mills. The new method was completely different.

Göransson and his engineers could start with the possibilities offered by a new production method. They were building one of the world’s first large-scale steel mills entirely based on and proportioned for the new Bessemer process. It was natural to focus on things that their smaller-scale competitors could not match, namely large and heavy forged and rolled products.

In Sandviken the industrial community was growing. The first year there would be jobs for about 100 workers. At first, they slept in the 50 or so quickly built, earth-covered timber huts along the canal, in districts that local wits, no doubt for good reason, soon called Flea Town and Louse Port. Washing and personal hygiene had second priority. The laborers slept on bunks around smoky open fires. They worked twelve hours a day, six days a week. They bought food from a makeshift trading shed. During the second year, another 160 workers arrived, and the year after that a further 200. Homes for the steel



mill’s clerical staff and officials were dismantled and brought in from Högbo, and simple housing for the laborers began to be built because their families had begun to join them.

While all this growth was happening, dark financial clouds were moving in over the new community. As early as late 1863, the company’s liquidity guarantor, Johan Holm, began to have trouble with his financing. His pledges were no longer worth very much. The question was whether the company would be forced to shut down before its operations had built up enough momentum to keep going.

The investments in the Högbo company contributed to Holm’s problems. When the “Holm financial scandal” and resulting bankruptcy exploded in January 1865, the situation looked dire. Högbo’s part-owner, the trading house owner J. N. Michaeli, who was in charge of the company’s finances, said that it would remain solvent for a maximum of six months.

Take a close look at this photograph of Sandvik’s first production facility (on the next page), taken in 1864 after two years of struggle with all the practical, technical and financial difficulties. In the picture 15 proud engineers and foremen are standing or sitting, symmetrically arranged around the founder

Sandviken's train station around 1900.





A photo of consul Göran Fredrik Göransson and staff at the tyre rolling mill. The photo was taken in 1864 for promotional purposes.

and leader, Consul Göransson. The message to the world's railroad market is: "Here is the leadership of the world's most modern steel mill, ready to deliver its products!"

There is no mistaking who is the leader. The well-dressed man in the center has his arms confidently crossed over his bulging stomach. The other men have a more cautious posture, their hands at their sides. The actual technology and products are central to the project. In the image, Göransson's head is at the center of the large cogwheel in the rolling mill, and his foot is placed ostentatiously in the foreground on one of two huge tyres, the company's main product.

Thus does a photographer paint his picture, in consultation with the client. Göransson, described by later commentators as one of Sweden's leading entrepreneurs, naturally wanted to show his customers, competitors and financiers that his was a modern, powerful, and solidly based engineering company. Railroad companies, which were now seeking engines and carriages for their huge projects in Europe and Russia, needed steel tyres for their wheels from the new Swedish company in Sandviken.

Today, with hindsight, it is easy to believe that the steel mill made a brilliant debut. But that was hardly the case. These men had ventured into almost unknown territory. They were testing different ideas about how, in the most systematic and cost-efficient way, they could cast in large molds ingots that would then be forged by a giant hammer and subsequently rolled into steel tyres by the rolling mill that can be glimpsed in the photo.

At first, the company made ingots with a hole in the middle. The monster hammer would quickly shape the bulky workpieces with a few heavy blows. Gradually improved methods made it possible to produce smaller ingots, and thereby more consistent steel quality. As a result, the expensive hammer was soon no longer needed to produce the steel tyres. The company's salesmen had to start cultivating other markets in order to supply the hammer with work, mainly producing machine parts and large billets for cannons.

Nor was the tyre rolling mill with its large cogwheel a particularly successful investment. The wheel's bearings were of poor quality and easily jammed no matter how much they were lubricated. Orders were low, and the lack of standardization in the market meant that the company finally had to obtain or make 44 different types of rolls to be able to supply the correct dimension to each customer. The rolling mill had to be constantly stopped to change rolls after each short series, thereby losing all planned economies of scale.

In the early years, production hardly flowed at all. Reports say that each steel tyre could require reheating four or five times during the forging stage and a further two or three times when it was rolled. The quality was uneven, partly as it was not yet possible, despite all the trials in Edsken to guarantee

the steel's quality when it came out of the converter, and partly as the engineers had simply not mastered all the subsequent stages of the manufacturing process.

The rolling mill had other flaws. The process created large quantities of scrap. At first, the company tried to recycle the scrap using another, less effective melting technique, but soon began selling it on the international scrap market.

Another problem for the new steel company was the water power. The canal from the Jädraån River provided insufficient water for the turbines, and it was only when several wood-devouring steam engines were installed at the steelworks that the lack of power ceased to be a problem. It was an expensive solution.

Steel mills are complicated systems that take a long time to fine-tune. This company started out in the wilderness with new technology and a largely untrained staff.

Göransson's company was one of three steel companies in Europe that could manufacture steel tyres for train wheels in one piece. Railroad companies were eager to have such homogeneous tyres, even if they had minor flaws. But shipments were still returned to the steel mill, and the fact that large quantities of steel were stored at the English port of Hull as collateral for short-term warrants (i.e. securities) says something about the financial fragility of the company's early operations.

The company's first years of operation were heroic but hardly successful. If it been able to continue a while longer, all this great effort would certainly have paid off, because the company was one of the first in the world to have functioning volume production of steel. But liquidity dried up first.

In March 1866, the great disaster occurred. When it was not possible to raise additional liquidity, operations at Högbo's Sandviken steel mill were halted. The production stop did not come as a bolt from the blue, as the wages owed to the workers had already increased to 180,000 riksdaler, an average arrears of between one and two months.

Some employees had savings, but many did not. The fact that the school already had 74 students by then shows that there were families who were caught in a difficult situation. Neither the officials nor the workers had new jobs to go to. Many other Swedish ironworks were also in crisis.

Within the space of a day, Sandviken became a small ghost town as the blast furnace was blown down and the Bessemer converter's spectacular bursts of flame faded away. The great hammer ceased to pound and the steel tyre rolling mill squealed no longer.

At the start of the crisis, Göransson tried to buy out the new steel mill, a

measure that Pontus Kleman did not want due to the mills he had himself contributed to the venture. Nor did the co-financiers in London want to let their investment go so easily.

Kleman, who had initially wanted more British ownership interest in the Högbo company than Göransson was willing to concede, had a new plan. A London-based company would be formed to buy the distressed Swedish company. Göransson, who had first resisted this foreign influence, began to regard it as the company's last resort.

The financial crisis continued in 1865. During that time, Michaeli had to arrange one loan after another so that the company could cover its day-to-day expenses. Småland's Bank began threatening lawsuits to recover its debt. Göransson and Kleman were the only ones who believed that the British could save the situation. Negotiations over the new company had come so far that at the beginning of 1866 Michaeli traveled to London with all the necessary documents, such as the certificate of search listing the company's debts, the powers of attorney, and the title deeds.

The industrial area included an extensive rail system for transport, initially using horse-drawn carts.



Billets for cannons and rail-
way tyres, two of Sandvikens
Jernverk's early products.

However, at the board meeting of the new Anglo Swedish Steel & Iron Company, Kleman was vague about how much of the huge capital of 1.5 million pounds was actually fully subscribed. As a result, the deal finally collapsed.

The result was bankruptcy. Every machine, rolling mill, furnace, and piece of ground was mortgaged, and in the port of Hull lay Bessemer steel worth more than one million riksdaler, the basis of a debt carousel. Only a fifth of the loans came from Swedish credit institutions. The big losses would be borne by the aforementioned stakeholders.

The Högbo crash was not huge by British standards, but it echoed throughout the financial district of London. It was a small link in a chain of events that only a few months later sparked one of London's biggest financial crises. The troubled discount bank Overend, Gurney & Co. was allowed by the authorities to fail, initiating a meltdown in London's financial district that would transform British bankers into the world's most conservative for decades to come.

Consul Göransson appeared in the public eye as a loser, but the crash made

a comeback possible. His knowledge and experience of the project would give him another chance. For the financiers Johan Holm and Pontus Kleman, however, this was the beginning of the end.

The workers at the steel mill were experiencing terrible difficulties. To escape famine, some workers and clerks returned to the farms from where they had come. Others tried to struggle on amidst the Sandviken silence, surviving on minor handicrafts, maintenance work for the bankruptcy estate, or odd jobs for local farmers. They hoped that the mill would start up again, but the months kept passing.

It never rains but it pours, goes the old saying about misfortune. After more than a year of hardship and waiting came the fateful summer of 1867 when winter did not want to let go of northern Sweden.

Terse diary entries from the time speak of the ice breaking up in mid-June, and cows being let out to graze a month too late but with no grass growing for them to eat. Even worse, winter returned very early, in the first week in September.

This would prove to be Sweden's last period of widespread famine. Thousands of people died in northern Sweden, and emigration to the United States reached record levels. At that time, the harsh living conditions of subsistence farming still prevailed, with people always on the brink of destitution. Later, industrial society would change this situation, but that did not help the remaining jobless workers in Sandviken. By the autumn, people who were having difficulty coping with the runaway food prices were already literally starving.

People expected that the company's founder, Consul Göransson, would alleviate these problems in true patriarchal spirit. That Christmas, for example, he collected money from the company's major creditors for flour and lutefisk (dried cod treated with lye), and a foundation was set up. The bankruptcy estate paid schoolteachers so that "the children would not roam about." The suffering did not ease; instead, it worsened in 1868, a year of drought on the farms. Attempts were made to restart the steel mill, but Sandviken, with its hungry inhabitants, sank back into silence again.

Finally, after two years of famine, rescue came. Göransson's relatives and friends were able to redeem the mill from the bankruptcy estate. Crucially, his sons had inherited capital directly from their maternal grandfather, Nils Jacob Sehlberg, who died in 1865 as the crisis was just beginning. He bequeathed his daughter's inheritance directly to her sons to avoid the money ending up in the crisis-hit company. The legacy made it possible for the three adult sons in the Göransson family to help both save the mill and maintain their father's influence.



The first head office was modest.



In 1891 the well-established firm erected a more fitting structure.

Following spread: Göran Fredrik Göransson with some of his closest staff.







The company's operations stood still for 19 months until the creditor in the bankruptcy, Thomson T Bonar & Co., leased out the operation. Soon, starting two years after the bankruptcy in March 1868, Göransson's eldest son, Anders Henrik, formally took over responsibility at the head of a Swedish group of owners.

In London, Pontus Kleman continued his efforts to found a new company, and in Sweden some of the smaller ironworks were purchased from the bankruptcy estate. However, the bankruptcy auction of the Sandviken works, the Högbo mill, and the blast furnace and converters in Edsken was delayed again and again. Interested parties wanted to prevent the facilities being restarted and take advantage of the head start. Göransson's company was no longer alone in building Bessemer converters. There were about a dozen new such projects in Sweden alone, and owners of established ironworks and their financiers would be happy to see Göransson disappear from the scene. Other Swedish financial institutions that had lost money on the venture wanted to give him a lesson he wouldn't forget. In fact, though, such efforts played into the hands of the new group of owners.

The Sandviken mill finally started up again, and two months later the newly incorporated company, called Sandvikens Jernverk, formally took over the facilities, with the Göransson family in the lead.

The new start was favorable for the new owners, and not just because it happened during an economic upturn. What could be better than to attack the new markets with a steel company that was no longer burdened by history, debts, obsolete equipment and a fragmented production structure? This was during the dreadful era when a large number of mills died in Sweden. As others shut down, Sandvikens Jernverk was reborn.

Consul Göransson himself was still in bankruptcy, but that did not stop the company's owners giving him their full trust to run the new company.

Göran Fredrik Göransson near the end of his life. Personal bankruptcy had been overcome and he had built up a new income base for his family.

THE MILL OWNER'S BUSINESS IDEA

Anders Henrik Göransson, eldest son of Consul Göransson, loyally worked at his father's side until the bankruptcy. He and his brothers then used the inheritance from their grandfather to buy their father's life's work from the bankruptcy estate. At the age of 24, Anders Henrik was now formally the head of the new company, the 'brukspatron.' In practice, this did not mean very much as the entire project was based on his father's knowledge and experience. Neither the son's nor the father's business friends had ever expected that anyone other than the Consul would continue to run Sandvik.

In various recollections from the time, Anders Henrik is described as a dutiful, ambitious and very gentle man. One of his children characterized him as conscientious and anxious to behave properly and honestly, but determined and eager when he was convinced that everything was fair and correct. As for his relationship with his wife, it is said that they never exchanged a heated word.

The Consul could not have had a more promising son than Anders Henrik.

Fredrik and Betty, as his parents were called in private, had six children in the space of ten years. Anders Henrik and two of his younger brothers were sent to a boarding school in Lausanne, Switzerland, in the hope that they would learn foreign languages at an early age. Business friends saw to it that the expensive school fees were paid even after the bankruptcy, an investment that they later found very profitable.

Production at Sandvik struggled along without many orders in hand and without adequate funding. The problem of a lack of money was alleviated by a promissory note loan personally guaranteed by the board's wealthy chairman, Per Murén. When it came to the company's investments, however, he was said to be cautious. Murén resigned in 1883, some time after reaching retirement age. Consul Göransson's period of bankruptcy was then at an end, and he was free to formally resume the chairmanship. His son, Anders Henrik, and his son-in-law, Carl Wilhelm Sebardt, helped him pay off his private debts.

After three years in Lausanne, Anders Henrik traveled to Germany and England on study visits and for practical training. The young man not only mastered French, German and English, but was also one of the new generation's young forward-looking men, accustomed to railroads, telegraphs,

Göran Fredrik's son Anders Henrik Göransson. While he was the company's formal managing director, his father held the ultimate power.

The board's wealthy chairman, Per Murén, personally had to guarantee several company loans.



Anders Henrik Göransson traveled extensively for work. Here a trip to Paris, winter 1870, including transport by ice boat over the Great Belt in Denmark.

steamships and printed media, but also highly optimistic about future developments. In his novels, the famous French author, Jules Verne, reflected this new generation's ideas, which he simply took from international technical journals to use in his stories. Through new media, young men like Anders Henrik gained a clear information advantage over previous generations.

He traveled around to get customers for the restarted iron works, contacts in the markets having become outdated during the long period of inactivity. Equipped with letters of introduction, samples and analysis, he made his rounds. The very first trip was highly successful, because he sold in greater volume and at higher prices than intermediaries would have managed.

That is probably why, between the years 1869 and 1870, Anders Henrik Göransson spent most of his time traveling. Though transportation was more comfortable than before, hardships and setbacks still dominate the picture he gave when, night after night, he wrote long letters about everything that had happened during the day. Back at Sandvik, it was his father who made the decisions, and everything was subject to his control. The travel budget was limited, and the comfort level of cheap hotels demanded a strong young body. In the beginning, the young salesman encountered problems everywhere, but he soon began to make breakthroughs.

A close look at the first six annual reports for the new Sandvikens Jernverk gives a surprisingly positive impression, given the venture's past problems. Sales grew every year and the profit margin was between 17 and 18 percent, which means that the investors who invested in Sandvik quickly got their money back. Not only the Göransson family, but also the trading house owner



and railroad financier Murén and the merchant and mill owner Michaeli had taken great personal risks.

International steel prices rose due to a new economic boom. Sandvik's favorable situation was the result of the end of war between France and Prussia, and the formation of the new Germany and its government-controlled 'Gründerzeit.' Otto von Bismarck, the new industrial nation's strong man, graciously permitted free trade for a while. Thousands of new companies were established, and German industry cried out for steel. In contrast, the business climate in France, which had lost the war, was tepid for many years, just as it had been in London after the great financial crisis.

Establishing a new company was not easy, because firms such as Krupp in Germany and Vickers & Brown in England dominated the market for railroad wheels, cannon blanks, and other high volume products that the new, unknown Sandvik had to offer. Many customers preferred finished wheels over the semi-finished tyres produced by Sandvik.

But large orders soon came in from Russia, where Anders Henrik Göransson received great help from the Swedish ambassador in St. Petersburg and succeeded in finding an agent with excellent contacts, the Belgian Emile Jansen. At the time, European Russia was laying three times as much railroad track as Sweden. The rapid pace of investment in Russia, as elsewhere, was largely based on foreign capital.

Steel mills in England were buying ingots from Sandvik. Swedish railroad companies were also contributing to filling the order book, especially after 1869. The new Sandvik sold everything from pig iron, ingots, tyres, and train



The various 19th-century Russian railroad projects led to numerous jobs for Sandvikens Jernverk. Here, an image from the Trans-Siberian railroad, commenced 1891.

Following spread: Workers at the foundry, 1920s.



axles to a variety of forged products, drill steel, and other steel products to customers in Sweden and Europe. But without the big orders from the Russian railroad entrepreneurs, the new owners would have had more difficulty succeeding with the project.

Sales, which had slowly climbed to 900,000 Swedish kronor in 1870, shot up to 2.5 million in the record-setting year 1873. This was the result of both greater volume and higher prices. Even with raw material costs increasing, net profits increased from 220,000 kronor in 1870 to 465,000 in 1873. They remained at that level for several years.

Given that the owners had invested only 375,000 kronor to save the company from bankruptcy, this was a far bigger profit than anyone had dared to dream of. In spite of the generous dividends paid out to shareholders, the funds on the balance sheet were sufficient to both issue new capital stock and provide a stock dividend in 1870.

The risky short-term debt could rapidly be converted into more secure mortgage loans with local lenders such as Gefleborg Hypoteksförening and Gefleborg Enskilda Bank. The bankruptcy was finally history.

All business cycles come to an end sooner or later, but this one had been marked by unusually big swings. In May 1873, volatility in the Viennese stock market became worrisome and quickly spread to Germany. In the autumn, a wave of panic reached new heights in New York when big railroad companies failed and the leading banking firm of Jay Cooke & Company became insolvent.

In London, where investors had been particularly cautious after the crisis of 1866, the mood was calmer and Swedish railroad expansion kept things going a while longer. But mill towns continued to die in central Sweden.

Sandvik managed better than most. Big orders came in from the national railroads and private railroad companies. The young railroad equipment company Atlas in Stockholm also bought tyres for their railroad cars. Sandvik also continued to do good business with the Russian Defense Ministry, primarily in ramrod and bayonet steel. This was business that Anders Henrik Göransson carefully nursed, with frequent trips to present new products.

Volumes remained high but market prices dropped by half and reduced the value of sales to less than 1.5 million kronor in 1877, a year in which management reduced the number of employees, after having increased the workforce in previous years to well over 500.

The annual reports show how profits quickly melted away. Earnings sank to less than a third of earlier years' earnings. Of particular concern was the fact that Sandvik, which had little in the way of raw materials, had contracts for delivery of iron ore and charcoal that automatically refilled the stockpiles in quantities to last for years.

In time, it became clear that Sandvik was not the ideal company for making large-volume products. While the Bessemer process did save a lot of fuel, a shift by most competitors to the new steel technology made proximity to coal mines a bigger competitive advantage than proximity to iron ore. It would soon be unprofitable to produce large volumes by using charcoal, a labor-intensive method.

In a competitive environment, where success was increasingly linked to access to cheap ore and coke, Sandvik had neither. While it was more rationalized than any previous steel mill in Sweden, it was not as cost-effective as new British and German facilities near the coal mines.

The Bessemer process favored steel made from the pure ore of Bergslagen, the mining district around Sandviken, but a new English variety, the Thomas process, would soon make it possible to use ore with more impurities, including that found in the Lapland area of Sweden.

Another global trend was occurring that would soon have a long-term influence on Sandvik. The great era of international free trade, which began in 1846 when the UK removed its grain tariffs, had come to an end. Protectionists, tired of volatility and crises, won repeated victories in country after country. From the 1890s onwards, there was a new world of import duties, regulations, cartels and trusts. This development did not favor a small, export-oriented company on Europe's periphery.

In company histories it often appears that strategy is primarily worked out at a desk and that the business then simply sprouts from the excellent plan the

The name Sandvik was used as a brand at the Centennial Exposition in Philadelphia, U.S., in 1876.



Sandvikens Jernverk's ad for spring steel used in gramophones, 1928.

founder and his colleagues dreamed up. In reality, that's seldom the case, and Sandvik was no exception. Instead, the plan had to be adjusted when the market changed and new customers—as well as additional funding—had to be found.

One thing led to another. Wholehearted investment in an unfinished British innovation paved the way for financing Sandvik, and the new technology determined the direction the company would take.

Much of what had been built up with a great deal of effort turned out to be disappointingly bad bets. Selling tonnage products manufactured with labor-intensive charcoal-based production methods was simply a poor choice, at least after the good times were over.

It was high time to look for new ideas. The steel company needed to be restructured from the ground up, an expensive and dangerous undertaking in which one wrong step could lead to disaster. Where were the new customers to be found and what would the new production look like?

Fortunately there was one person in the organization that had learned enough about the world's steel markets in time to once again save the company. Thanks to his travels, the young managing director (or 'brukspatron' as he was called in Swedish), Anders Henrik Göransson, had come to realize how serious the situation was becoming.

Swedish steel companies marketing to foreign markets no longer had any special competitive advantages. In fact, it was just the opposite, given the long transport routes. Anders Henrik could only see one way forward: more highly

refined products and manufacturing aimed at quality markets. That could support higher costs.

Sandvik built another Bessemer plant during the boom year of 1873, locking in the production method for decades to come. The company was no longer a technological leader, but it soon demonstrated the ability to satisfy the requirements of new customers with the technology it possessed.

The pace of change in the manufacturing industry of the late 19th century can be compared to the IT industry of our day. One new product after another was launched, small as well as large.

Razor blades and the steel nibs for pens came first. Both were mass-produced beginning in the 1860s, as were pocket watches. Other consumer products in great demand included umbrellas and corsets.

Larger consumer items and tools made their debut In the 1870s: sewing machines, typewriters and telephones. However, it was not until well into the 1880s that they were produced in larger quantities. In the 1890s, bicycles with rubber tires, chains and freewheels were introduced, revolutionizing life in the city and countryside. Towards the end of the century the phonograph, automobile, kerosene motor for small boats and many other products appeared, including a range of small household appliances.

To manufacture these mass-produced products efficiently, new machines were successively developed in Britain and the United States capable of turning, grinding, milling and drilling with greater precision.

The list could be made long, but these examples give an idea of the dynamic market in which the young Sandvik found itself. Products no one had ever heard of one year could turn up in the following year's offering. The organization had to keep up with the latest developments and focus on more refinement of products to keep the interest of the manufacturing companies.

To meet these new market demands, the fine rolling mill for tooling steel was enlarged during the crisis years of the late 1870s. In 1880, yet another fine rolling mill was built. Around that time, British pipe manufacturers had enquired about the possibility of purchasing strip steel for making pipes.

In the meantime, Sandvik's workers learned to draw wire. In late 1877 a proud managing director wrote to his agent in Germany, the Norwegian Mr. Duus, and said, "Today we drew the annealed wire, which went very well, so we hope to begin work in earnest on Monday."

Even before wire drawing had come to Sandvik, rolled wire, known as wire rod, was produced for manufacturers of umbrella ribs in Germany and Britain. In the years that followed, the Swedish company developed the manufacture of wire for fishhooks, carding combs and needles. Finished wire for umbrella ribs was soon to follow.



The company manufactured profiled flat wire for umbrella ribs.

Spoke wire for bicycle wheels was an additional Jernverket product.

SANDVIKSTÅLET

No 7 1928



SANDVIKENS GRAMMOFON-FJÄDERSTÅL

Grammofonen och radion utgöra ett mycket betydande exempel på hur nyheter och framsteg på ett område kunna stimulera verksamheten på närliggande områden. Inför perspektivet av radion med dess rika möjligheter till aktuell och mångsidig repertoar att bjuda den lysande allmänheten bekräftades sålunda rätt allmänt en tillbakagång för grammofonen. Raka motsatsen har emellertid inträffat, i det att konkurrensen med radion sporrat grammofonfabrikanterna till nya ansträngningar, vilka på kort tid resulterat i rent hjälpnödvärande förbättringar, framförallt i grammofonens ljudkvalitet.

Villkoret för att denna förbättrade ljudkvalitet även vid de största skivorna skall komma fullt till sin rätt är emellertid en god fjäder. För denna detalj användes numera i stor utsträckning Sandvikens grammofonfjäderstål. Fjäderna av detta stål utmärks sig nämligen för en synnerligen jämn dragkraft och hög brottsäkerhet. En följd av våra rigorösa provningar av fjäderstålet är vidare den ytterst ringa kassationen av fjädrarna, vilket förhållande fabrikanterna själva vid flerfaldiga tillfällen framhållit.

SANDVIKENS JERNVERKS AKTIEBOLAG. SANDVIKEN. SVERIGE.



The rolling mill for drill steel laid the foundation for a new era of specialized and finished products. Jernverket ceased to be a high-volume manufacturer.

A whole new era had begun. Sandvik was no longer limited to heavy tonnage for a few big customers, but could focus on kilo-quantity goods to many customers further along in the refinement chain.

Problems developed quickly in the earlier large volumes market. The broadest product assortment still went to Swedish customers. But in Russia, sales went into free-fall when competition in the railroads sector stiffened and orders from the defense department were reduced. The Czar's underdeveloped economy had no advanced industries needing wire and fine rolled products. The industrial countries, Germany and Britain, however, did have such needs, and Anders Henrik Göransson had to hire agents to develop new kinds of customers.

Volume levels in 1880 were a far cry from those of the record year of 1873. The only similarities were that Scandinavia remained the largest market and total tonnage was nearly as big. Orders for tyres still came in from Scandinavia and Russia, but they were clearly on the decline. More highly processed products for British and German customers took their place. In spite of the improved products sales, figures did not reach the seven-year-old records. It is safe to say that Sandvik did not get a good return on its product development in this period, and that its finances were severely depressed as a result.

But the alternative would have been bankruptcy.

Fortunately, the board managed a successful bond issue for 600,000 kronor in 1874. However, the sum was insufficient to cover all of the costs associated with the new Bessemer plant, the new rolling mill and the new wire drawing mill, not to mention the stock of raw materials. In the general absence of profits, the company's debts increased by a million kronor during the five-year period leading up to 1877.

Once again, Per Murén and other board members with private fortunes were forced to sign promissory notes or other obligations. The financial transactions were taken over by Anders Henrik Göransson's brother-in-law, the pharmacist of the royal court, Carl Wilhelm Sebardt. He had to return to Stockholm's Handelsbank 23 times in 1877 to renew the company's credit line. The Göransson family was not going to let the family business slip out of their hands a second time.

But this crisis was also resolved and Sandvik's ability to secure long-term financing improved. There was plenty of equity in the company's properties—if only they could be put to profitable operations.

The recently established company had now survived two crises. The young managing director had carefully built up a new business model through his frequent contacts with customers and agents in the marketplace. He manufactured high-value-added products that could support the cost of long transportation routes and stressed research and development, often in close



S. A. Edwards, Jernverket's agent in Birmingham, joined the company in the 1870s and successfully introduced Jernverket's wire rod to the British market.

Sandvik's first subsidiary outside Sweden was founded in 1914 in Birmingham, UK. Some production was later started.

cooperation with customers. He tried to group the different products in optimal product lines and marketed them via his own dedicated agents.

Step by step, a certain logic evolved that would carry the company through the next 100 years and more.

There are also factors relating to the solidarity and openness of an organization, where the population of a small community and the family that owns the company are dependent on one another for their survival.

In this respect, Sandvik's corporate development is not very different from other successful examples, whether in Sweden or in other countries. Sustainable business concepts require breadth and complexity to stand up to tough long-term competition. A simple business concept like that of the Högbo company could be planned at the kitchen table, but could also be copied just as easily. Survival is about continuously relating to both customers and competitors in a complex and sophisticated way. Everything is constantly changing and the company must be open to these changes. Competitors can copy aspects of a business concept or buy key personnel, but they cannot get at the entire formula. In 1880, after 18 years of experimentation, Sandvik had developed into a sustainable business.

To a large extent, the honor for the turnaround belongs to the second managing director, Anders Henrik Göransson, and the agents he managed to recruit in the late 1870s.

Forty-four years went by between the first group photo of Consul Göran Fredrik Göransson and his technicians and the group photo where his son, Anders Henrik Göransson, gathered his agents around him in 1908.

Much had changed between the era of the earlier photo and that of the later one. Most of the men in the new photo still had some type of beard, but fashions had changed and the clothing was of better quality. Most importantly, it was now the sales approach—not the technology—that set the tone for the company.

The photo, taken at one of the managing director's sales meetings, is representative of his contribution to the company: a new business concept with the focus on salespeople and customers rather than the technical capabilities of the plants.

The transformation of the sales work and, consequently, the business, began with the new agent in Germany, Wilhelm Peipers, who, however, doesn't appear in the group photo. He was a specialist in the steel industry. Sandvik had lost its usual markets in Germany during the crisis of the 1870s but was able to introduce its new rolled wire to German wire drawing mills.

Encouraged by the new signals from Germany, managing director Göransson traveled to England and signed on S.A. Edwards as a new agent in



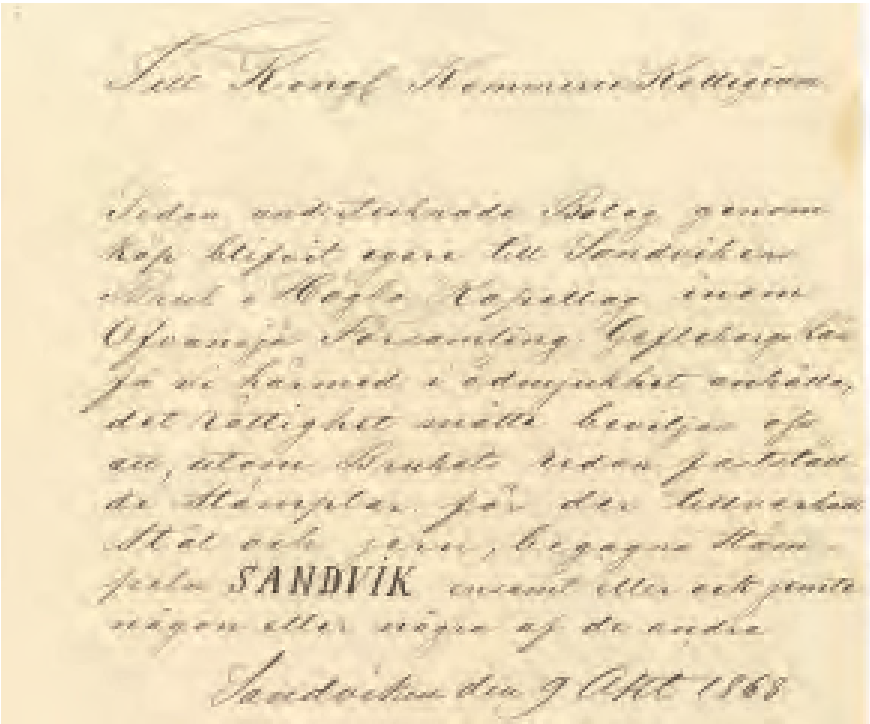
Anders Henrik Göransson with some of his key agents, 1908. From left: S A Edwards, Birmingham; Th Book, Eberfeld, Germany; E Bruckner, Paris; A Olsson, Stockholm; and L E Courvoisier, Bienne, Switzerland.

Birmingham’s wire drawing mills district to augment his London agent. Edwards succeeded in overcoming the skepticism of the British toward the Bessemer process and, before long, wire from Sandvik was making its way to China, India and Japan in the form of umbrella ribs. Fishhooks and carding combs from British manufacturers also required high quality wire. And then there was the order for strip steel to be used in manufacturing pipe, which would prove to be of great importance.

The third important agent in Göransson’s new sales organization was the Frenchman E. Bruckner. It may not be entirely coincidental that the Frenchman is standing directly behind the managing director in the photo. Bruckner joined the company in 1880, after French trial orders for wire had already come in, but it was he who suggested a number of cold-rolled products, particularly saw blade steel.

Sandvik’s owner built his European sales network around the inner trio of Peipers, Edwards and Bruckner. The network not only ensured that the company’s products were widely distributed, but also provided feedback and continual demands for changes. Price pressure from tough competition in the steel market helped open the Swedish company to constructive criticism.

The cold-rolling mill project initiated by the French agent had a rough start. Nothing worked. The technicians at Sandvik had to find their way



Sandvik’s application letter for approval of the brand, 1868.

Following spread: In 1899, the Göransson clan gathered to celebrate Göran Fredrik’s (middle row, third from right) 80th birthday. Of the patriarch’s sons, only managing director Anders Henrik (middle row, third from left) still worked in the company, while his brother-in-law, Carl Wilhelm Sebardt (center, seated) sat on the board. Two of the company’s engineers, Tord Magnuson (back row, second from left) and Arvid Johansson (back row, third from right) married into the family. On the far right side stands 20-year-old Karl Fredrik, the family’s hope for the future. Behind Anders Henrik stand his daughters, including Sigrid (light dress), who would play a major role in the struggle for social change.

through uncharted territory and it took many years before they eventually became internationally acclaimed authorities. The first four or five of what were to be some 50 rolling mills of different types were developed and built in the 1880s. Several other Swedish companies provided stiff competition, but Sandvik eventually took the lead, and the product list gradually grew. Ordinary strip steel was produced in sizes as much as 80 centimeters wide and special, thin strip could be rolled down to thicknesses of only some tenths of a millimeter. Customers punched and pressed the strip into bicycle parts, chains, typewriter parts, adding machines and textile machines; measuring tapes, razor blades, door closers and many other products.

In 1889, Sandvik launched gang saws for sawmills and carpentry saws. Wood bandsaws were added to the line the following year, and 1892 marked the introduction of what was to become Sandvik’s best-selling consumer product, the handsaw. The little fish surrounded by a hook that was registered as the official emblem of rolled steel for fishhooks was also used for the handsaws. That’s why, for more than a century, people all over the world would ask for the fish and hook handsaw—the one that stayed sharp so long.

In 1897, a German instructor was summoned to start up the manufacturing of mainsprings for clocks and phonographs. A Swiss man arrived in 1907 and stayed three years to fine-tune the manufacture of springs for pocket





Jernverket's display at the 1893 World Exposition in Chicago, U.S.

Anders Henrik Göransson with daughter Sigrid, 1890s. Sigrid took an early interest in her father's work in the Sandviken community; she never married.

watches. And in 1909, the time was right to start the production of razor blade steel, an area in which Sandvik's Swedish competitor Munkfors had the advantage.

Pipe joined the product list in 1888. Just four years later it represented a third of the company's production volume, and two years after that, half. One pipe rolling mill after the other was built. Even in this case, Sandvik chose to go with the most advanced niches in the market: high quality pipe and tubes. The new bicycle manufacturers were looking for inexpensive welded tubing, and Sandvik manufactured pipe and tubes that could withstand pressure. These were needed for new motors, boilers, steam pipes, drill steel and other uses.

Over a period of 40 years, Anders Henrik Göransson moved the company from a focus on technology and volume products to solving difficult problems for customers. The new company grew increasingly complex, but at the same time it became less dependent on transportation distances, raw materials and steel processes. Anders Henrik's father, the company founder Göran Fredrik, passed away in 1900 after the new company had taken shape. He can be seen in a photograph from the year before, on his eightieth birthday: a patriarch with many heirs but with surprisingly few candidates from within the family who could take over the helm of his company.



NEPOTISM AND THE GROWTH OF THE LABOR MOVEMENT

In 1901, the managing director's only son, Karl Fredrik Göransson, came home and, at the age of 22, began working at Sandvik. In addition to practical experience from steel mills, he brought with him practical training in bookkeeping, academic degrees in economics and metallurgy, and a microscope in his suitcase. The last-named item on the list emphasized his knowledge of metallurgy, newly acquired at Columbia University in the United States.

There is no doubt that he returned home with great expectations, anxious to dive into the family business just as his father had done in his youth. But that was not to be the case, despite his grandfather having recently died and his father having taken on the demanding roles of chairman of the board and managing director of the company.

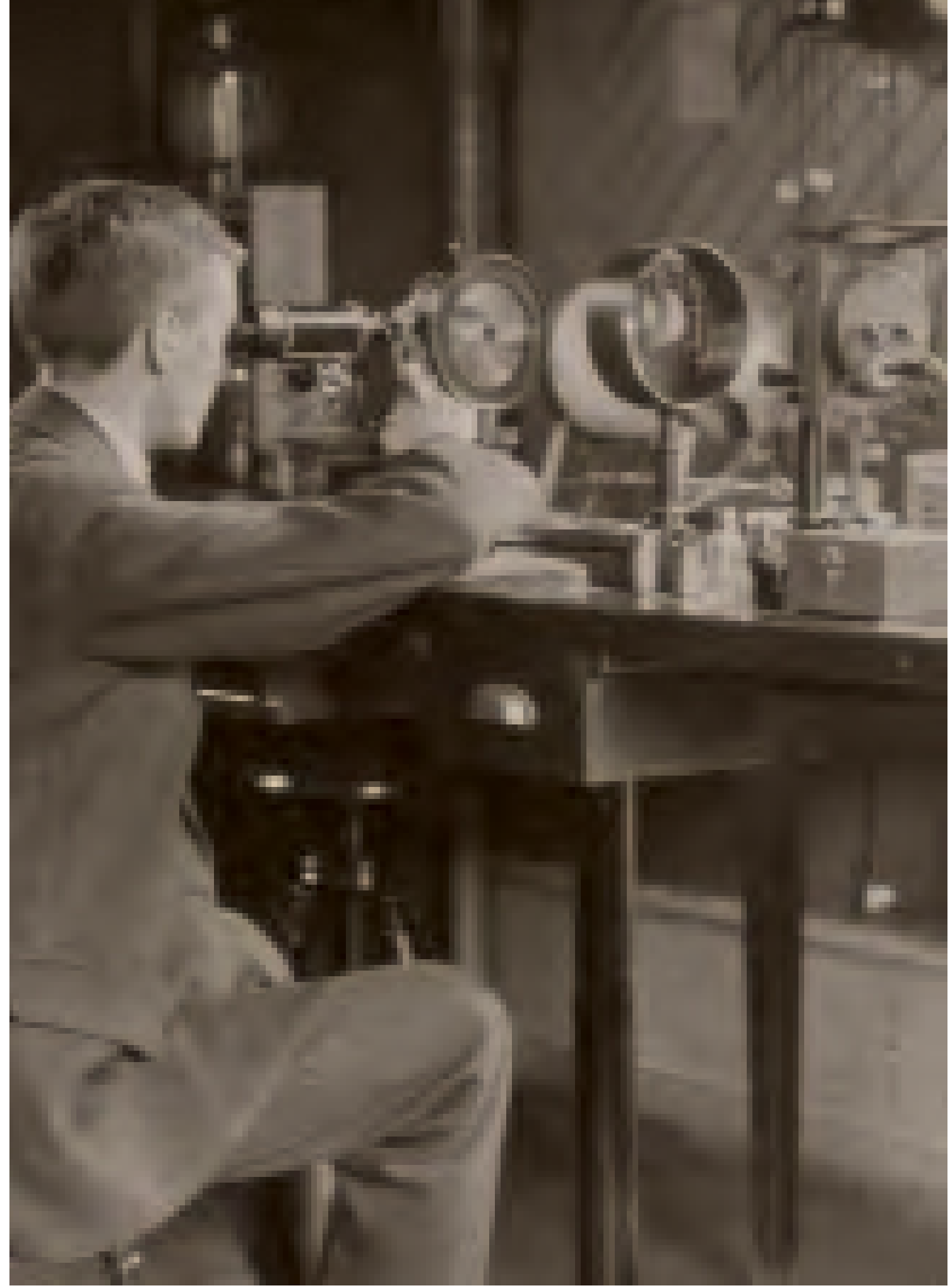
There were several reasons why Karl Fredrik had to wait. Most importantly, Sandvik had grown to be one of Sweden's largest privately owned companies, along with the other industrial giants Stora Kopparberg and Uddeholm, and it was not really the place for a management trainee fresh out of school. Another consideration was that the father did not feel that his son had the diligence he himself had had when he took over the business. It has been said that Anders Henrik Göransson sometimes expressed the desire to live long enough to see his son become truly mature. The veracity of such anecdotal evidence is, of course, questionable.

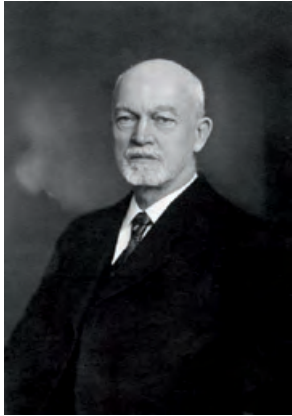
Karl Fredrik, the anointed, had had a happy childhood as the only boy with several older sisters. He received mediocre grades at school, but in the end he applied himself to his higher education with gusto. Now he was to be groomed to take over the different staff departments that were being established.

The new leading manager was someone else entirely—the earnest and conscientious metallurgical engineer, Tord Magnuson. As vice president, he took on increasing responsibility, especially for personnel production and the supply of energy and raw materials. In historical records he is presented as a down-to-earth technician who was happiest when standing on the workshop floor. While Anders Henrik Göransson focused on sales and the community that had grown to 6,000 people, Tord Magnuson kept the technology and production in order. His primary area of interest was charcoal and ore processing, about which he wrote a treatise around this time.

Metallurgical engineer and future managing director of Jernverket, Karl Fredrik Göransson, bought the company's first metal microscope in the U.S. in 1901.

Karl Fredrik Göransson waited eagerly to take over the reins of the company.





Tord Magnuson was Anders Henrik's brother-in-law and closest advisor. He headed the company until Karl Fredrik was deemed ready to take on the responsibility.

Sigrid Göransson was seven years older than her brother, Karl Fredrik. In another age, she would probably have taken over the top post.

Following spread: Strip steel for conveyor belts was produced from 1902 and proudly displayed for promotional purposes.

Tord Magnuson was born in a mill-owning family in Grythyttan in 1851. He had originally intended to study medicine, but changed abruptly to the department of mining and metallurgy at the new Institute of Technology. He joined Sandvik in 1880 and only a year later became the technical supervisor for the wire drawing mill. The following year, he became part of the family, marrying one of Anders Henrik's sisters.

Nepotism was rampant at Sandvik in the early 20th century. No fewer than four men in the management group had married into the family, or would do so in the future. In 1901, Sandvik's board was headed by a triumvirate consisting of Anders Henrik, Tord Magnuson, and another of Anders Henrik's brothers-in-law, the leading Swedish pharmacist Carl Wilhelm Sebardt.

The founding family had moved to Sandviken when it was just a settlement, with all their children and grandchildren. They had been the social focal point for the first four decades, especially for the young university graduates who had moved there to take the growing number of white-collar jobs. A register of white-collar workers at the Swedish ironworks and mines published in 1902 lists some 20 names.

In those days, women were not allowed to have any connection with the company beyond taking care of family life. The managing director's wife functioned approximately like a hotel concierge. However, four of the women in the Göransson family were married to men who worked for the company. The managing director's oldest daughter, Sigrid, was also influential in the company, and was often seen at her father's side, and later her brother's. She never had a family of her own and worked tirelessly for the community.

This was a liberal family that dreamed of creating a small suburban community in the British or American style. This proved somewhat difficult when it became necessary to rapidly expand the workforce and manufacture ever more refined products.

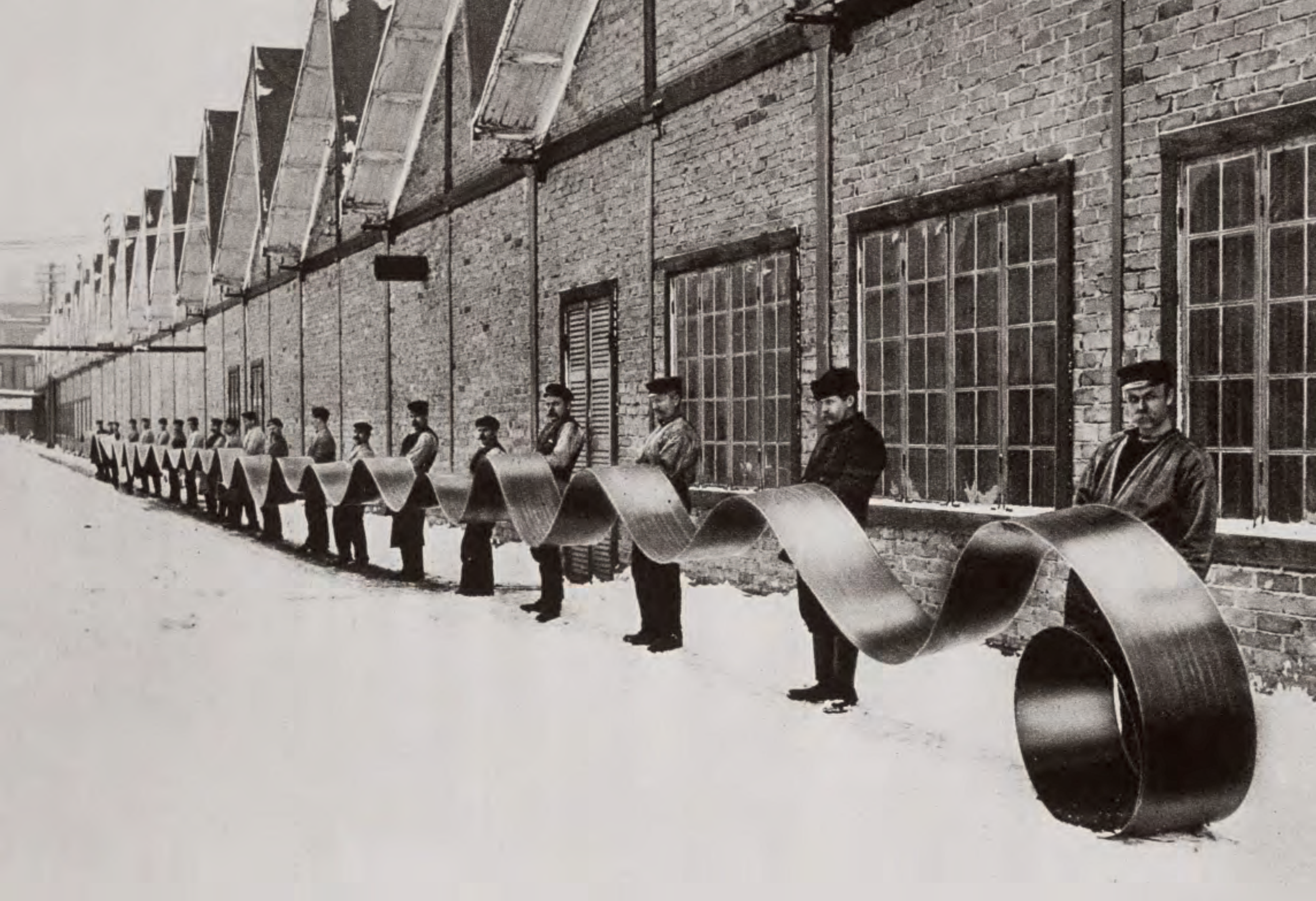
But what had happened to the founder's male heirs?

Older brother Anders Henrik became the managing director early on under the watchful eye of a very particular and controlling father, with no formal position in the beginning. The two middle brothers found so little opportunity in the company that they pursued their own projects, and the youngest son died later in an accident.

In other words, the potential male successors disappeared one after the other. And matters were not improved by the fact that Anders Henrik had five daughters but only one son.

The company had two very significant technical developments in the early 20th century. The first was the investment in a Martin furnace and a new blast furnace. The Bessemer era had ended and the railroad tyre rolling mill was soon to be closed, a self-evident development given the direction Sandvik had





The Sandviken plant 1903, after electrification transformed the company. The blast furnaces to the left and the Bessemer steelworks to the right.

chosen. The only problem was that several other companies had invested earlier in the Martin technology and established themselves as dangerous competitors. Munkfors was part of the Uddeholm Corporation, and Fagersta was owned by Possehl, a German trading company.

The other development was the breakthrough of electricity, and the subsequent addition of a new electric power department. Sandvik ordered some 80 electric motors over the course of a decade and an electrical system was connected to a power station in Näs in the Dalälven River. The steam engines and the old water turbines appeared hopelessly out of date.

Over time, all the cumbersome and hazardous mechanical belts were replaced by electrical transmissions and small local motors. Production facilities could now be set up more efficiently, based on the order of the refining process, rather than on proximity to where their shared power source happened to be.

Sandvik's new business concept worked. Business in markets outside Sweden developed nicely with the new niche products and, by the outbreak

of World War I, exports accounted for 70 percent of sales. Sales of pipe and boiler tubes increased dramatically, and even saws gained ground in new markets.

The 1890s marked Sandvik's second big business boom, after that of the early 1870s. But at the turn of the 20th century, there was a new major setback in Sandvik's best market, Germany, due to crises in banks and industrial companies.

For the mills in Sandviken, however, the slowdown was short-lived. Preparations for war in Britain and Germany resulted in strong demand for pipe and tube materials for naval projects. Wire products also broke volume records, as did strip steel. However, because competition had stiffened, profit margins did not reach the levels of the 1870s.

In 1908 business began to slack off, and this trend was reinforced the following year by a countrywide strike in Sweden. Subsequently, however, war preparations picked up again, with Germany and the Austro-Hungarian Empire at the center of things.

In hindsight, it is evident that Sandvik lost ground in this period. The peacetime industrial applications were slow to develop in this dynamic period.

Swedish industry more than doubled its production volumes prior to the outbreak of war. But the niche company could not really keep up when so many specialized industries were started as a result of new industrial and motor technologies and the advance of electricity. Other entrepreneurial Swedish projects, such as the electrical engineering company Asea and the engine company Bolinder, were expanding at an incredible pace.

The fastest development of all was in the U.S., where giants like General Electric, Westinghouse, Ford and General Motors were being formed and seeking advanced materials technology. The U.S. market was not insignificant for Sandvik, but was still simply too far away.

A major governmental electricity project in Trollhättan demonstrates the power of the change. A huge hydroelectric power station was planned there, with an output that is now calculated in hundreds of thousands of horsepower. The unwieldy machines Sandvik had previously dealt with had a capacity of perhaps 50 horsepower each.

Tord Magnuson wanted complete access to this powerful electrical energy, and as early as 1908 Sandvik bought rights to build a hydroelectric power station at the Lanforsen falls. But the Swedish government actively opposed the plan, and only after decades of wasteful use of wood, coal, and coke could the power plant be built. Magnuson was very disappointed by the setback.

The following passage, in his handwriting, is noted in a directors' report from 1915:

With genuine dismay, it must be remembered that the company, in this



manner, could have replaced a large part of its coal imports with electricity from Lanforsen, had not the government, through litigation over ownership, laid its dead hand on this company ever since 1910, a circumstance that, in terms of lost income, represents an annual loss to the company of approximately 90,000 kronor.

But the biggest headache during this time for Magnuson was the relations with the workers' new union organizations. Union reports from the period describe Magnuson as an aggressive and conservative manager.

The founder, Göran Fredrik Göransson, wanted to create an environment in Sandviken in which the company's owners made decisions for the residents in their own interest. His son, Anders Henrik, and his granddaughter, Sigrid, wanted to go in a more liberal direction. Their attitude, however, did not encompass any egalitarian thoughts or acceptance of socialist ideals.

After the bankruptcy and the dark times, the early 1870s must have seemed a marvel of welfare. The new, albeit crowded, apartments, with cast iron stoves and flues, were better than anything seen before in the rows of houses of the mill towns or in the tenant farmhouses. Early on, space was set aside for American-style vegetable gardens and yards. Eventually there were projects for cleaner water and safer sewage, which, however, made it necessary to build more densely, for economic reasons.

Unfortunately, the vision of every family having 50 square meters of modern living space was never achieved.

The lifeline for Sandvik, the engine of the community, was the decision to concentrate on more labor-intensive products. As a result, a constant stream of new workers came to work in Sandviken. This forced people to crowd together, and the efforts to improve living conditions were focused on the skilled workers and white-collar workers who were most important for bringing the new strategy to fruition.

Ultimately, greater class differences therefore arose between the different categories of employees in the company, though not to the same extent as in the old Swedish mill towns, with their time-honored sharp divisions between the local gentry, the blacksmiths, and the latter's assistants.

Sandviken doubled in population every decade. The local dialect became a kind of mixed central Swedish, entirely distinct from the dialect of nearby Gävle. Life was greatly influenced by working conditions, as the men worked in the mills twelve hours every day but Sunday. This resulted in a very simple worker culture, in which alcohol consumption was the most common form of relaxation.

In the old mill towns, the mansion, the mill, and the church were the obvious centers of activity. Sandviken had Sandvik, the modern factory. The word

'mill,' in contrast, was used to describe the housing district that the company provided more or less as an employment benefit.

The company ran almost all of the town's institutions. The most important, the elementary school, was headed by the self-taught Johan Reinhold Tysklind, who was a blacksmith at Sandvik. He had a great interest in both the world and music, and had even built an organ himself. He was a pioneer in frugal, religious living, and also ran a kind of library service, loaning out books from his private collection. His successor, F. W. Samuelsson, was also something of an Enlightenment man. Sandviken became his own private stage, with countless lectures and musical performances.

The school's highest authority remained, however, Anders Henrik Göransson, who devoted an amount of time to school matters that is remarkable in light of all the responsibilities he had in the company. Meanwhile, the number of teachers and students kept growing.

On two occasions, the company built a fence—the first to mark the mill's northern boundary, and the second to fence in the actual factory area. In the inner Sandviken, the company governed with its own rules, while in the outer area a freer culture spontaneously came into being. In the 1890s, Anders Henrik Göransson contributed to the growth of the free area by offering lots for single-family homes. He wanted the most capable workers to remain in Sandviken and not be lured away by the competition. Getting them to settle

Housing for mill workers in Sandviken in 1897; originally an extension of the plant.





In the 1910s, Köpmangatan was a simple unpaved road, where residents periodically found themselves amid morasses of mud.



Laundry time in the 1910s in the old canal from the Jädraån River. The community still suffered from widespread poverty.



Interior view of barber-surgeon Pettersson's shop at the turn of the 20th century.



A Sandviken family in front of their home in Gamla Bruket (the "company town").

In patriarchal Sandviken, workers' movements emerged somewhat later than in other communities, but eventually May Day parades wound their way through this community, just as through all other mill towns.

down with their own homes and vegetable gardens was in the company's interest.

In 1901, a construction company for building houses was established to facilitate the process. Homes and shops were built in straight lines with the main streets running from north to south and the cross streets numbered rather than named. Had the buildings been a little taller, you could have called it a Manhattan in miniature.

Step by step, a commercial infrastructure was also built up, with shops and craftsmen offering services. But trade in agricultural products was long inadequate, and the cooperative and semi-cooperative shops regularly went bankrupt, weighed down by the demand for long-term credit from poor customers.

The town was not electrified until World War I. And every spring and autumn Sandviken's roads turned into a sea of mud. Pedestrians walked on narrow, worn wooden sidewalks until the 1930s, when the town acquired its first real street system.

Life was hard for workers throughout the industrial world, even in Sandviken's would-be model society. Employees worked almost continually and came home to overcrowded homes with just enough time to eat and sleep. The impatience of the workers increased, and agitators gave them hope of a better life.

The company's competitive base was built on manufacturing relatively

cheap products with a poorly paid workforce. In that environment, productivity improved extremely slowly. Why invest in expensive, more productive equipment when there was plenty of cheap labor available?

Socialism and the labor movement came to Sweden in the 1880s but had difficulty taking root in the new town. The Consul took a very hard line against the "subversives," whom he saw as very dangerous. Those who went to meetings and listened to socialist agitation risked being fired, and a number of workers from Sandvik emigrated to the United States after being blacklisted in the Swedish labor market through collaboration among anti-union companies.

But in the summer of 1903, after the town's first May Day parade, Sandviken's Building Association was founded to take ownership of the "People's House" community center that was to be finished the following year on the outskirts of town. The driving force behind the building was Axel Gallon, who had been fired after helping raise money to support fired co-workers.

Axel and his wife Asta started Café Linnéa, located in the outer area of town, and to which many famous names came. The first official union (Local 135 of the Union of Metalworkers) was founded in 1907.

Attending this meeting was Tord Magnuson himself, who argued, in particular, against affiliation with the Social Democratic Party. This was, in part, because the steel mills in Sweden had, at precisely the same time, founded the Steel Mills Confederation, of which Tord Magnuson on Sandvik's behalf was also a member.

Fairly quickly the union signed up 1,000 members. This, however, did not stop Magnuson from maintaining that it was another, very small, employer-run union that was the proper representative for Sandvik's workers.

The background to this major union activity was that the years 1903 and 1905 were characterized by major conflicts and lockouts within the industrial sector in Sweden. In a first national contract, Swedish industrial workers succeeded in getting regulated work hours, the right to a union and to negotiating procedures—a major union success. Managing director Göransson and his assistant Magnuson were very recalcitrant participants in the process.

The union's negotiators overplayed their hand. These were troubled times with close to 300 conflicts throughout the country, of which half were lockouts. In 1909, a lockout was initiated at all steel mills and LO, the Swedish Trade Union Confederation, responded by declaring a countrywide strike. This time around, the employers had the upper hand and the labor movement had to give in, as strike funds were quickly exhausted.

In Sandviken the mood turned ugly as a result of the company's use of strikebreakers and the firing of hundreds of striking workers. The membership of the Union of Metalworkers was halved as the company used the enticement of benefits to bring in non-union workers.



The tube rolling mill in 1908; manufactured tubes to meet customers' exacting demands.

With the knowledge of how things later developed, it is easy to criticize conservative managing directors like Anders Henrik Göransson or administrators like Tord Magnuson. In their view, some people were quite simply better than others.

In the 19th century, foremen struggled with a number of problems having to do with the workers' lack of education, physical flaws, alcoholism and lack of initiative. Many of the sons of farmers and smallholders who flocked to heavy industries were far from the splendid specimens that artists of social realism later conjured up in their proud versions of history. The pace of work was slow in the mills and productivity weak; and not only because of lack of technical expertise.

It isn't surprising that many workers were attracted by the vision of a paradise in which they would have absolute power. Who wouldn't get angry knowing that administrators and owners were ten or a hundred times more well off?

Company owners, who better understood the connection between productivity and welfare, sensed the catastrophes that could follow in the footsteps of revolutions. It was partly a coincidence that Sweden, and therefore Sandvik, could follow a more reform-friendly path. It was hardly a harmonious development but rather a long, drawn-out trench warfare that gradually expired.



A gifted Sandvik worker, Sven Floberg, is an interesting example of the changes that took place. In the beginning, he was a communist who became the leader of the Metalworkers' local union in troubled times. Company management felt that the union targeted Sandvik, in particular, during the strike of 1932 because of this aggressive leader, who still dreamed of the dictatorship of the proletariat.

But times changed, both for management and workers. When a production manager from a later period wrote about his friends in the community, he did so with particular warmth in describing working with Floberg, who had become Sandviken's greatest political pillar of society. He was, by then, a pragmatic Social Democratic councilman in the new spirit of cooperation, in which the company took care of production and the labor movement handled political matters.

One of the company's managers is said to have said, "If we had known it would be like this, we wouldn't have needed to fight so much." The statement could just as easily have come from Sven Floberg.

In the summer of 1910, Anders Henrik Göransson died from pneumonia after 42 years as the formal managing director. After his father's death, he had also been the chairman of the board.

Saw blades being produced in the early 20th century. Prior to factories being electrically powered, machines in workshops had a common energy source, driven by belts along spinning axles in the ceiling. This impractical and unsafe working environment was transformed once each machine had its own electric motor.





Charging of the blast furnace. Jernverket transformed ore and charcoal into processed steel products through a long refining process.

This was the beginning of the end for the patriarchal period. Sandviken still had its company-owned housing and institutions, but the workers had a new view of their community. Many of them wanted to break the managing director's dominance and participate in the modern social changes taking place elsewhere.

The brothers-in-law, Carl Wilhelm Sebardt and Tord Magnuson, built a kind of regency, one as the holder of the chairman's gavel and the other assuming the president's responsibilities. There were differences of opinion in the Göransson family with respect to this arrangement. Karl Fredrik Göransson, who felt passed over, was backed up by his older sister Sigrid and some other shareholders, while the majority supported Magnuson.

This was the beginning of a long period of friction between two different owner factions on the board. The Sebardt-Magnuson group had approximately the same share capital as the Göransson group and managed to retain control until Carl Wilhelm Sebardt's death in 1916, because some of the owners on the Göransson side had more faith in Tord Magnuson.

Magnuson gave 'Crown Prince' Karl Fredrik Göransson the task of building up the sales organization while the war was raging. As for himself, he was both chairman and president during the last four years of his reign.

In 1912, the Stockholm stock exchange climbed to a level that, in real terms, would not be beaten before the early 1980s. This was the result of the success of companies such as the mining enterprise Grängesberg and the lighthouse technology exporter Aga. One year after the outbreak of war, in 1915, stock prices plummeted by nearly 30 percent. But later, a peculiar economic dance began, driven by wartime inflation. Profits rose and market value followed.

Sandvik is a typical example of what happened—the company's average prices increased rapidly, by 290 percent between the summer of 1914 and late autumn of 1918, in spite of a trend toward cheaper quality. Manufacturing volumes, on the other hand, actually sank somewhat. The stock price shot from 4,000 to 12,000 kronor when profits soared while costs lagged behind.

In 1917, Sandvik showed a profit of more than five million kronor, a sum it would not reach again for decades. Another reason why the figures were inflated was that the depreciation of inventory and assets was calculated on the basis of historically low values.

The big banks gave loans for stock purchases and acquired one provincial bank after the other. Before the war started they had begun to organize their stock dealings via what were called 'issuing houses.' Now they earned money not only from interest but also from the restructuring of companies. New companies were continually being floated. Market transaction values

In the 1920s, the Sandvik board had a distinctly familial composition. From left: the one non-related member, technical manager Lars Yngström; managing director and founder's grandson, Karl Fredrik Göransson; brother-in-law Axel Koraen; cousin Carl Wilhelm Sebardt; and lastly, uncle Tord Magnuson, who married into the family and served as a powerful board chairman.

increased 30 times in three years. It was speculation that looked particularly bad when times of scarcity led to hunger riots in the streets of Stockholm.

Revolution was in the air, and not only in Russia.

Due to the apparent increases in profit, Sandvik's board increased dividends, in several steps, by 200 percent up to 1918. This did not sit well with workers in Sandviken, who, between 1914 and 1918, were forced to settle for half as much in increase, which was not enough to cover inflation. In real terms, workers' standard of living sank by nearly 30 percent.

The slow pace of raise in wages, which increased the room for higher dividends, became more and more problematic. The reports by Sandvik's directors bear witness to the concern. "From 5 April 1917, the organized workers at Sandvik, as well as at several of the other bigger steel mills have gone on strike," said the report for the annual general meeting that spring. The conflict lasted five weeks and, in combination with a general scarcity of manpower, created problems in production. Manufacturing volumes sank by 15 percent, which, together with cost-of-living adjustments, put a stop to the increasing profits. In 1918, profits were cut by more than half.

The board complained about the Swedish government's Fuel Commission, which had "paid good wages and lured away workers." The sum of dividends was raised to nearly 1.5 million kronor, and remained at that level in 1919 in spite of the fact that management had written, in the spring of that

year, that "the prognosis for the current year is anything but promising." The increase was not a very good idea given the friction in society at the time.

These were turbulent times, if not outright revolutionary, in which wages were steadily sinking in terms of purchasing power. The mood was such that a special session of the Swedish Parliament, the Riksdag, in the autumn of 1918 was the starting point for both universal suffrage and the eight-hour workday in the country. The breakthrough for the labor movement happened to come just before the period of inflation came to an abrupt halt and turned to deflation. The first Swedish election with the broader suffrage was held in 1919, and shortly thereafter, the law mandating shorter work hours was passed.

Just as for other companies, Sandvik's situation was radically changed. The boom that economists expected to come after the war never happened. Instead, there was a demand crisis, and workers' wages suddenly seemed too high rather than too low, especially given the forthcoming radical reduction in work hours.

It was in this tumultuous period that Tord Magnuson, at the age of 60, finally resigned the position as president. He remained, however, as the chairman of the board, and even brought in new directors.

So began the long period of Karl Fredrik Göransson's time in power. He was now 41 years old, and could hardly have achieved his goal at a worse time.



FROM DISCORD TO AGREEMENT

Karl Fredrik Göransson finally became president of the company in 1920, after two decades of preparation and waiting. From preserved meeting minutes and other company documents, it is clear that he was a man with the ambition to further develop the company that his father and grandfather had created. There was to be no more of Tord Magnuson's brief, handwritten notes of board meetings in scant fulfillment of the law's minimal requirements.

However, Karl Fredrik did not enjoy free rein in the beginning. As chairman, "Uncle Tord" maintained his hold on the board until his death in 1929. He had also hired an experienced industrialist, Lars Yngström, as vice president and technical manager when Karl Fredrik became president. Yngström, who was 50 at the time, had worked with a number of modern Swedish technical projects and the board position added to his authority.

Karl Fredrik Göransson was critical of his relatives who had granted the owners such large dividends and turned a cold shoulder to his and his sister Sigrid's ideas about retaining the best workers through a pension system and other benefits. The conflict, however, never went so far as enmity. Preserved letters indicate open communication was maintained.

The 'bruksdisponent,' as he as managing director was now called, was at least as disappointed with Sandvik's employees, who were completely unsympathetic towards his ideas about more flexible wages, in contrast to the rigid collective agreement that was the labor movement's central idea. Karl Fredrik was an advocate of social liberal ideas, but in meetings with the socialists of the Metalworkers local union, he came across as even more unsympathetic and hard line than his predecessors. Paradoxically, this man has been described by some as modest, kind-hearted and loyal, and by others as manipulative, neurotic and dictatorial.

As a young employee, Karl Fredrik Göransson was moved from the recently established metallurgy laboratory to the bookkeeping department. The challenge was to improve an antiquated calculating system. The basic data for the new system was created by the competent foreman, Carl Gustaf Larsson, by having test weeks at the various rolling mills in which all material and work hours consumed were meticulously noted. These weeks then became units of cost in very rough estimates.

Not until 1920, at the age of 41, did Karl Fredrik Göransson advance to the post of managing director. He gained full control of the company in 1929, when he also became chairman of the board, a position he retained for 30 years.



For every new technological development, Jernverket developed specialized products. The 1920s opened new markets in the promising aircraft industry.

In 1923, Swedish air force pilot Gösta Andrée flew to Cape Town, South Africa. The airplane, named Sandvik, had a Jernverket-manufactured steel construction.

It was a primitive system that Karl Fredrik had to struggle with, and a new system based on running accounts was slowly being developed. But profitability reports wouldn't really make a breakthrough before the 1950s when new office technology had arrived. With old-fashioned methods it was difficult to even produce a report in which the accounts were balanced for every year.

Even though the new managing director had studied metallurgy, he was never a technician with practical technical experience. During the war years he was the marketing manager. It was at this time that he began the life-long collaboration with the seven-year-younger Viktor Magnusson (not a member of the owning family). Magnusson would later become vice president of marketing. The technical manager, Lars Yngström, was someone who could mediate between the parties on the board when technical needs increased. Tord Magnuson was not against investing in new facilities either, even if it risked the power of the owning family.

Unlike his predecessor, Karl Fredrik Göransson launched into long, intellectual arguments. His favorite subject was the balance in the company between owners, employees and management. But this theorist and marketing man lived in a time when the scope for ideas about cooperation was limited. If the first years after the First World War were bad, those that followed were a catastrophe.

The new working hours and labor conflicts increased labor costs dramat-

ically. News from the market was filled with cancelled orders and steadily rising prices for raw materials. In the financial year 1920, volumes slumped by 15 percent, which was only temporarily balanced by rising prices for the company's products.

The net profit was cut by half and, given that depreciation was kept low, the drop was even more. The market nearly collapsed in the late autumn of 1920. This made the board fear a catastrophe as the annual general meeting approached in the spring of 1921. Consequently, the family went along with a reduction in the dividend, but only by 25 percent from the previous high level.

Through a coincidence of wartime inflation and shortened working hours, Swedish workers had achieved considerably higher wages than those in European countries that had participated in the war. True, wages had fallen seriously behind during the war, but now when, instead, the cost of living had fallen, along with the company's average prices, it was the employer who had big problems.

The new Swedish government of the Social Democratic and Liberal parties consistently pursued an anti-inflation policy, having learned to hate rampant inflation during the war. But those policies created a veritable acid test for both Swedish industry and its employees.

During Karl Fredrik's second year as managing director, Sandvik's sales plummeted an appalling 66 percent because of the "business depression" and difficulty in keeping up with the price competition. For the first time ever, Sandvik reported a loss—a full half-million kronor, which in reality was twice as high, because the company did not book any depreciation. Dividends were now lowered by another 39 percent. The justification for not canceling dividends completely was that the board wanted to show some optimism as the stock market completely fell apart.

"The year 1921 should be etched with indelible letters in the labor movement's history, and in the memory of every worker. A darker year could hardly be found in the history of the working classes," wrote the Metalworkers' local union in Sandviken. The Steel Mills Confederation called for a 40 percent wage cut. And throughout the industry, panic-stricken management fired workers. In two years time Sandvik had gotten rid of a fifth of the personnel.

If this year was the darkest in the history of the Swedish working class the same could be said for the owning classes. A large part of the leading Swedish industrial families of the 19th century disappeared from the scene when their pledged stock ended up with the banks as collateral. It has been calculated that a third of all large Swedish companies ended up in the hands of the banks. The previously mentioned holding companies of the banks fell like ninepins, just like all of the heavily indebted financiers, when the company values sank to between 10 and 30 percent of their worth before the end of the war. The

rdagen den 9 nov. 1929

Sandvik

åter till väders.

Startar tidigt i dag från Johannes-

burg för färd norrut.

Ett mer än veckolångt uppehåll för

noggrann översyn.

— Meddelare till Götte Dagblad. —

JOHANNESBURG, freldag. Nu

är jag äntligen klar för återfärd-

ning. I morgon tidigt här det av,

och jag beräknar att via Pretoria

och Palapwa Road första dagen

komma fram till Bulawayo.

Sedan jag sist låt höra av mig har

jag flugit från Kimberley och hit.

Här har Sandvik varit i sin färd

i land hitar för noggrann undersök-

ning och översyn. Allting var som

det skulle vara från landningsstället

av Sandvikens till till ständigt

från Vikings fabriker i Lillköping.

Jag har de senaste dagarna varit

en smula nedstämd då man lite var-

stans såde mig, att det skulle vara

omöjligt att flyga tillbaka på grund

av väderleksförhållanden, en sak,

som jag för övrigt antydde i mitt

sista telegram. Jag har nu varit

inne i Pretoria åtskilliga gånger den

här tiden för konferenser med vä-

derleksmän, och det hela har

resulterat i att jag i morgon på all-

vär styr hem mot gamla Sverige

igen. Allting all right.

Gösta Andrée.

(Copyright Götte Dagblad.)

SANDVIKSTÅLET



I de Dornier-Walmaskiner, med vilka
Amundsen företog sitt senaste försök
att uppnå Nordpolen, voro flera viktiga
detaljer i flygkropparna framställda
av Sandvikens specialbehandlade kall-
valsade stål. Den i fotografiet infällda
bilden framställer en sådan detalj. —
I Dornier-Walmaskinerna, vilka åtnju-
ta anseende över hela världen, använ-
des alltid Sandvikens material för
många av de mest påfrestande delarna.
Vi kunna leverera kallvalsat och hårdat
bandstål i max. 600 mm. bredd.

1926 JANUARI 1926

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Sandvikens Jernverks Aktiebolag

SANDVIKEN • SVERIGE



In 1919, the company established its first American subsidiary, located in the Woolworth Building, a skyscraper on Manhattan, New York.

The new American subsidiary's stamp.

question is whether the classic tradition of family enterprise in Sweden ever really did recover from this brutal purging. The Göransson family managed better than most, in spite of the setbacks.

In 1922, volumes rose again by nearly half, which unfortunately helped only somewhat as prices fell by roughly half at the same time. The losses were barely stopped, considering the low level of depreciation.

And so came 1923, the big lockout year of the Steel Mills Confederation, when the Sandvik works were closed for six months and the company scraped up its profit in the other six months. The workers, who were without their wages during a long period, won the conflict in the end and got revenge for the great lockout of 1909. They withstood the pressure for lower wages.

The reason for this was that the Social Democrats led government had instituted laws on relief for the poor that required the municipalities to step in with support when locked-out workers found themselves living below the subsistence level.

To liberal company owners like Göransson, the conditions for a showdown in the labor market “on equal terms” now appeared entirely changed. It was no longer possible to force workers into submission with the lockout weapon because it did not empty strike funds.

The managing director saw that the only way forward was instead to get the employer and employee to agree on ways to achieve a more rational production and thus improve the capacity for payment of wages. That analysis was to gain more and more adherents from both sides in the future.

But it looked like a long uphill climb to launch ideas about cooperation after all the altercations, industrial actions and conflicts. “The Wednesday Club,” which started as a discussion forum between workers and management in the home of the managing director’s sister, Sigrid, can be seen as a local predecessor to the national “Spirit of Saltsjöbaden.” However, the union saw these fumbling efforts as a way of “stealing the workers’ knowledge and at the same time getting them to work harder.” The fact that the managing director chose the title *How to Handle Your People* for the first edition of his socio-political book instead of the second edition’s *Understanding Between Worker and Owner* shows, perhaps, that it was not only the workers who had difficulty handling the new way of seeing things.

The greatest international authority of his day on the subject of technical rationalization was an American, Fredrick Winslow Taylor. He was no longer living, but his book from 1911, *The Principles of Scientific Management*, was very much alive. He was the high-speed-steel innovator who followed up his experience of shortening metalworking times with a new view on more rational production, based on scientific methods. Taylor’s method of breaking up the work into many small tasks to be carried out individually and as optimally as

possible by many workers was hardly popular with veterans who had had responsibility for whole projects.

The U.S. received a steady stream of workers with little education. They could be quickly trained to manufacture cars, pack post-order boxes or butcher a side of beef along a conveyor belt, in steps worked out in a time-and-motion study. But in the steel mills, there was another established tradition.

During the cost crisis of the 1920s, Taylorism was, nevertheless, introduced in Swedish industry on a broad front by engineers who had experience from the U.S. Sandviken was no exception. In 1921, there were already close to 50 engineers and draftsmen at Sandvik, compared to 20 at the beginning of the century. The number increased quickly when power was shifted to those who planned and designed.

At a local union meeting in 1929, the managing director and time-and-motion engineers participated and talked about the time-and-motion studies. A union member expressed his skepticism regarding the new technology:

What’s the point of knowing how many steps per minute a horse that pulls scrap metal in the mill takes, compared to knowing the reasons that have contributed to a worsening of the day’s production?

The design and construction office at Jernverket was established in the 1920s and reflected the increased power of engineers and planners as production as well as products grew more complex.





SANDVIKENS sågar
och
svenska nävar

— två goda
exponenter
för pålitlig
kvalitet

— två viktiga
faktorer vid lö-
sandet av vårt
bränsleproblem

**Ställ endast effektiva redskap
till skogsfolkets förfogande!**

Sandvik had been in operation for more than a half-century. The company was approximately eight to ten times bigger now than when it was restructured in 1869, whether measured in actual monetary value, number of employees or tonnage. Sandvik had grown about four percent per year in real terms, but productivity had improved only marginally. Partly this was due to the company's facilities getting older. Another reason was that an ever-increasing portion of the production was done with a higher labor content.

For example, belts greased with tallow and squeaking along at 15 meters per minute drove many of the nearly 50 cold-rolling mills for strip steel from the 1880s.

The steel mill's cold-rolling operations were completely rebuilt, inside and out, in the peak year of 1930. New, stronger and faster rolling mills with ball bearings greatly improved efficiency. The heating department was electrified. A young engineer named Carl, from the Sebardt family and with experience from the U.S., made a contribution here that gave his career a boost.

The other important product area, seamless tubes, was given a modern and bigger facility. "Without such a thorough modernization of our facilities for tube making, a partial or complete shutdown of this production, previously so important for Sandvik, may occur in a not so distant future," noted the production manager in the brief investigation that preceded the investment decision.

The hot-rolling mill was also rebuilt. Even a sintering plant and new electrical arc furnaces were set up and adjustments made in virtually all of Sandvik's many departments. The company had never made such concentrated investments since the investments at the start.

The most important event of all, however, was the breakthrough of stainless steel.

It would be an exaggeration to call Sandvik a pioneer in stainless steel as, during the 1920s, a number of Swedish and other competitors adopted the new corrosion-resistant chrome steel that had already been invented and patented by the German company Krupp in 1912. The Englishman Harry Brearly was not far behind the Germans and won the patent battle in parts of Europe and North America. He concentrated on 'stainless' cutlery, and to this day, corrosion-resistant steel is called *stainless* in English. Because Krupp had a virtual monopoly in the German market, it was the Americans, rather than the Germans, who promoted the development of stainless steel. Swedish steelworks also took part in a dynamic manner.

Stainless steel's corrosion resistance is due to the fact that, when the chromium content exceeds 10.5 percent, a very thin film of chromium oxide is formed and protects against corrosion. If the film is damaged and there is

The hand saw—an iconic Sandvik product already from the 1880s. The international forest industry valued the company's quality selection.

oxygen in the surroundings, the film is rapidly reformed. However, in oxygen-poor environments, even stainless steel can rust.

Thousands of different kinds of stainless steel were to be developed over time to fit different uses. This was done, for example, by changing the amount of nickel or manganese added.

Stainless steel can be divided into groups based on the structure of the material. *Martensitic* stainless steel is magnetic and can be hardened but only to a certain degree and is unsuitable for welding. It is well suited to tools with a cutting edge. *Ferritic* stainless steel is magnetic but cannot be hardened and is used in environments with only moderate risk for oxidation. *Austenitic* stainless steel has become the largest group, because it is weldable and easily shaped. A common steel grade contains 18 percent chromium and 8 percent nickel. *Ferrite-austenitic* stainless steel, also known as duplex steel, would be developed later with, among other features, very good mechanical abrasion resistance. Another later development was *martensite-austenitic* steel, well suited to, for example, turbines.

The new world of stainless steel, in other words, was characterized by diversity and the ability to meet different customer demands. For a number of customers, corrosion resistance was a prerequisite for expansion. Companies producing artificial fertilizers, ammunition or pulp and paper needed the new steels to make their equipment robust and safe. In one fell swoop, the food industry was able to improve its hygiene.

Stainless steel was a good complement to Sandvik's product line. An important reason on the production side was the electro-melting technology that was required for carbon-poor alloyed steel. The company's hydroelectric plant at Lanforsen provided cheap power.

Diversity was already standard and the product line contained nothing but niche products.

There were interesting and demanding customers in nearby markets. A company called Separator and its smaller competitors manufactured and marketed products to the world's farms and dairies. A number of Swedish equipment companies built plants for the pulp and paper industries. In middle Sweden, factories were established for the manufacturing of kitchen appliances.

The first melting of stainless steel was reported by the technical manager Yngström in 1921. But it was another three years before Sandvik started regular production of first tube, then wire and strip. The steel laboratory was enlarged to prepare for the new steel grades.

The patent situation was complicated. A Swedish competitor had an agreement with one of Harry Brearley's companies, so the problem had to be resolved by several other Swedish steel companies buying the rights through Avesta, which thereafter promoted itself as a stainless specialist.

Apparently, it took some time before stainless steel made much of an impression. Volumes were low in the beginning but subsequently increased steadily. At this point in time, in the early 1930s, Sandvik had 30 different grades of stainless steel in production. Notes from board meetings of the period state that stainless tubes were profitable.

In 1932, for 60,000 dollars, Sandvik acquired an exclusive Nordic license, from an American company, that was to be of great significance for the direction the company would take. The license had to do with the cold rolling of steel tubes using the pilgering method. This process, further developed by Sandvik's metallurgists, made it possible to reduce both the outer diameter and the thickness of the tube material in a single rolling operation. This meant a significant rationalization, because a single operation could replace several cold drawings in the earlier method, and the resulting quality was even better. One pilgering mill after the other was built in the company's own workshops, and the Swedish competitors could not follow suit when Sandvik launched one seamless stainless tube dimension and grade after the other for the process industry, with inner diameters of two to six inches.

Sandvik's seamless pilgered tubes were in demand with customers who needed components that could withstand an aggressive chemical environment, heat and high pressure, sometimes all at once.

Already in the late 19th century Jernverket produced high-quality tubing. Stainless steel introduced new opportunities within areas such as the energy, pulp and paper, food, and chemical industries. Pictured is production of tubes at the end of the 1920s.





Sandvik also developed the ‘multi-rolling mill,’ which changed the fabrication of razor blade steel, flapper valve steel and other strip products.

In the 1930s, Sandvik began delivering stainless strip steel, especially for deep pressing of different kinds of containers and die-cast products for industrial use. Profiles for building and decoration were also produced. Another stainless product that grew in sales was conveyor belts for the food processing industry.

In spite of the crises, unrest in the labor market and the disputes among the branches of the family, Sandvik thus made a technological leap forward under the leadership of the new president and his technical director.

Thanks to former president Tord Magnuson’s cautious rule, funds had been built up from the profits to both get through the postwar crisis and continue to pay out dividends. But the profits generated were no longer enough to finance expansion. For the first time, the family company needed to get capital from others.

There is no documentation of the discussions by the board members, but the number of proxies included with the minutes of the annual meeting in the spring of 1930 shows just what a fateful question a new stock issue was for the family. There were not one, but two stock issues during the 1930s, and yet another one in 1941. In total, 13 million kronor in new capital was paid in, and the family’s share of the ownership shrank considerably.

Soon, external shareholders owned more than half of the stock but, as few of them had any representation at the annual general meeting, the two factions of the Consul’s descendants continued to control the board.

The product line was niche heavy even after the big technology investments.

Hollow drill steel, which was selling nearly as well as seamless tubes, entered a critical period after the biggest customer, Ingersoll Rand, switched back to Sandvik’s competitor, Fagersta. Cold-rolled wire material and strip were delivered in many different styles and steel types. A large part of the strip steel and wire went to in-house production: saws of different kinds for the forestry industry, a variety of handsaws for professionals and ordinary consumers and springs for watches, clocks and phonographs. A very special chapter was the conveyor belt: especially hardened, wide and fairly long cold-rolled belts for the chemical and food processing industries. A separate company had been set up for these. Several of the subsidiaries established by the new management marketed transport solutions and even processing equipment.

Sandvik also manufactured tube fittings and flanges, finished razor blades, specialty knives and tools for stone working and forging. On the wire side, which was smaller, different types of drawn wire were further refined into

Jernverket’s conveyor belts were put to a variety of uses. Here bicycle saddles on an assembly line in Germany, 1928.

Following the crisis of the 1920s, the market slowly recovered. Interior of Jernverket's Paris office, 1924.

piano wire, wire for pins, spring wire and wire for mechanical parts. In razor blade steel, Sandvik would soon get the upper hand over its competitor, Munkfors—a major success. Construction steel of niche character was also sold to the new automotive and aircraft industries, which already stood for a sizeable portion of the industrial production in the U.S. and western Europe. In Sweden it had been boom times in the auto industry, but a number of manufacturers went out of business. SKF's recently established subsidiary Volvo was an interesting new arrival.

So the business concept from the end of the 19th century still worked. Just keep up with new needs. The marketing department, with some 30 staff, kept the technicians busy meeting increasingly stringent specifications from customers.

Between the crisis of 1921-1922 and the Kreuger crash of 1932, the cost of living for a Swedish worker fell by 16 percent at the same time as the hourly wage barely fell at all. Blue-collar workers, therefore, received a 15 percent increase in wages, in real terms, in a period when white-collar workers saw a drop in their salaries of seven or eight percent. The Swedish working class, for the first time, began to approach the middle class. The only problem was that it did so at the expense of high unemployment. That was not the case in Sandviken, however, because Sandvik increased the number of its employees by a third.

The tough times did not only bring negative developments. Many of the bigger Swedish companies entered a growth phase, just as Sandvik did. They were compelled by the times to do something about their efficiency. Major successes in the international market for export companies like SKF, Asea, Bofors, Aga and Electrolux resulted in growth in the Swedish economy of five percent per year from 1925 onward.

The steel industry had a more difficult situation. During his first 15 years at the helm, Karl Fredrik Göransson and his engineers had seen the average price for the company's products fall by 55 percent as the export share steadily decreased. Before the First World War, Sandvik invoiced 80 percent of its sales to foreign markets, but in the 1930s, that share was down at 65 percent. Dependency on the small domestic market had nearly doubled.

The Great Depression of the 1930s arrived late in Sweden, and governments in one country after another used protectionism to shield the economy from the American crisis. Unemployment in the metalworking industry tripled to 20 percent. Sandvik's sales fell by 35 percent over two years. Both price and volumes declined. Whether 1931 was a profitable year is a matter for debate. Depreciation was once again kept to very low levels, probably to avoid panic among the new external owners. Thirteen percent of jobs disappeared and wages were lowered, without agreement between labor and management.

But the turnaround for many companies was relatively quick. As early as in



The catalog of manufactured steel products steadily expanded. Here the production of bandsaws.

1932 delivery volumes for Sandvik climbed sharply and in 1934, when its prices also increased, the company reported an extraordinary profit—more than three million kronor after correctly booked depreciation. That paved the way for a new influx of capital for Sandvik. Even a cautious stock market could mobilize capital for profitable projects.

By 1935 the total number of people employed by Sandvik was once again at record levels. In 1937, after the start of major international rearmament, production records were beaten, despite the protectionism of the new planned economies in Germany, Italy and the Soviet Union. However, the world's liberal governments were led into the same kind of regulating mentality. In 1935, the board of Sandvik complained about the company's dire situation:

The obstacles to international exchange of commodities are increasing. Prohibitive tariffs, import prohibitions and the like. Companies from the big protected markets attack the unprotected small Swedish market.

Many business personalities predicted at that time that “the era of internationalism” was over.

Perhaps it was the external pressure that led to the Swedish Employers' Confederation and the Swedish Trade Union Confederation to launch study groups to determine how to cope with the unrest in the labor market. There were dreams in parts of the labor movement of ‘social engineering’ that were not incompatible with the ideas of Taylorism.

For these reasons, the Swedish Saltsjöbaden Agreement of 1938, in which Karl Fredrik Göransson had actively participated, became world news. The workers and company owners of a small country had agreed that scientific methods would be used to rationalize companies and time-and-motion studies would determine how the fruits of this rationalization would be divided. ‘The Swedish Model’ included corporate features in a corporate time, but would prove to be a formidable tool when Europe's industries were rebuilt after a new world war.



CEMENTED CARBIDE— A CHANCE FOR REVENGE

In the spring of 1938, Carl Sebardt, head of the cold rolling mills, was summoned to headquarters. President and chairman of the board Göransson informed him that he was the new production manager. Erik Pehrsson was being made technical director, succeeding Yngström, who was retiring.

The meeting was the start of two decades in which Sebardt was the main force behind the technology development (the older colleague, Pehrsson, was only mildly interested in what he called “the technology side”). It was also the beginning of the successful era of hard metal, or cemented carbide as it would more commonly come to be called in English. Previous management had in a sense been bystanders for a decade while hard metal engaged customers and competitors.

The new, young production manager believed that Sandvik’s competitive position in the high-speed steel business for tools was hopeless and that rock drills would be forever lost to the company’s competitor Fagersta unless Sandvik went into hard metal. Before joining the company, Sebardt had seen Sandvik lose rock drill customer Ingersoll Rand to Fagersta. He had heard from Atlas Diesel that in Germany Krupp was developing rock drills with cemented-carbide tips. Atlas Diesel had been an important customer for Sandvik’s metal tyres in the 19th century, and later invested in diesel engines without much success. Now, though, a new business operation, mining equipment, was about to make a breakthrough after many years of poor profitability.

Cemented carbide, a chemical compound of tungsten, cobalt, and carbon, has interesting properties. Carbide of tungsten is about twice as hard as steel and can withstand temperatures nearly twice as high. The nascent light bulb industry was the first to take an interest in both tungsten and carbide.

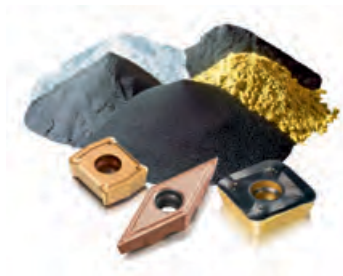
The term tungsten, used in English and French, compounds the Swedish words for ‘heavy’ (*tung*) and ‘stone’ (*sten*) to celebrate the two 18th-century Swedish chemists, Axel Fredrik Cronstedt and Carl Wilhelm Scheele, who researched and presented findings about this mineral of unusually high density. Tungsten ore was later renamed scheelite. But the German word *Wolfram* is currently used in other language areas and the symbol W is used globally. German miners had been struck by the ore’s characteristic appearance: *Wolfram* means ‘wolf froth.’ In old German tin mines, the mineral was seen as an impurity.

The metal was eventually produced in pure form, with another Swedish

Jernverket’s breakthrough into the field of cemented carbide is linked primarily to Wilhelm Haglund, a workshop engineer who later headed the entire company and led it through a phase of expansion.

Carl Sebardt, the young technician who initiated the company’s investment in the field of cemented carbide.





Cemented carbide is a sintered metallurgical product comprised of metal powders and a binder. Modern grades are advanced compounds of different materials.

Inspection and packaging of drill bits for rock tools, 1960s.

chemist, Jöns Jacob Berzelius, probably the first to fully succeed. When high-speed steel was being developed around the end of the 19th century, it was discovered that inclusion of tungsten would increase the steel's hardness.

A real breakthrough came in 1923 when German scientists found that they could mix tungsten carbide and cobalt into a powder. The cobalt would function as a binder. The steel giant Krupp bought the patent and launched the new material as Widia (*Wie+Diamant*). Seven years later, it was found that adding titanium carbide or tantalum would enhance the material's properties. Widi X was Krupp's new, improved product.

The cemented-carbide powder could be pressed into desired shapes. Using temperatures high enough to melt the cobalt and absorb the carbide particles, the pressed material was sintered, and achieved the toughness of cobalt and the hardness of tungsten carbide, substantially harder and tougher than high-speed steel.

Competitors, though, were stirring. General Electric established its Carboloy subsidiary in 1928 and Kennametal began operating a few years later. In Sweden, Arbit was an early competitor, making rock drill bits and various nozzles from the new material.

The new Swedish steel group Fagersta, which had been restructured in 1927 via Handelsbanken from a number of small companies that were in deep trouble, saw its high-speed steel threatened by the new material from Germany. So Fagersta's management became much more active than its counterpart at Sandvik.



Krupp had legally protected only parts of the new manufacturing method in Sweden, so Fagersta focused on circumventing the patent and protecting its own process. Fagersta succeeded and named its product Seco ('I cut' in Latin). Arbit was acquired by Fagersta and the group began to develop and manufacture tools, drill tips, drawing dies and more.

Sandvik was observing all this. How could the company gain entry to an area already protected by numerous patents and established competition? Sebardt ordered the foreign sales division to comb the market for carbide products and potential partners. It quickly found an interesting Swiss supplier, Radimant. A German engineer from Radimant was actually on his way to Sandviken in the autumn of 1939 to start a joint carbide project when war broke out. He was captured by the Wehrmacht en route and sent to fight in Poland.

The two Swiss brothers who owned Radimant were reserve officers, Swiss style, and were activated by the military. One of the wives traveled to Stockholm and signed an agreement postponing the project. Cemented carbide was put on hold.

World War II brought other problems for the production manager. Foreign customers for steel disappeared. Gillette, the American customer that Sandvik had regained from Munkfors, was forced to source supplies domestically. Fagersta lost Ingersoll Rand. A number of other major international customers were written off and the export segment was halved to 30 percent. For several years in the early 1940s, Sweden was commercially under siege by the Germans.

Without the desperate need of the Swedish defense forces for grenades, Sandvik would have been in crisis. But the engineers in Sandviken, using their knowledge of seamless tubes and a welding method shared with Asea, developed what was probably the world's most efficient grenade manufacture. Two million units were rapidly produced after the Finnish Winter War, during which Swedish grenade stocks were secretly depleted to help Finland.

Then cemented carbide emerged again: a factory where one of Sebardt's brothers worked—the light bulb manufacturer Lumalampan owned by the Cooperative Movement—was producing hard metal tips for military grenades. And the light bulb manufacturing unit was using tungsten for the filament and cemented carbide for the drawing of the filament wire.

Negotiations between Sandvik and Lumalampan regarding a partnership began in the autumn of 1941. In that same autumn, Carl Sebardt employed on his staff two people who would later help make Sandvik a world-leader in cemented carbide.

A young Sven Edström had been fired from Lumalampan but was so warmly recommended by Sebardt's brother that he was immediately employed



Sandvik has a long history with razor products. Sandvikens Jernverk competed with Munkfors for the right to supply the American company Gillette.



Inspection of rock drills in the 1930s.

Rock drills with cemented-carbide inserts radically improved mining. Delivery of drills into Sandvik's own mine in Bodås, Gästrikland.

Sandvikens Jernverk and Atlas Copco developed the Swedish method of rock drilling: "One man, one machine."



in Sandviken and placed at the research laboratory. Engineer Wilhelm Haglund, later to become company president, worked in delivery control, at that time a new and controversial department even for customer-oriented Sandvik. He was unhappy there, and made his dissatisfaction known to the production manager. Before he was given the important but thankless role as manager of quality control, he had been on loan to a joint venture that made finished razor blades. Sebardt recognized in Haglund an experienced technician and workshop manager and took him on board for his new project.

The cemented-carbide plan was roughly this:

- * To manufacture rock drills with cemented-carbide inserts, resurrecting Sandvik's big seller, rock drills.
- * To produce cutting tools for metal working in lathes, milling and drilling machines and the like.
- * To produce wear parts, for instance in textile machinery for which the company supplied steel—a new product as far as the company knew.

The contract with Lumalampan was signed just after New Year in 1942 and Wilhelm Haglund was assigned a small workshop on the second floor of the hardening and tempering workshop at the facilities in Sandviken and asked to help develop cemented-carbide tools and wear parts. Rock drill steel remained with the rolling mill department, while the hard metal workshop at Lumalampan would produce the cemented carbide.

At the patent office Sebardt applied for the name Coronit but was advised to also include a second choice of name. Improvising, he wrote Coromant. Coronit, it turned out, was already taken.

Beginnings are always difficult. Initially, cutting tools seemed to be doing best. In March, Wilhelm Haglund enthusiastically began work. Sandvik had bought machines for the production of shafts for turning tools and machinery for the manufacture of milling cutter bodies. Asea welding machines helped conclude an experiment in high-frequency welding.

In contrast, the new rock drills faced problems. They were based on a standard integral drill with a forged head on which four inserts in a cross were soldered. Detachable heads (drill bits) existed in the market but were not chosen because they would not work in hard rock with light equipment of the new Atlas type.

It would take five years of dedicated work and development to produce workable drills. Haglund tested drills on hard and soft surfaces with equally disappointing results. The cemented-carbide inserts cracked or loosened. Even with better cemented carbide, the idea of having four inserts was unsatisfactory, as the supports for them were too small and loosened during drilling.

"Finally we gave up and tried chisel-formed inserts," wrote Carl Sebardt in





Test drilling in the Sandvik mine at Bodås.

his memoirs. “Wilhelm Haglund used to travel to Sandvik’s own mine in the province of Gästrikland to lead test drilling there. So Haglund took a bunch of drills with chisel inserts to the mine. When he came back he told me it had been a complete success.”

A contributing factor was the new solder metal produced by Svenska Metallverken in 1944. The first real test was when the new Atlas Diesel drilling machines were tested with the new Coromant drills. The test was carried out at Hjältakraftverket, a hydroelectric plant under construction, that same year. Success was not immediate because production could not yet provide the high and consistent quality needed. But the technicians ultimately overcame the difficulties.

The technicians in Sandviken worked closely with Atlas Diesel on plans for machines that could take full advantage of the new drills. Atlas Diesel was invited to Bodås to test and jointly develop a completely new drilling system.

Sandvik’s long experience in the production of drill steel was a major benefit. In 1931 the company had patented a method of ‘mandrel rolling’—drilling a hole in the center of a circular billet to insert an extractable mandrel. Hot rolling produced a hexagonal drill steel with a hole in it with a smooth, shiny surface. The collar and drill head were forged. The chisel-formed inserts in cemented carbide that came out in the 1940s were soldered across the drill head in a groove and the waterhole located on the side. The finished product was called integral drill steel and would dominate sales until 1960, when extension drill rod equipment took over.

So Coromant drills, combined with light drilling equipment from Atlas Diesel, entered into the world market as one of Sweden’s most in-demand export products. If the equipment could take on the tough ores and rocks of Swedish mines and win, who could question its performance?

It would appear that Sandvik’s rock drilling competitor, Fagersta, missed the opportunity. When Sandvik and Fagersta signed a three-way deal with Atlas Diesel in the summer of 1943, Fagersta was still superior in terms of product, with both integral drill steels and detachable drill bits. But detachable bits were needed only for very long holes and when it came to the integral drill steels the development people in Sandviken led the way.

Fagersta’s management and board became nervous that the partnership was taking too much effort, and pulled out. Thus, after 1947, Sandvik gained an exclusive contract as sole global supplier. Machines and rock drills were now sold together by Atlas Diesel, which shut down its diesel engine production to focus on compressed air equipment.

Atlas wanted to have the exclusive global rights, but initially did not get them. There were suspicions that the Wallenberg group, to which Atlas belonged, was planning to start rock drill production at the Söderfors or

Wikmanhyttan ironworks, which had also made progress with cemented carbides. However, in the late 1940s, Sweden’s leading industry owners, the Wallenberg brothers, Jacob and Marcus, convinced Sandvik’s management that the Wallenbergs understood the company’s technological edge. A deal was made that laid the foundation for the success of both companies in the mining sector for the next 40 years.

The task of the cemented-carbide department was also to produce finished cutting of the Coromant brand for workshop machinery. It was natural to start with turning tools since they would be easiest to standardize and mass produce. Haglund wanted to market finished cutting tools and provide grinding stations for customer service as well as customer training sites.

For decades, workshops had been making their own tools, soldering a blank of high-speed steel or later cemented carbide onto a slot in a steel shaft, and then grinding it. All these steps were fragile and critical for tool life and quality. Customers could not cope with the process.

For a long time, the steel division, understandably, distrusted the new operation: it was based on the completely new material cemented carbide, had persistent and wide-ranging quality problems, and delivered very little profit. Sales manager Viktor Magnusson put it succinctly in a subsequent letter to the Lumalampan president:

In the spring of 1946 we were distraught over the uneven quality, not only of the cutting tools but perhaps even more so of our major product, rock drills, on which we were working frenetically with no regard to costs.



It started with brazed cemented-carbide turning tools and continued with indexable-insert cutting tools before the major successes came.



Cemented-carbide production got its start in Gimo at a defunct iron foundry and woodworking shop, in 1951.

Expansion in Gimo has occurred in several steps, and the plant is now the world's largest of its kind. Here are shown the workshops for insert production.

Despite the technical breakthrough at Hjältakraftverket, internal quarrels continued.

For years, Lumalampan's president had been agitating to get rid of its tungsten carbide facility. In early 1946, he offered to sell it to Sandvik. Magnusson, a powerful figure, vetoed a purchase, and even questioned the company's own investment.

Even Carl Sebardt joined the chorus, which bruised the feelings of the head of his new, still small department. "With all respect to Wilhelm Haglund, management has grave doubts about the continued operation of the cemented-carbide department," Sebardt said at a meeting, according to Haglund's recollection. But the operation did continue. Remaining doubts dissipated with the big breakthrough for rock drills the following year.

The Lumalampan factory was acquired in the spring of 1947—now at a much higher price. The reason for the acquisition was that annual production was about to double because of the volume increase in rock drills.

A more basic problem was that the grade of cemented carbide that Lumalampan was delivering was not good enough for either cutting tools or rock drills. Change came when Sandvik leased the facility and appointed Sven Edström manager. Edström was interested in research, and after a while persuaded Haglund to see his views. The quality improved.

The rapid expansion of rock drills made two investments necessary. The first was a large new plant for cemented carbide since the Lumalampan lease would expire after five years. The location was the Västberga district in Stockholm; Lumalampan was also located in Stockholm and its employees preferred to remain in the city, while Sandviken was starting to feel a labor shortage. The factory was ready in 1953. Then, by chance, cemented-carbide management found the town of Gimo, not far north of Stockholm. Company shutdowns had thinned the population. In 1951 Sandvik opened a small workshop in Gimo and four years later it had 100 employees. Twelve years later the number was 1,000.

But the cutting tools department was struggling. Business was slow and profitability was poor. The financial management complained that the department was making a loss, prompting the cemented-carbide manager Wilhelm Haglund to get tougher with costs. The autumn of 1953 was to be make or break.

Sebardt suggested that the cemented carbide department be responsible for its own sales. Haglund, under pressure, considered this for a few days and then accepted. The board decided that the general sales department of the company should stop selling cemented-carbide products for a trial period. The cutting tools department began recruiting vendors with workshop experience, and began cultivating customers professionally to get them to buy better machines. Sandvik had its first independent product area.

The outlook brightened, not only in marketing. In the spring of 1953, Wilhelm Haglund came across a twenty-year younger mechanical engineer, Sven Wirfelt.



Wilhelm Haglund and Sven Edström were leaders in the major breakthrough into cemented carbides.



A POST-WAR PROGRAM BESET WITH FINANCIAL PROBLEMS

M*etallurgical engineer* Carl Sebardt, the de facto technical director at Sandvik, was the grandson of former chairman Carl Wilhelm, making him a great-grandson of the founder. It is unclear whether the managing director who had no son saw Sebardt as his successor. It is clear that Sebardt and many of his colleagues were counting on this. But year after year, a seat on the board, a prerequisite for the job of president, was not forthcoming.

Karl Fredrik Göransson continued as both managing director and chairman, although his interests outside the company were growing; for three years, until 1942, he was chairman of the Federation of Swedish Industry. In effect, Sandvik was being run by the duo of the experienced sales director Magnusson and the production manager, Sebardt, who was 18 years Magnusson's junior. So there was a clash not only between sales and technology but also between two generations of Sandvik employees.

If there was friction, Sebardt did not mention it in his memoirs: "It was easy to cooperate with the dynamic sales manager Viktor Magnusson. He was always trying to get our products on the market before our competitors and to speed up our production units."

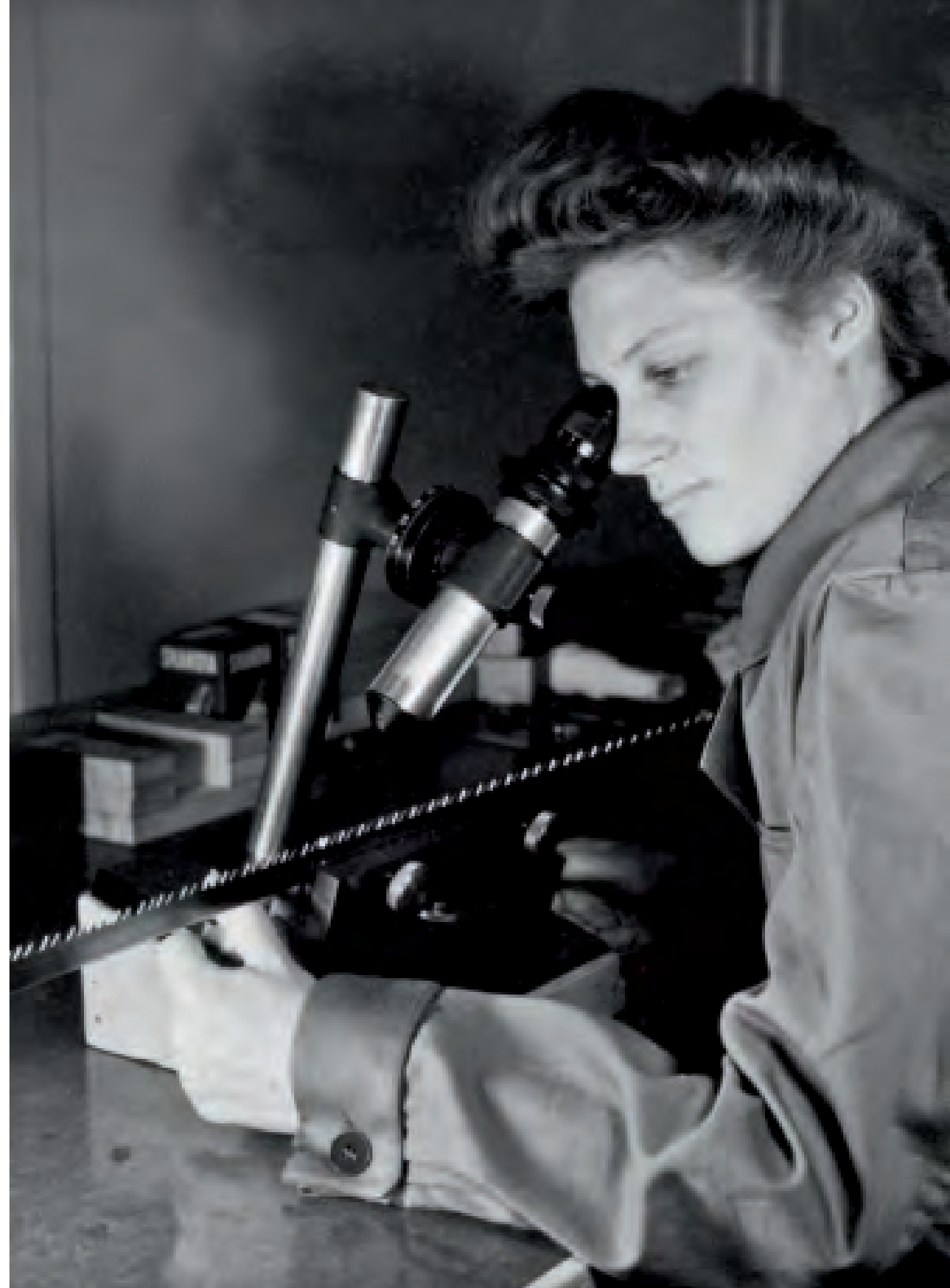
Magnusson was indisputably a key figure, and among those who refined Sandvik's business idea. His motto was "commercial rationalization"—products should be standardized as far as possible to allow for long production runs, and grouped on designated machines so that machine turnaround times would be as fast as possible.

"Using as few product items as possible, we need to serve as many customers in as many markets with as much tonnage as possible," ran one of his pithy sayings.

Viktor Magnusson was interested in technology, but regarded it as secondary to marketing. Customer needs were paramount and technologies existed simply to meet them as efficiently as possible. In the case of cemented carbide, Magnusson found it hard to accept that such a lot of resources were being invested in a new and uncertain market. But he was quickly forced to recant. Without the swift breakthrough of rock drills, Sandvik would have been in big trouble.

His irritation with the self-confident, and ambitious technocrat Sebardt

Should production focus on technology or customers? Competing views addressed how to balance the two. Here, saw-blade production.





Blooming mill, 1966.

shone through in Viktor Magnusson's later correspondence with Karl Fredrik Göransson. In a 1954 letter to the chairman, the recently retired sales manager was scathing.

"Despite his lust for power and ruthlessness he is inexplicably passive when it comes to production."

This was one of the company's most dynamic periods, bringing not only a large investment in cemented carbide, but also the major transformation of the steel operation, completed in 1954.

When World War II was winding down, technical director Erik Pehrsson and production manager Carl Sebardt had foreseen massive reconstruction needs in Europe, and had discussed increased production capacity with Göransson. The cold rolling mills from about 1930, which stood on thousands of wooden piles in the old bay, were the company's most valuable section. Other sections were in worse shape, especially the units for steel melting and for hot rolling of blooms and billets.

At the starting end of the chain were four old charcoal-based blast furnaces. The next production stage was not modern either, even though the Bessemer converters had now been scrapped. Some small and rather old Martin furnaces were complemented by a pair of electric arc furnaces. An attempt to develop an iron sponge production had been abandoned in the early 1930s and left to the partners at Söderfors.

Next in line, in the hot rolling section, everything except the hot rolling mill for tube was from the late 19th century, and even the fine rolling mill that produced different kinds of drill steels and tool steels was part of the problem.

Sebardt felt strongly that Sandvik's focus on niche products and customer needs had seriously neglected the first link in its value chain. It had been possible to improvise during the wars and the turbulent years in between, but it was high time to build a strong technical base.

The first question—where it would be built—was answered by a letter. The urban traffic administrations in Gothenburg, Dalarna and Gävle wanted to electrify the railroad line and speed up their trains. They needed to straighten a few sharp curves, which made it possible for Sandvik to pay to move the railroad to the north and expand its industrial site.

An ambitious master plan for the immediate postwar era was quickly drawn up. The old plant site was to be restructured as to both raw-material handling and transport systems. The site was to be increased by use of the Stensmo residential area, from where houses would be moved to Hedgrind. Part of the work actually began during the war. Investment needs were compounded by the emergence of the cemented-carbide operation from its early startup problems.

World War II was followed by an economic boom. Exports were as yet not at

Modern production demanded investments in all areas. A worker operates a micro-probe at Sandvik Coromant, in Stockholm, in the 1970s.

pre-World War I levels, but doubled in a few years to about 60 percent of sales.

Ore supply improved when the Bodås mine was opened. An iron sponge plant was built under license from former partners Söderfors; the steel melting plant with electric arc furnaces doubled its capacity; the fine rolling mill was replaced and a central gas plant was built. The new blooming mill was opened after much delay in the spring of 1954. "This marks completion of the last unit in our post-war construction program," the annual report noted, putting the total cost of the program at 179 million kronor (equivalent at the time to USD 35m), an almost astronomical sum then.

The underdeveloped Swedish stock market was unimpressed, and the stock market valued the entire extended company at about 90 million kronor. The reason was low profitability and high indebtedness. This made the owning family nervous and put the aging chairman under pressure from the other owners.

Where did Sandvik get the money for this subsequently so successful venture?

A total of 20 million kronor in new shares came from the stock market on two occasions, in 1946 and 1951. This was not an advantageous financial arrangement, with no consideration paid to the double taxation of dividends or to the dilution that the former owners suffered as a result of the low share price.



Added to this were a subordinated loan of 15 million kronor and two bond issues totaling 35 million. Bank loans of 40 million kronor completed the picture of a company exposing itself to a much higher financial risk in order to keep up with the competition and match expansion as war-damaged economies invested to bounce back.

Cash flow increased sharply after 1954, but higher production and marketing meant larger stocks, and inflation increased short term assets. Plus, there was the investment in the cemented-carbide factory in Västberga and the cutting tools plant in Gimo.

Was this a period of extreme over-investment?

Not if investment is expressed as a percentage of sales. Between 1946 and 1957, Sandvik invested an average of 10.5 percent of sales income into new plant and equipment. The figure could have been higher but investments were put on hold when the steel product area ran into trouble in 1954. The corresponding figure for 1928 to 1939 was nearly 11 percent.

Sandvik suffered a severe demand slump between 1953 and 1955. For a company with such a large proportion of fixed costs, it was devastating to lose sales. Upwards of 35 million kronor in losses for steel products were incurred. It is difficult to determine whether declining production capacity was a contributing factor.

Cutting-tool production in Gimo in the 1960s. Special lapping and grinding machines made it possible to produce inserts in large volumes in a cost-effective manner.





After nearly six decades with the company, Karl Fredrik Göransson stepped down as chairman of the board in 1959. He's seen here at one of his last public appearances.

The situation in 1954 was so serious that without the profit of around ten million kronor from the cemented-carbide products, Sandvik would have posted a loss.

Some investment in what were known as the 'hot sections' could have been postponed. But then perhaps the thin stainless steel strips for razor blades and the extruded tubes would not have enjoyed their competitive advantage in the 1960s. Bad luck was also a factor, and some projects were delayed or affected by accidents.

To be fair, it should be said that Sebardt had for a long time run a joint venture with a number of other Swedish metallurgical companies. In this case, too, it was Fagersta that made the fateful strategic decision by pulling out of the project at the last minute and setting the stage for a situation in which a number of Swedish steelworks were wrongly dimensioned in terms of their operations. Sandvik was not the only company to make excessively costly investments.

However, it is obvious that Magnusson's market savvy was often pitted against Sebardt's grasp of technology, and that the experienced marketing manager often felt that he lost out.

Carl Sebardt's powerful influence in those two decades was partly due to the fact that Karl Fredrik Göransson, in his final period on the board, was busy with other issues and that the president, Eric W. Forsberg, was no match for a smart, ambitious subordinate.

Worry spread when the financial strategy did not hold. Money had to be borrowed and a new share issue was needed to meet capital requirements. A whole generation of Sandvik managers polarized into different camps under the fuzzy leadership provided by Göransson and the board. Carl Sebardt was not the only one who came in for criticism. The manager of cemented carbide, Wilhelm Haglund, took offence at the treatment he received, first from the marketing department then from finance.

There is an old Swedish saying: When the manger is empty, the horses will bite each other.

The chairman wrote a memo to his inner circle spelling out the problems he saw from Sebardt's influence: The major plants had quality problems; there were shortcomings in raw materials and from suppliers; there were too many executives; and a savings program agreed on in 1952 had been quietly forgotten.

It was a remarkable document from someone with top responsibility, but there were reasons.

Göransson had himself waited a long time before coming to power, and in the 1940s he was showing no signs of letting it go. But time was running out for both his family's dominance and his own influence. After the war, a more

The combination of expansion and a shortage of workers drove large Swedish companies to concentrate more attention on their workers' health. A fitness session in Sandviken in 1955.

leftwing labor movement pushed the government to tighten capital gains and inheritance taxation, targeting families like the Göranssonssons.

A new corporation law more clearly defined the roles of chairman and president and Göransson was given until 1948 to choose. For someone approaching 70, it was not going to be a tough choice. Some of his relatives on the board from his own generation were irritated at his reluctance to let go.

In 1943 Gustaf Söderlund joined the board as its first external member. He was president of the Swedish Employers' Confederation and later a director at Skandinaviska Banken, the predecessor of SEB, one of the largest banks in Sweden today. Like Göransson, he was one of the major initiators of the Saltsjöbaden Agreement. Söderlund was joined on the board in 1946 by Tage Wärn, president of the large pension insurance company SPP. The board now included respected spokesmen for both creditors and external shareholders, who could influence the decisions when the branches of the former owning family were in disagreement.

In 1944, in something akin to a boardroom coup, Göransson unilaterally appointed yet another board member, Eric W. Forsberg, to whom he had already promised the company presidency in 1948. He would be technical

director until then. Forsberg came from a small steel company, Kohlswa. Göransson was planning to retain some executive powers as 'on-call chairman' with an office at the headquarters.

Consternation ensued. The board was critical both of the choice of Forsberg and of Göransson's plans to stay in power. The board imposed a rule prohibiting all contacts between the board and the company employees that did not go through the new president.

Sebardt felt passed over as candidate for company president, but was assured by Göransson that he was needed as technical director to implement Sandvik's impending technology upgrade. Two departments would be merged under his leadership. From 1952 Sebardt was finally also a full board member.

Meanwhile, the new managing director, Forsberg, took over Göransson's representative functions and board work, and the aging chairman was increasingly isolated from the company.

This was the background to a plot by Göransson and other board veterans to outmaneuver Sebardt when president Forsberg ultimately retired. It would be hard to appoint a managing director without steel experience, since Sebardt would be against it.

The plotting lasted several years. In the spring of 1956, Göransson, in a

The 1950s proved to be good for industrial workers, with large gains in real wages. Break time at Jernverket, Sandviken, 1955.



Opened in 2002 at the initiative of Sandvik and Sandviken's municipality, the independent school Göransson's works toward developing a greater interest in technology and science, particularly among girls.

private meeting with the neutral board member Gustaf Söderlund, expressed his distrust of Sebardt. Söderlund refused to give Göransson his support.

In response, Göransson, as chairman, made a desperate attempt to alter the balance of power on the board. He asked the other neutral board member, Tage Wärn, to give up his seat for Göransson's own son-in-law. Wärn was affronted.

More consternation followed. Handelsbanken, holding a sizeable Sandvik overdraft, intervened. The Göransson family's last magnate was forced to apologize all round.

The external members stayed, as did Göransson. But Sebardt realized that his chance of becoming president was gone. A timely offer came, to manage a new steel plant in Oxelösund for the Gränges mining group, wealthy from selling its shares in the mining giant LKAB to the Swedish state.

Financial problems were met by an additional share issue in 1957, opening a door for a competitor to the principal owners, business lawyer Hugo Stenbeck, who had been fighting for years for the control of the nearby forestry company Korsnäs. Stenbeck would progressively buy shares, thereby eating away at the Göransson family's majority holding.

In 1959, at the age of 80, Karl Fredrik Göransson finally abdicated from the board. He died the following year, in the belief that "outsiders had

destroyed the company." The neutral Gustaf Söderlund took over the chairman's gavel with the new major shareholder Hugo Stenbeck as his deputy.

This did not stop Göransson and his family continuing to make their mark on the city of Sandviken. At an early stage, the Consul himself and his granddaughters Sigrid and Ester had established several charitable foundations. These still provide healthy dividends—financing the huge Göransson Arena for sports, a constant reminder of the founder, Consul Göransson, and his progeny.



COROMANT BECOMES WORLD LEADER

“H*e’s an interesting guy.* I’m going to take the job!” That was mechanical engineer Sven Wirfelt’s reaction to an offer from Wilhelm Haglund. It was the spring of 1953 and Wirfelt, working at the truck company Scania Vabis, had been considering a job offer from his previous employer, Sundstrand Machine Tool Company, in the United States. Wirfelt’s choice was based on more than his desire to stay in Sweden.

The two men were on the same wavelength immediately; that meeting was a turning point for both Wilhelm Haglund and Coromant Tools. Haglund had been successful with rock drills, but only in a subordinate role under the technical director and the head of the rolling mills department. Now, Sandvik was again a world leader in rock drilling, as in the 1920s.

Wilhelm Haglund, who was rather low down the hierarchy but held responsibility for the complex cutting tools, had new problems. Many cemented-carbide competitors were developing cutting methods that should function well at customers. Nothing indicated that Sandvik as a newcomer would succeed better than they. At the time, few could predict that Wilhelm Haglund would become a Sandvik legend.

Summoned to the finance department, Haglund and his new development engineer Wirfelt were told they had little time left to demonstrate success. Many members of the management envisaged a future without cutting tool technology in the cemented-carbide product area. Cutting tools had never been Sandvik’s strong suit, and some people were saying it might never be.

”Haglund wanted to separate cutting tools from the other cemented-carbide operations to focus on his problems, and he wanted Sven Wirfelt to take managerial responsibility. Wirfelt hesitated. He thought the product line was in bad shape and that he was needed more as a product developer with free rein than as an administrator.

In 1955, however, a department was created that was both subordinate to Wilhelm Haglund as manager of cemented-carbide products and answered to Sven Edström, who had Haglund’s old job as technical manager. Soon, nobody in the Group had the muscle to oppose investment in cutting tools.

Wirfelt was given carte blanche in product development. He realized the danger in too wide a range of tools. Itemized production delays large projects and hurts profitability. He focused on standardization and streamlined pro-

The secret of success involved streamlining production and reducing the amount of special tools. A complete overhaul of the production of cemented-carbide tools resulted in lower costs compared with those of competitors.

Mechanical engineer Sven Wirfelt’s novel ideas helped pave the way for Sandvik to take over global leadership within cutting tools.



duction. Together with the tools department at Köpings Mekaniska Verkstad he developed special equipment, for example the Adam machines, which were kept secret from competitors.

Production was increased in Gimo, once a depopulated mill town but now an expanding industrial site.

Development was guided by trends in the United States. American enterprises had produced a square rod of cemented carbide. When the rod gradually abraded through usage, it was reground, giving a new smooth surface with sharp edges. At first, the toolshaft could hold the rod only to a certain length, leaving a stump to be discarded. Ultimately, the clamping device was made so effective that even the thinnest remaining plate could be used. But why have a rod? Why not instead mass produce that last thin plate? Some engineer must have asked himself that question. That is how ‘throwaways,’ or indexable inserts, were born.

Sven Wirfelt was one of the few Europeans who understood the importance of this American innovation. In Germany, Krupp was too busy with special tools and the market leader in Sweden, Fagersta, made almost no investments. Talk in the industry about ceramic materials overshadowed the epic significance of the insert.

The manager of Cutting Tools wanted to streamline the production of the brazed turning tools, but along came Gammax, a mechanically clamped little insert that heralded a new era. The Kanthal company in Hallstahammar would be a subcontractor.

Wirfelt began to analyze the opportunities offered by inserts, and found the prospects dizzying. Customers would be able to buy hard metal with what they saved on regrounding. There would be huge savings! The challenge was to find grinding methods to bring down the price of the inserts.

At Sundstrand Machine Tools, Wirfelt had used a method that might be suitable. Known as ‘lapping,’ it involves grinding using an abrasive and a vibrating cast iron disc.

For the basic grades, this was an immediate cost cutter, 30 percent cheaper. It made Sandvik the market’s price leader. “Are you planning our collective suicide?” grumbled an industry veteran. “Can Fagersta win back Seco’s ranking among Swedish cemented-carbide brands?” pondered a worried Fagersta executive in an internal memo.

Something incredible was taking place. A small hard metal unit in a nearly century-old Swedish steel company was approaching world leadership in arguably the engineering industry’s most important technology area.

The new T-Max insert holder put Sandvik at least three years ahead of the competition. Krupp saw it was being overtaken and tried to derail progress by promoting a millimeter standard that would separate the American and

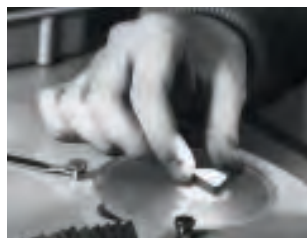
European markets, forcing Coromant to produce two lines. Sven Wirfelt warded off the coup by lobbying the working group adjudicating the matter at ISO, the international standardization organization.

A savvy observer might rank machining with cemented-carbide cutting tools as one of industrialism’s major innovations. Without it, mass markets could not afford the cars and electronic products that are expensive for industry to lathe, mill and drill.

Cemented carbide contributed to the productivity increases that enabled

Technical manager Sven Wirfelt and marketing manager Ola Axell, here on the production floor, transformed an entire industry within cutting tools.

A small product translates into big business. Quality control of a cemented carbide insert.



Packing section in the factory in Gimo, 1965. In the background can be seen the production of cemented-carbide tools.

autoworkers in Detroit as well as engineering workers in Eskilstuna to multiply their standard of living. The first improvements from the era of high-speed steel were followed by even greater progress. Processing speed increased dramatically when tools and methods could constantly adapt.

The growth of Coromant Tools is almost unmatched in Swedish industrial history. Rock drills continued to be a profitable and expanding business but were soon overtaken by tools, which doubled in production volume about every five years. The plants in Gimo, Västberga and Sandviken hummed. Soon, cemented-carbide products made up half of Group sales, mostly through cutting tools.

The Gimo plant now had 65,000 square meters of factory floor space and 1,500 employees. Methods and machinery developed briskly. An international engineering technology and components company was born.

Coromant's breakthrough was supported by the plant in Västberga that had been built under Sven Edström's management. Without the new cemented-carbide powder grades, the breakthrough for indexable inserts might not have happened. The Gamma Coating (GC) layer coating later made Coromant into a technological world leader.

Gamma Coating is an interesting example of how coincidences can determine a company's future. Since the 1920s, it had been known that coating



hard metal with extremely thin layers of other materials would change its properties. The Germans led research in several fields, but due to chance, the Swiss watch industry enabled Sandvik to be first to reach the market.

A Swiss visitor from Ciba, the chemical and pharmaceutical company, had tried to sell Sandvik his company's coating technology, but it did not match requirements. The visitor let drop that LSRH, the Swiss watch industry's research laboratory in Batelle, had another proprietary method. A sample insert coating from LSRH turned out to perform so well that within half a year, in June 1968, Sven Edström had negotiated an exclusive agreement and also got the nod from management to think big. A patent application was lodged in the New Year, two weeks before Krupp's for Widia.

The 1970s saw the launch of Multi Service, an overall view of how to rationalize customers' manufacturing processes. Sandvik staffed its sales organization with engineers and specialists. Sales expenses were high.

Sandvik's marketing symbol was five men with briefcases, conquering the world market through technology and service. The briefcases stood for consultation, analysis, design, planning and reporting—together, Sandvik's brand.

The new management team was anxious about sales costs. Wouldn't it be



Multi Service was the face of marketing and service for demanding clients worldwide. Sales engineers with the skills to help customers with applications symbolized the commitment to service.





The toolholder T-Max took Sandvik Coromant into a new era.

The cemented-carbide factory in Västberga outside Stockholm, completed in 1953, developed cemented carbide that could meet new demands for quality.

cheaper to let distributors handle sales? But sales manager Ola Axell was a determined man.

A major contributory factor to the marketing department's success was the rapid pace of innovation. Modular tools were revolutionizing set-up times in flexible machining. Indexable inserts did not, as many had feared, become a mature product line by the 1980s. New generations of inserts for turning, milling and drilling kept arriving. Coating technology continued to evolve over the decades as variations on GC, each coating grade better than the last. Names like Block Tool System, Varilock, T-Max U-lock, Q-Cut, Ejector and New Wave show Sandvik bombarding the market with new tools. The list has grown. Expansion also included acquisitions and subsidiaries.

The new Sandvik gained a good lead on its competitors, leaving behind many who could not match the pace of development. In business, the difference between winning and losing can be very close.

Why did Sandvik rather than another company become the world leader? Maybe people with a background in steel regarded cemented carbide as

just one material among others. Ever since Consul Göransson's day, Sandvik had seen itself as a technology vendor close to customers. It focused on materials as well as products and production methods and realized early what insert technology could do.

But if Wilhelm Haglund had not recruited the brilliant product developer Sven Wirfelt in 1953, the path would have been different.



A MAJOR INVESTMENT IN STAINLESS STEEL

In 1957, the board was looking for a successor to Eric W. Forsberg as president. They did not want a repetition of the negative relationship between Forsberg and Sebardt: a weak president and a strong technical director. Why not accept reality and make business developer and engineer Wilhelm Haglund the new president?

It was not an easy decision. Haglund was neither a Göransson nor a metallurgical engineer. He was a man almost from the factory floor, with little command of English, who was going to succeed several generations of cosmopolitan managers from the founding family.

Haglund came from a family in the mining district of Närke, and had ancestors who had worked as blacksmiths and welders, some of Flemish ancestry. His parents were Methodists, and Haglund remained a member of the Methodist church for life.

The young Haglund chose vocational studies and began working at the age of 13 as a turner and welder. Five years later he enrolled in a technical school, ultimately qualifying as a mechanical engineer at Örebro technical college. After graduating he joined Sandvik as a designer.

So it was a real shop-floor-to-boardroom leap for this practical man who took over the presidency of Sandvik in the spring of 1958 at the age of 55. Only 15 years earlier, he could be seen walking around in the cemented-carbide tools workshop dressed in a workman's gray uniform coat.

In many ways he was a square peg. But as a businessman, designer and solver of customer problems, Haglund was a highly respected boss, and his notes and letters reveal an intelligent analyst. And as the prime motivator of the cemented-carbide development and later of the globalization of the company, he has influenced this narrative more than most.

Haglund gathered around him a group of strong executives and staff managers who represented a new generation. Almost immediately, a new tone was evident in the information material from the board: a thirst for analysis.

The following year, 1959, Karl Fredrik Göransson retired from the board due to age, and former banker Gustaf Söderlund took his place. Haglund and his two new supporters on the steel side, the production director, Erik Nygren and the research director, John Olof Edström, were quick to suggest major new investments for the company's largest manufacturing product area.

Peel turning of stainless bar steel in Sandviken.



Punch-card machines, predecessors to modern-day computers. Even at this early stage, people had a dream of a rational information system.

The recent investments in steel plants had been controversial. Now, another large step was needed after a period of conflict and indecision. The board voted for major investments in stainless steel tube and wire, with extensive investments to follow in the cold rolling, hardening, and tempering of strip.

Sandvik had the advantage of not having a classic mill tradition of a fragmented production structure and conglomerate thinking. The plants were centralized. The organization was strongly market-driven—not typical among competitors.

Enter a young group of staff employees with a new view on business strategy and product profitability. The new financial director, Carl-Eric Björkengren, backed by Haglund, developed analytical accounting methods to help each product bear its full costs, including calculated interest and depreciation.

A flow of detailed cost and statistical data is essential for an industrial company in growth mode. The need to increase the number of accounts grows swiftly. But how to organize and overview all those figures? And how to extract something useful?



In the accounts departments of 19th-century steel mills, when the chief accountant of the mill ruled over ‘mill clerks’ or ‘book keepers,’ it was not easy to access current, structured information. The annual balancing of the accounts was on its own a massive undertaking, manually assembled and aggregated from accounts in various binders and filing systems. Forget about interim financial reporting!

The difficulties in getting a good grip on finances and economy put a kind of ceiling on how big a company could become. Entrepreneurs with flair and intuition for how matters stood in the company’s various parts had an advantage. But the risk of unpleasant surprises was real. Anyone with a modern frame of reference who studies decision-making in the early Industrial Age is amazed by its primitiveness.

Information did not spread quickly at Sandvik’s headquarters but even before World War I correspondence was on primitive typewriters and calculations were done on early adding machines. In the 1920s, punch card systems in various mechanical sorting machines were introduced.

A summary shows that at the end of the 1940s, Sandvik had about 1,200 office machines and 225 telephones. The core of the company’s information processing was five accounting machines and seven billing machines.

Streamlining the process was necessary but so was improving analysis. As early as in the 1920s the company tried to introduce detailed account systems with number designations. In 1945, Sweden’s Mekanförbundet, a trade organization for the manufacturing industry, published its standard chart of accounts, based on a German model. Subsequently, all MBAs and accountants had to grapple with variations of it.

Business records could now register the production process in all its details and analyze sales, costs, productivity and other items that together comprised the company’s profitability and long-term viability. The rationalization of factory work—the company’s foundation—required detailed manufacturing programs, material flow preparation, continuous control of production, labor studies, and projections of financial results. Streamlined technology and new systems supported this.

In 1953–54, Sandvik introduced an annual sales budget that was to become progressively more detailed. Costs could be calculated per item. As chief accountant for the management accounts, the young MBA Carl-Eric Björkengren provided theoretical background and practical implementation. He introduced a follow-up system for the approximately 100 groups of articles Sandvik called product accounts: about 20 for hard metal products, 60 for steel products and 20 for steel manufacturing. President Wilhelm Haglund consistently backed this system of profit control.

Full cost (‘product cost’) was calculated for each individual item at the



As financial director, Carl-Erik Björkegren changed the company's financial direction. When he left Sandvik he became a financier in the bullish stock market of the 1980s.

parent company and updated for the annual budget. It was shown only as one indivisible value to avoid what was called marginal costing.

Each product carried its share of the company's costs, ranging from the costs for machining hours to the costs for general administration. A very important part of the hourly cost was calculated depreciation on fixed assets. The depreciation should be sufficient to replace facilities at any opportunity. The product cost, including storage costs and calculated interest, was a central part of the accounting principles once known as "the Björkegren doctrine."

The aim of this type of full-cost calculation was that the products should carry their own costs, which meant that weaker products were forced out and strong ones supported. The company's sales staff were given tighter price margins. In companies with large fixed costs for plant and equipment, there was otherwise always a risk that products were retained as long as they 'contributed.' The marketing department could keep cutting prices until all the competitors had profitability problems.

In the autumn of 1957, the business cycle slowed down again. The new president, Wilhelm Haglund, tried to mitigate the effects by approving the production of steel ingots for stock. Just after New Year 1958, 270 men were temporarily laid off. Ninety women workers also had to go, but neither the new general manager nor the metal workers' union equated this with the lay-offs of men; women were seen as temporary staff. Haglund promised the union that the company would be better prepared the next time the economy dipped—no more lay-offs of breadwinners if he could help it.

As new president, he was idealistic, ambitious and rational, but still a man of his times. Far from being reduced, the rate of investments was increased, unlike during the previous downturn. This managing director wanted to upgrade.

The cold rolling mills, not included in the previous investment round, were now given abundant resources and the stainless side was close to commercial breakthrough. Fortunately, management did not go for a volume market for stainless steel, although the strategy had briefly been discussed. That kind of steel quickly became a base product, as Sandvik's competitors Avesta and Gränges Nyby discovered. Sandvik's tough appraisal of product costs had revealed some of the weaknesses.

Instead, the hot rolling mill for strip built in 1950 provided a base for an intensive product renewal of a traditional, niche type. In particular, the need for razor blade steel escalated, prompting the swift construction of ten new cold rolling mills for thin stainless steel strip.

A spectacular investment was the new plant for extruded tubes for the new nuclear power industry, among other customers. Wilhelm Haglund and his

steel people took serious aim at world leadership and won by adding generous manufacturing capacity. Sandvik's competitors were too cautious, with consequences well into modern times.

The steel industry has an innate logic: invest heavily or lose. Sandvik was living dangerously. Sweden's steel companies were small but nevertheless invested in major expansion programs.

Sandvik's management argued for more investment in an unprofitable manufacturing segment, saying that cost savings were not the way to avoid problems. Sandvik needed to focus on even more demanding technologies.

The post-war programs had become expensive for all the companies involved, partly because every small specialty steel works had retained all the production stages from ore to finished product instead of collaborating at the raw material and semi-manufacture stages.

In general, the 1950s were an era of big installations. Petrochemistry made its breakthrough and the first nuclear reactors were built. The new, bigger plants in basic industry and energy meant not only increased demand for tube and pipe but also a rise of demand for quality. The economic consequences of tube ruptures in the chemical and power industries could be huge. Sandvik's steel engineers saw their chance.

Quality control became increasingly important. Measuring the thickness of razor blade steel.

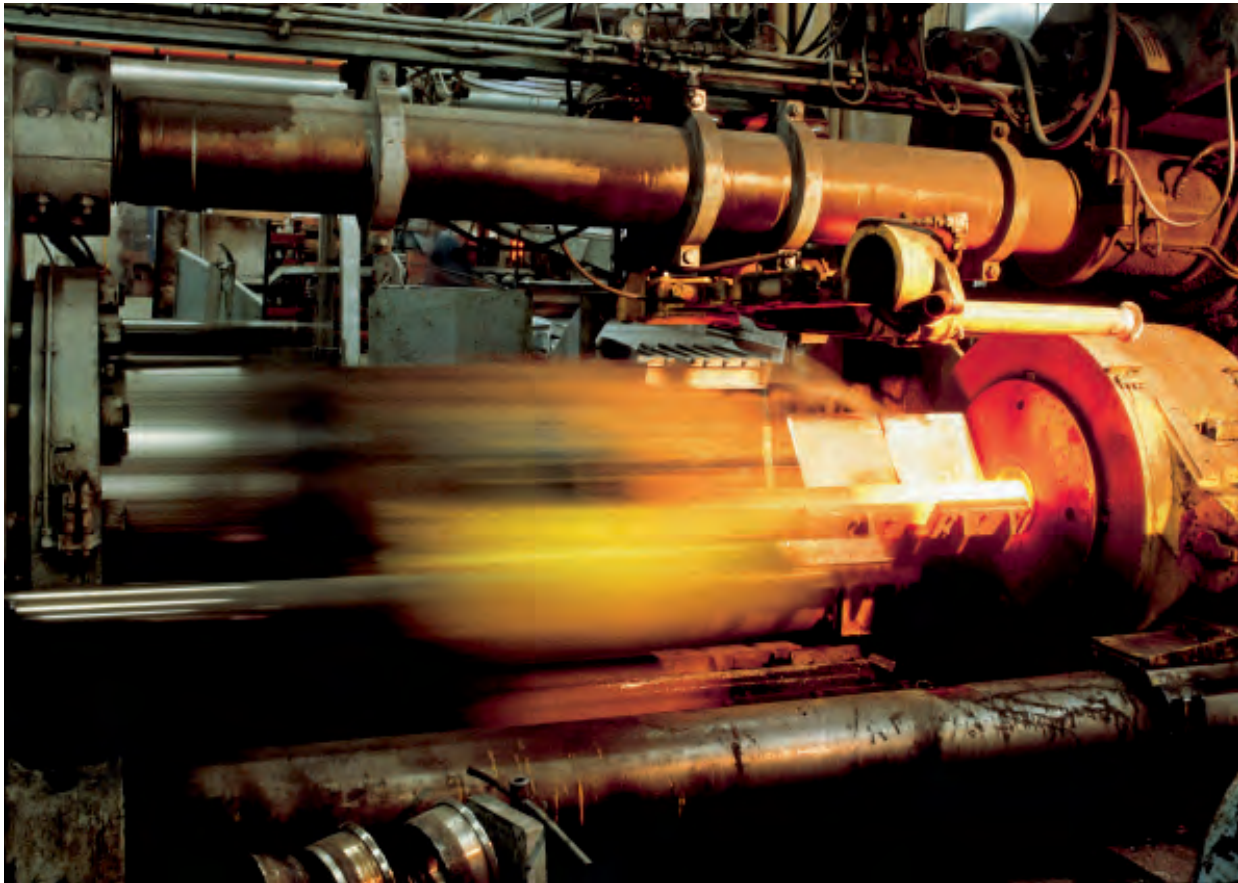


Extrusion press 1962 was one of the largest steel projects in the company's history. The plant in Sandviken produces tubes through extrusion.

Seamless tube was a product with a pedigree. The manufacturing process was labor intensive, but Sandvik's technicians had used and improved American methods and built so many new pilgering mills that Sandvik led the field.

However, new competitors, especially Nyby in the Gränges group, were embracing a promising new technology, extrusion, developed by Ugine in France for the 'hot operations' in tube manufacturing. The method, previously used for softer metals, involved pressing the tube through a gap. In more technical terms, a hollow tube billet heated to 1,200 degrees Celsius is pressed through a gap over a mandrel with a press power corresponding to 3,000 tons.

To extrude stainless steel tubes of the quality demanded by the new process industries was a daunting technical challenge. Ugine, however, had been improving the technique, and in 1959 Wilhelm Haglund and his newly appointed steel manager signed a license to build the industry's largest plant. The plant, Pressverk 62, was completed just in time for the company's centenary, and laid the foundation for market leadership in a new field. Competitors were unwilling to challenge, because the new Sandvik plant was so large that increased capacity would inevitably lead to a price war. Wilhelm Haglund had dared not only to invest but also to do it on a scale large enough to intimidate the competition.



The new facility opened up a top price segment in the tube market; productivity was two and a half times more efficient. The investment was followed by the Rörverk 63 facility the following year, built to house the finishing operations and quality control of the tubes.

With the combination of extrusion and pilgering, product properties could be further enhanced. For the Rörverk 68 plant, Sandvik's engineers developed a twin pilgering mill. The extrusion process could also be used to compress the two materials in the same tube under high pressure and high temperature, producing the 'compound tubes' used by the pulp and paper industry and others.

Another indication of the rapid change in the refined tube market was the new alloys for corrosive environments in the chemical industry and the alloys for the nuclear energy industry. The product range was expanded with high nickel content alloys, titanium and zirconium alloys.

Soviet scientists and engineers were quick to build nuclear reactors, as were U.S. companies with Pentagon involvement. In the 1950s, the Swedish government wanted a Nordic nuclear consortium, partly for military reasons.

At a major nuclear power conference in Geneva, the United States put its cards on the table. To prevent possible Soviet dominance, the new technology



The nuclear power industry quickly became an important market for Sandvik.

The production of steam generator tubes for use in nuclear power plants.





Cladding tubes in zirconium alloys for fuel in nuclear reactors.

The AOD converter in Sandviken, 1976.

would be made available to all countries. Sandvik was one of several companies that saw an opportunity.

As early as in late autumn of 1958, Sandvik received its first order: bars and 'cladding tubes' of zirconium alloys for fuel elements to the Swedish state-owned AB Atomenergi test reactor in Ågesta.

Sweden's Social Democratic government and armed forces still regarded nuclear power as a matter for the state. But when several projects failed, Atomenergi was forced to merge with the privately owned Asea company. In 1965, a Swedish nuclear development program was initiated, the biggest in the world in relative terms. A number of companies, including Sandvik, were involved, using primarily U.S. technology.

One of Wilhelm Haglund's proudest moments was when the U.S. company United Nuclear Corporation, backed by the United States Atomic Energy Commission, approached Sandvik to offer cooperation in the production of cladding tubes for uranium fuel in nuclear reactors. A joint manufacturing venture was started in Kennewick, Washington State. Similar invitations came from West Germany and Japan.

Other companies in Europe were investing in seamless stainless steel tubes but had to purchase their billets or semi-finished, extruded tubes, and never became really competitive. Sandvik had a chance to take the lead and become biggest in the demanding applications that mattered most. The same applied to stainless steel wire, but the technology level was not adequate. Sandvik was on equal terms with the competition.

In the early 1960s, Sandvik also expanded its program for cold rolled strip products. As mentioned earlier, in 1961, 1963 and 1964, no fewer than ten cold rolling mills for thin strip were built, designed by Sandvik engineers. Cemented carbide was not the only product of the future. When the world's consumer markets ordered stainless steel razor blades, Sandvik was well positioned to take the lead.

The basis for this venture was the previously controversial post-war program that had resulted both in modern steel mills and in a hot rolling strip mill of up to 30 centimeters in width. The company's engineers now controlled all stages of production, providing a unique opportunity to compete using quality. Having one's own complete chain of production thus had advantages as well as disadvantages.

As we have seen, cold rolled strips had a long history in the company, from the tentative beginnings in 1883. Cold rolling to thin dimensions was a time-consuming process because the mills were slow and weak.

Technology improved, as did knowledge about alloys. The new induction and arc furnaces were suitable for stainless steel but it took until around 1960 until stainless steel strip, which everyone associates with modern Sandvik,





Hot rolling of strip at the plant in Sandviken. These then served as basic material for cold rolling in a new generation of cold-rolling mills.



Melting of recycled steel and alloys in an electric arc furnace.

had its true breakthrough. In 1935, stainless steel hardly showed up in sales, but by 1965 it made up 25 percent of all strip. A large assortment of strip helped.

The product range had been slimmed down considerably by this stage. Thinner and stronger was the only way to beat competition from other steel companies. Qualities once difficult to manufacture quickly became mass-produced bulk products.

From being production driven, Sandvik's cold rolled products increasingly became customer driven. In close cooperation with customers, the company developed and marketed products with features that customers demanded. Delivery dependability and reliability plus service helped to keep customers.

In that respect, development was similar to what was simultaneously taking place in cemented carbide, although the product range probably should have been slimmed even more.

The situation was somewhat different for Saws and Tools, which was closer to the market. Ever since cold rolled strip had first appeared in the product range, professional forestry saws had been an important Sandvik product. Two-man crosscut saws were exported mostly to countries with less snow, while the felling saw was better suited to snowy northern climes. Bow saws were the main type used for smaller dimensions of timber, pulpwood and firewood.

In 1953 Sandvik introduced a major innovation for bow saw blades: teeth point hardening, which produced lasting sharpness and reduced the need for re-filing, a difficult and time-consuming chore for forestry workers. In Sweden alone, 100,000 men worked in the woods with axes, felling saws, and bow saws.

But the innovation came late; the chainsaw had already been introduced. In Canada only a few years later, 95 percent of all commercial logging would be done with chainsaws. The manual era ended in the 1950s, even in Sweden.

Sandvik's engineers, though, had seen the writing on the wall, and in 1945, the manufacturing department produced a two-man chainsaw. But just as for mining drills, the market preferred light, one-man equipment, and this time the North Americans were the winners.

Sandvik's steel marketing department first invested in selling steel to the companies that made the chains for the chainsaw manufacturers, but Sandvik never became competitive. Accordingly, in 1957 the company started producing finished chains—coinciding with the introduction of direct-drive chainsaws, with higher demands for speed and chain strength. It was another failure.

Considerably more successful was the development of chainsaw blades, launched simultaneously with the drive chains. In 1964 Sandvik Roll Top was

patented and became the Scandinavian market leader, thereby compensating somewhat for the reverses in the forestry market.

Sandvik retained hand saws and saws for metal cutting. At the end of World War II, 600 types of carpentry saw were trademarked with the fish and fish-hook. By 1956, the range had gradually been trimmed by two-thirds. As with forestry tools the best saws were expensive professional models. But simple face-ground handsaws quickly won market shares when DIY became popular.

In 1963, teeth point hardening was applied even to carpenter saws, giving Sandvik saws a new golden age. The same applied to metal cutting after Sandvik's focus in the 1950s on high-speed steel blades.

Conveyor belts for gravel, charcoal, unrefined sugar and other materials were the other classic finished-good product line based on steel. Sandvik had been producing 40 centimeter-wide belts since the beginning of the 20th century. When stainless steel belts were introduced in the 1920s, the food industry, always interested in hygiene aspects, became a major customer.

Designing, manufacturing and marketing transporting equipment needed more and more expertise, and from 1913 it had a dedicated section. A network of subcontractors and an international sales organization were gradually built up. Welding technique was mastered after 1940, opening up new opportunities.



Sandvik regained dominance in the field of razor blade steel with Gillette as its customer.

Sandvik's steel belts for personal transportation—here in a subway in Paris, France.





Hand saws continued to be the company's best-known product.

Rotoform units are used, for example, for the pastillization of sulphur. Here the production of the units at the plant in Fellbach, outside of Stuttgart, Germany.

Rubber-coated steel belts were launched after the war, allowing the transport of ore, for example, up steeper gradients. It was an expansive business, although around 1960 it faced stiff competition from synthetic materials. Rubber-coated steel belts were also used for passenger conveyors—the Sandvik Movator.

Belt widths increased with the new welding technology, opening the door to process industries. Steel belt conveyors had been used on a smaller scale when heating or cooling. The technique was useful in the production of foil or for drying different products. The production of veneer sheets needed heat-resistant belts that could go through the presses.

What was initially a simple steel-belt carrier was developed into a complex machine. An invention based on the magnetic properties of carbon band steel was used for example in sophisticated package-sorting facilities, especially in Japan.

Sandvik's conveyor operation quickly became complex and in 1969, Conveyor, as it was now called, moved to Fellbach in West Germany in the center of a large and expanding European market. Proximity to customers was important because all conveyor equipment was more or less customized. Design time and running-in time lengthened. With costs rising rapidly, it was difficult to maintain profitability without sharply increasing volume. The solution seemed to be to expand through acquisitions and integrate.



Expansion in the 1970s would come to a sad end for most Swedish steel companies, but not for Sandvik, which had invested more wisely. In 1972 the company adapted the name it used within Sweden, changing from 'Sandvikens Jernverk' to what was judged to be the more direct and international 'Sandvik.' The Group was now an international player, and the importance of the product line associated with the traditional steelworks name had declined.

Leafing through Sandvik's financial statements from the end of the 1970s, it is hard to believe that Sweden was experiencing one of its worse industrial crises ever, with the steel industry threatened with closure everywhere. On the Stockholm stock exchange, share prices dropped to levels equal in real terms to the period before World War I. It was as if six decades of development had never happened. The question was whether any basic industrial company, with the exception of Sandvik, would survive.

The Swedish government, through the new minister for industry Nils G. Åsling, set up an 'emergency room' in late 1976 for the country's big industrial companies. Many of these received financial first aid from the state. The reason was not only the global oil crisis but also Swedish inflation policy, which had rapidly eaten away at the country's competitiveness.

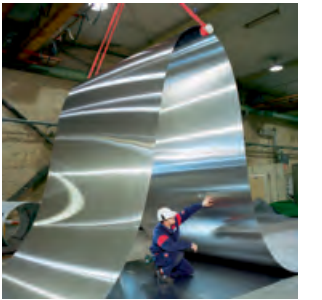
The main reason behind the Swedish industrial crisis was that Sweden was out of step with the other industrial nations. During the 1973–74 economic upswing, the Swedish government had stimulated the economy, leading to a violent increase in domestic profits, prices and costs.

The two-year collective labor contract for 1975 and '76 broke all records. Within two years, wage drift, higher payroll taxes, and other measures had inflated Swedish labor market costs by 43 percent. At the same time, Swedish industry was locked into the then-strongest currency, Germany's Deutschmark.

After the worst of the crisis was over, it was time to restructure the specialty steel industry, which had many more players. One aim was for three major groups, Fagersta, Uddeholm and SKF, to pool their steel units into a new company, with structural changes to follow later. The restructuring discussions went to and fro for about eight years, with Sandvik management in a side seat. Sandvik waited until the 1980s before getting involved.

In contrast, Fagersta experienced its steel crisis earlier than any other company. Its main bank, Handelsbanken, forced the company to sell its golden egg, Seco Tools, which had been invigorated by competition with Sandvik. When the government refused U.S. competitor Carboloy permission to buy, the offer went to Sandvik.

In the second half of 1973, Fagersta and Sandvik agreed to set up a joint company for Fagersta's manufacturing and sales of cemented-carbide cutting tools and wear parts. A new subsidiary, Seco Tools, with a turnover of 200



Inspection of wide belts at the Sandviken plant.



million kronor (equal at the time to USD 46m) and more than 1,500 employees, was 65 percent owned by Sandvik, with Fagersta owning 35 percent. In November 2011, Sandvik announced a recommended public offer to the minority shareholders of Seco Tools to acquire all remaining shares in the subsidiary.

Finally, after many skirmishes and financial problems Sandvik, with a strong stainless steel division, emerged as one of the few steel companies that could weather the crisis independently. The company's success was thus not only thanks to cemented carbide.

Seco Tools became a member of the Sandvik Group, while reserving the right to expand its own reprocessing products independently and in its own markets. The Seco Tools main plant, in Fagersta, has expanded extensively.

GLOBALIZATION AND GENERATIONAL CHANGE

In February 1957, the technical director, Wilhelm Haglund, wrote home to the president, Eric Forsberg, from India about talks he and his team were having with the Indian government about building a factory. This was before India's liberalization and its mercantilist and indeed planned-economy policy at the time was to build up production as much as possible.

Sandvik had an agent in India and sales of rock drills and cutting tools of nearly three million kronor a year, a sizeable market.

British competitor Wimet had already tendered a cemented-carbide factory in India and a Japanese delegation had been there. An Austrian player was also involved. The Indian government pressed Sandvik for a quick answer, signaling its trust in the company. Haglund was not a seasoned traveler and his language skills were poor. But in the past decade, he had been in several countries in the Americas and Africa where Sandvik had subsidiaries and manufacturing.

Four months later, India's prime minister, Jawaharlal Nehru, accompanied by Sweden's ambassador to India, Alva Myrdal, visited the facilities in Västberga. The visit underscored the importance of India's order for a factory to produce rock drills and cutting tools based on cemented carbide. It was a big project for a developing country.

Haglund's time was characterized by heavy investments but most importantly by internationalization. Subsidiaries and manufacturing operations were launched all over the world. There were fewer than a thousand employees in Sandvik companies outside Sweden when Haglund was appointed president, but five times as many when he finished. The India project was an exotic example.

Subsidiaries were first established during World War I and the inter-war period. In 1930, Sandvik did a head count of its agents and subsidiaries for an Export Association survey, finding ten subsidiaries, including four in the U.S., two in Germany and two in the UK. All three countries had dedicated companies for conveyor belts and the U.S. had subsidiary companies for saws and watch springs. In Switzerland, there had long been a co-owned factory. Some subsidiaries manufactured but the main purpose was to support exports from a single manufacturing location in Sweden.

This was not a good time for international business, and export shares

In 1957, India's prime minister Jawaharlal Nehru visited the cemented-carbide factory in Västberga, Stockholm, prior to the establishment of a subsidiary of Sandvikens Jernverk in Pune, India. Here, he's speaking with Sven Edström, manager of the cemented-carbide division.





Wire factory in Mogi Guaçu, Brazil, in the mid 1970s.

Sandvik's plant in São Paulo, Brazil, 1960s.

declined as one country after another adopted protectionist and planned economy features.

The company's international organization was thus still underdeveloped. In 1945, Sandvik had only 17 subsidiaries, and with three of its Swedish competitors—Uddeholm, Fagersta and Hellefors—it formed a shared sales company for overseas markets. This conformed to the trend. Swedish companies owned only about a hundred manufacturing subsidiaries outside Sweden at the time. That would quickly change.

A new subsidiary in prosperous Argentina was soon producing steel conveyor belts and saws. Sandvik founded a rock drill production company in South Africa together with Atlas Copco, which was later bought out. Rock drill factories were also opened in Canada and Brazil. Sandvik was following a Swedish trend, establishing manufacturing facilities mainly in Europe and Latin America.

The 1960s was a breakthrough period for Sandvik and other Swedish companies. Sandvik now accounted for nearly one-tenth of all Swedish-owned subsidiaries abroad.

It started with the production of cutting tools in Düsseldorf and rock tools in São Paulo. The afore-mentioned new factory in Poona (now Pune), India, started production, followed by cutting-tool production in Madrid, Spain and in Fair Lawn, New Jersey, and rock tools production in Mexico and Australia. A factory for the pilgering of stainless steel tubes was built in Scranton, Pennsylvania. Other steel production, such as industrial springs, was relocated to the Scranton factory. Conveyor belt production was started in Germany. Benton Harbor in the United States had strip hardening. At the same time some 20 sales companies opened, including one in Australia. In protectionist but dynamic Japan, a branch was opened in 1961. Japan would later grudgingly permit the manufacture of cutting tools and ultimately a full-fledged sales company.

Some foreign companies were acquired. But acquisition was not Haglund's strong suit, although some of his successors would excel at it.

By 1967, financier Hugo Stenbeck's strength as large owner had grown. He was 77 years old, with a long career as a prominent lawyer and head of Kinnevik. He now took full ownership power, ending the era of the Göransson family and Haglund. Who was this canny financier?

At the young age of 28 he was already an employee of Sweden's then most successful Swedish law firm, Lagerlöfs, specialists in business law and tax advice. When the two founders were killed in an accident, Stenbeck took over the firm.

For one of his clients, the Klingspor family-owned Kinnevik, Stenbeck purchased a major holding in forestry company Korsnäs—an extremely good deal as it turned out. Stenbeck took on more and more of the Klingspor family's business, ultimately becoming a partner in their investment company. Known as a "discreet and likeable lawyer," Stenbeck gradually took over. The Klingspor family's unprofitable farms needed cash and Stenbeck obliged by buying shares from his client.

Wilhelm Haglund remembered when he first met Stenbeck with Korsnäs boss Erik W. Eriksson at the beginning of 1958. It was after a share issue late in 1957, when Korsnäs and Kinnevik bought up shares and subscription rights and became major shareholders. Both Stenbeck and the Korsnäs president joined the board that spring.

"Because Hugo Stenbeck represented a large block of votes and because of his positive attitude and vision, he was very influential on the board. When it came to the Group's development, big decisions did not worry him," Haglund wrote in his memoirs.

The sober, straightforward workshop manager Haglund and the tough, manipulative Stockholm lawyer were a mismatch but somehow took a liking to each other. At least in the beginning, Stenbeck expressed his approval as



Tube extrusion at Pexco, in Scranton, Pennsylvania, U.S.

In 1966, Sandvik's Japanese company was based in this building in Kobe.





Rock tools production in Madrid, Spain.

the new president reshaped the old provincial industry into an international group. He also permitted major investments and accepted a number of stock issues in 1959, 1961, and 1966. He had more financial muscle than the founder family, the Göranssons, and reckoned on taking over.

In 1967, after nine expansive years, Haglund abruptly resigned as president. It was a year earlier than planned, and he was not appointed chairman of the board as he had expected.

Hugo Stenbeck took over the chairman's gavel, appointing as president one of his own men, Arne Westerberg. Westerberg was a metallurgical engineer and president of Kinnevik's small steel plant in Halmstad since 1959. He was not really qualified to run a complex operation like Sandvik. What was going on?

There was no shortage of internal candidates among Haglund's strong group of directors or vice presidents, but many were leaving. A memo circulated at Kinnevik and written by Hugo Stenbeck sheds light on the machinations and on the choice of president.

Discussing with Stenbeck, who was the majority shareholder, Haglund had apparently pushed for Björn Rosén, who was sales director, to become president. Stenbeck had not said no, but wanted Arne Westerberg instead. Haglund reacted negatively.

In the memo, Stenbeck notes that his "old friend" Haglund had favorites, and that a Sandvik employee had told him that Haglund's favorites were all yes-men. So Stenbeck thought that unrealistically high merits had probably been attributed to Haglund's candidate.

The summer of 1966 brought a new development. Haglund went to Stenbeck's holiday home in Fjällbacka to tell him that two colleagues—Sven Edstrom, who was executive vice president, and the developer Sven Wirfelt—were so unhappy about Haglund's proposal for president that they were planning to quit. Haglund and Stenbeck reached an agreement on Westerberg as president and were able to convince the key people in the cemented-carbide product area not to quit. At its next meeting, the board agreed to hire Westerberg, although initially as executive vice president.

Cooperation between the president and his presumptive successor did not go well. Haglund appeared to deliberately ignore Westerberg. Before the annual meeting the following spring, he told the board that Westerberg was a bad choice. Some board members were doubtful, but the decision had been made. Haglund demanded a new share issue at 1-to-4, a total of 39 million kronor, which (in Stenbeck's version of the story) he believed would squelch the financier's ambitions in favor of Industrivärden, the investment company allied with Handelsbanken. It was a sensitive issue for the bankers at Handelsbanken since both Sandvik and Kinnevik were major customers.



Production of wood bandsaws in Milan, Italy.



Rock tools production in Krugersdorp, South Africa.



Coromant school in Orléans, France.

Change of shift at the Sandvik plant.

Haglund himself was on the board of Handelsbanken. The Göransson family could not be expected to participate in the share issue. Kinnevik and Korsnäs did not have the resources to take it all.

But what Haglund was not aware of was that the now-deceased Karl Fredrik Göransson, bitter at the way Handelsbanken had acted in the board feud, had directed that if the family sold its shares, it should be to Stockholms Enskilda Bank. His daughter and her close relatives therefore sold to Investor (an investment company intimately connected with that bank), while Stenbeck agreed with the other relatives to take their subscription rights. The Göransson era was thereby over, even formally.

The result of Haglund's final share issue was that Kinnevik and Korsnäs strengthened their ownership position and influence. Kinnevik interests now controlled almost 19 percent of the shares and votes, while the Wallenberg sphere (including Investor and the Stockholms Enskilda Bank) became the third largest shareholder, after Handelsbanken's pension funds, with three and a half percent. The new shares appeared to be a brilliant affair,

and Sandvik's value rose every year until the industrial crisis of the 1970s.

During his years in power, Arne Westerberg was openly irritated whenever his internally esteemed predecessor, Wilhelm Haglund, and Haglund's successful investments in cemented carbide and steel were credited with the company's success on the stock market. The company now had another expansion strategy.

Under the new name of Sandvik, the organization would continue to conquer rich industrialized markets. That the company in distant India would one day be seen as one of Sandvik's most promising subsidiaries was not even dreamt of.

Hugo Stenbeck's message to the board was crystal clear: no more new share issues that could jeopardize the ownership structure.



EXPANSION DESPITE THE INDUSTRIAL CRISIS

S*andvik was again headed* by a superannuated board chairman, Hugo Stenbeck, and the new president, Arne Westerberg, had no detailed knowledge of the company. There was thus cause for unrest in the company with its tight organizational culture.

The fact that two veterans in the organization, the cemented-carbide product area director, Sven Edström, and the finance director, Carl-Eric Björkergren, were soon appointed executive vice presidents meant, however, that the very top executives ended up at a convenient distance from day-to-day events.

In hindsight, there are several reasons why Sandvik embarked on a partially new strategy. This entailed the Group acquiring companies rather than starting afresh in foreign markets.

One reason was the owner's outlook. If Wilhelm Haglund's era seemed terrific internally, it was not that successful on the stock market. It had certainly begun well with a bidding war and general stock market optimism. But Sandvik shares had then not only performed worse than the index, they actually fell in value. Haglund's major investments were devalued again by investors in a listless time. Stenbeck the financier must have realized that Sandvik needed to send new signals to the stock exchange in Stockholm. He was right, because the shares began to move again under the new management.

The second reason was that, in maturing markets, it might be interesting to buy competitors' market shares, especially if the stock exchange was undervaluing new investments in manufacturing.

In the U.S., the 1960s had been characterized by mature companies rising like meteors on the stock market growing through acquisitions. The ITT conglomerate was one of these. Westerberg wanted to create new growth businesses, and acquisitions were the only way he could do this. In particular, he nurtured deals within Conveyor—the business that was to be forwardly integrated towards the customer. The new Sandvik would supply not only stainless steel conveyor belts to the food industry, it would also supply all the equipment.

It took a while, but towards the end of the 1970s a round of acquisitions began that concerned Sandvik's steel belt conveyors. Supported by Sandvik's president, the conveyor division acquired companies including the British

The New York Stock Exchange on Wall Street. With financier Hugo Stenbeck, Sandvik got a more market-oriented owner, well versed in American financial market practices and able to lead the company through a period of acquisition expansion.

Sandvik's new principal owner, financier Hugo Stenbeck.





The new face milling cutter, Sandvik Auto, was part of Sandvik's investment in the automotive industry.

company Spooner Industries, which manufactured ovens/bakery equipment, high-capacity machines for pies, and hot-air dryers for the paper industry. Three smaller similar companies, Alto, Lewis Food Refrigeration and Jahn Huntingdon, became Sandvik companies in 1980. Under the new name Sandvik Process Systems, the division sought a new role as a fully integrated supplier of industrial equipment. The Group had, it seemed, found a new area in which to expand.

Even more important in the hunt for a 'third leg' to stand on was Saws and Tools, which made a dozen acquisitions, of which the biggest and worst was the U.S. company Disston, which had large manufacturing plants and 1,200 employees. The company's range included a new product, battery-powered garden tools.

Overall at this time, Sandvik made 125 acquisitions, according to a subsequent study. Some of these, like cemented-carbide companies Seco and Safety, were important and successful. Others, also in the cemented-carbide sector, like Wickman Wimet and Eurotungstene, were expensive, but strategic market shares thereby ended up with Coromant. However, the acquisition in 1974 of the West German company Lidy, a manufacturer of stainless steel welded tubing, was almost a disaster for the steel operations.

Previously, Sandvik had bought virtually no companies at all. This time there was not much time for reflection or for due diligence, a proper risk assessment. Perhaps that is why so many of the deals appear in hindsight to have been so bad. The company moved too far away from its core business. While the acquisitions were taking place, Coromant cutting tools carried out its aggressive expansion with field sales staff and service personnel. Up to 1973, the Cutting Tools product area had performed an estimated 2,000 consultations or tool analyses in various companies in the global market, during which production engineers examined the opportunities that existed to rationalize metal machining with more modern types of tools. Inserts with Gamma Coating were more expensive, but the speed of the machines could be increased so much that it was always cheaper per component. Since the coated inserts had a wider area of application than the conventional ones, not as many inserts needed to be kept in stock either. With the help of the new computer technology, the Sandvik salesmen and engineers could also to begin to figure out and propose the optimal combination of tool type, cutting speed and feed rate relative to the workpiece for each customer.

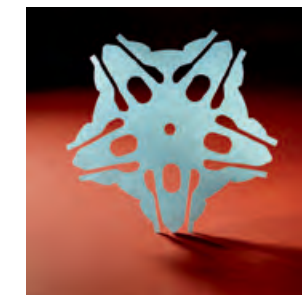
At this time, Sandvik was enjoying great success in the automotive industry. This was partly due to the new auto milling cutter, a cutter for machining cast iron in parts such as engine blocks in the automotive industry. Sandvik Coromant was involved right from the planning stage in big car projects such as Kamaz in Russia.

In Europe, some 50 cemented-carbide manufacturers had become 30 as a result of mergers. Sandvik had a leading position in the European market with its competitor Krupp Widia some way behind.

In the U.S., where the dealers ruled with their two main suppliers, Carboly (GE) and Kennametal, the Sandvik market share was much smaller. Coromant was reluctant to cede control to the dealers, who did not have the same views on technology and rationalization. In Japan, the Sandvik manager was grappling as usual with the informal protectionism that favored three local competitors.

Sandvik's sales organization was expensive, but it would eventually win the battle for the entire global market, though not before first creating a dangerous crisis of profitability.

Was the board exerting no control at that time? The new owning family was soon occupied by its own problems. Hugo Stenbeck Junior, born in 1933, had long been the president of Kinnevik and he was a partner in the law firm, just like his father. Hugo had a dispute with his younger sister Margaretha



The automotive industry has for a long time been a major customer for Sandvik, for example, of flapper valve steel.



about the strategies and operation of Kinnevik. This resulted in the 84-year-old father firing Hugo's sister from the board in 1974.

Hugo Stenbeck Jr then fell seriously ill and died in 1976, just as his father was about to retire. The old financier passed over his daughters and chose his youngest son Jan, who had been an afterthought. Jan had already managed to carve out a life for himself in the United States, away from the family's influence and beyond the reach of the Swedish tax authorities. It was partly about saving the value of a premature inheritance. Jan Stenbeck was a naturalized American, and would retain his U.S. domicile until his death in 2002 despite extensive industrial operations in Sweden.

Millicom was a small American company with which Jan had become involved as an entrepreneur after previous contact with it as an investment adviser and consultant. It would be his admission ticket to the cell-phone industry. This happened after two years of training in business management at Harvard, at a time when the old American view of entrepreneurs and risk appetite was starting to come into its own again. He had also managed to get both employment and a partnership at the leading U.S. investment bank, Morgan Stanley. Old Stenbeck had reason to be proud of his youngest son.

Jan Stenbeck became involved in the management of Kinnevik. Hugo Stenbeck died in 1977 at the age of 86, and after his death a triumvirate of Kinnevik-related managers was formed to govern the group: Jan Stenbeck, Sandvik president Arne Westerberg, and Korsnäs president Nils Landqvist. Swedish journalists tried without success to contact the media-shy young heir who would later become nationally famous. Westerberg represented more the ownership power than the executive responsibility, which rested largely with his two closest associates and vice presidents. A very young MBA with black-rimmed glasses and a beard, Percy Barnevik, was given more and more room to maneuver, not only by Björkegren but also by Westerberg.

Barnevik had been trained at the School of Business, Economics and Law at the University of Gothenburg during the time when the professor of distribution and 'company doctor' Ulf af Trolle reigned there. This was the same af Trolle who had to jump in to rescue the company Fagersta when it was in crisis.

Barnevik came from a family of small business owners in Uddevalla and distinguished himself more in his studies than in student life. One of the teachers of business administration saw to it that the elite student could study for a doctorate at Stanford in the U.S., and af Trolle used him for one of his consulting assignments. It was clear that the young man had his career staked out at an early stage.

Barnevik, however, did not return from the U.S. with a PhD, but rather as a consultant with ties to the Stanford Research Institute (SRI), the first American consultancy used by company owners in Sweden. SRI worked at Atlas

Copco, for example, and was later accused of having convinced the Finnish company Tampella to begin copying various Atlas machines for the closed domestic market in Finland. This would later have some significance for Sandvik.

Barnevik was soon furthering administrative development together with the Johnson Group's computer company Datema. Finance director Björkegren was not that interested in Datema's services, but he was interested in Barnevik.

"He was hugely intelligent and ambitious. The only thing I had to teach him was to laugh," Björkegren later said in an interview.

At Sandvik, the young Barnevik also encountered some of Sweden's most interesting computer enthusiasts.

Anyone who was not involved in the early 1970s' computer world cannot really understand the challenges in this area. At that time, computers had the memory capacity and processing speed that simple calculators subsequently had, even though the devices were so big and generated so much heat that the central units had to be kept in refrigerated rooms. Data was entered in batches using punch tape or punch cards, and came out on long, pajama-striped sheets of paper. It was necessary to reduce the volume of data both going in and coming out. Communicating with a computer involved programming in a com-

Percy Barnevik joined Sandvik as a young MBA. His career path included being chairman of the board of Sandvik AB 1983–2002, with an honorary position thereafter.





Even when computers took up enormous space and performed only limited jobs, Sandvik was at the forefront in computer use.



Managing director Erik W. Forsberg pressed the start button on the company's first computer in Sandviken, 1956.

puter language in which the slightest typing error in a long encoded sequence could mean working all night. However, the dreams within the industry were as big as the potential for error.

This world was ruled by the American computer company IBM. In Sweden it had more than two-thirds of the market. IBM had just introduced the Swedish word 'dator' for computer instead of 'datamaskin.'

There were many reasons why the winner took over everything in this world. IBM was the standard in an immature market and had the widest range of software. The hardware was like an empty book and the software was the actual text. IBM was also established all over the world, to the great advantage of customers operating internationally. The 360 series was launched in 1964 and had a huge impact on computer development within the global industrial sector. At this time, a large computer system had a memory capacity of hundreds of kilobytes. Four decades later, the capacity is counted in terabytes (1,000,000,000 times more than a kilobyte).

Was it a smart strategy to be a pioneer in a new field of technology, as Sandvik was at that time? The risk was large-scale failure and huge project costs. But the potential gain was to steal a march on competitors.

In the 1970s, Sandvik was perhaps the most advanced computer customer in Sweden. It was no surprise that the company invested in IBM computers from the start. The problem was rather that some of the subsidiaries were using computers from other manufacturers. Another problem was that Sandvik's engineers and planners in the modern new steel product area dreamed of creating an overall production management system with the inexperienced Swedish company Asea LME Automation.

Several Swedish groups of owners, in particular the Wallenberg Group, saw a future in computers and software. Datasaab would draw on the Group's computer skills to become a worthy competitor of IBM on the administrative data side (ADB), and Asea LME Automation would become a sort of counterpart on the engineering side.

In the midst of these developments, Sandvik became an advanced customer. As usual, the explanation for this lies with a few real enthusiasts. The first, and thereby perhaps the most important, was the first systems manager, Nils Strandell, who in the 1960s began to dream of a mathematical model that could encompass all the data on steel operations. Despite all the technical advances, his vision of a total management and information system was never realized. Strandell became a mentor to several of Sandvik's computer pioneers.

Percy Barnevik became head of the EA department, which managed the Group's administrative rationalization and control. He was probably not that interested in computers themselves, but he, too, had visions of their possible uses.

Sandvik's and the young Barnevik's big computer adventure started badly with the SV71 project. The plan was to enhance the efficiency of the entire hot flow from the steel mill to the cold rolling of tubes, strips and wire with a total system in which Asea LME Automation would supply both hardware and software. It was Barnevik who first realized that the SV71 project would never work and pulled the plug on it, with huge costs for Asea LME Automation as a result.

A little the worse for wear but keen to exact revenge, Sandvik's computer people embarked on major new challenges that brought them right up to the head of the pack. Barnevik hired an entire team of graduate systems engineers, and had a particular fondness for technical physicists. They had to learn programming from the computer engineers. An organization of 60 people worked on projects that were very advanced for the time, such as Sopic (Sandvik order processing and inventory control). The Sarek accounting system was one of the most advanced in Sweden in the late 1970s.

Without going into more detail about the various projects, it can be said that Sandvik was a particularly appropriate company for computerization. The reason for this was the high level of capital tied up in the cemented-carbide products stock. The potential profits were large, as interest rates were on the rise, thereby increasing the cost of the capital tied up.

How do you optimize a stock of 25,000 product variants spread across 30 different storage locations in various national or regional companies? Customers wanted short delivery times from nearby warehouses. It was not easy to manage customer orders, and it was therefore tempting for warehouse managers to have significant volumes in stock.

It was important to understand both what each individual product variant required and what each forecast looked like. A very comprehensive business analysis and study lay behind the various systems that emerged to solve these problems and others. Barnevik's guerrillas chased costs worldwide.

In particular, the subsidiary reviews, which were done by a group of four or five people, were like an invasion that could easily have been resisted by the subsidiaries. However, Percy Barnevik organized them from above with the support of Group management, thereby eliminating all opposition. These reviews were considered a great success, thanks largely to teamwork.

It was a laborious task to connect all of Sandvik's subsidiaries to the parent company via computer and telephone networks. Fixed telephone connections to the most remote ones did not come until the 1980s. The multinational company gained a wide network of nerve fibers, a system in which information from customers could quickly reach the right place in the company and trigger action. Big money was invested in the costly computer technology, but money was also saved or earned as Sandvik gradually became faster and more agile.



An employee at the headquarters of the Japanese subsidiary in Kobe sending a telex—a telegraphic message sent via teleprinters, a sort of predecessor to e-mail.

Arne Westerberg (second from left), a managing director who invested in expansion and then encountered problems. Here opening the Mexican subsidiary in its new premises in Tlalnepantla, Mexico City, 1967.

Sandvik became an unusually structured company, which would become apparent when newly acquired companies needed to be incorporated in the Group. The process almost always began with a culture shock but continued with a thorough review and harmonization of the new acquisition's various systems. The process was frustrating but effective.

Sandvik became one of the advanced customers that built the foundation of the vigorous Swedish IT consulting industry, which would give birth to the Swedish IT boom in the 1990s.

Percy Barnevik became a popular manager who looked after the computer staff's resources and well-being. Many people have fond memories of this time in their professional lives. Sandvik did not transform Barnevik into either a computer engineer or an industrialist. Analysis and rational organization were his all-consuming interests. All of Sandvik's junior and senior managers were surprised to see a young man who calmly intruded everywhere and insisted on attention with his analyses, prescriptions and remedies.

When top-level conferences and seminars were held, there was always a young man in a beard who stood next to the president, Westerberg, and directed the program. His supporter Björkegren, who would later become known as a financier and art collector, was a power phenomenon. Somehow,



Björkegren had managed to ally himself with Westerberg despite having initially ignored and almost offended him, just as the then-president Wilhelm Haglund had done.

At the same time, Björkegren had great power over the company. Sven Edström was probably the only member of the management team who could get his own way with Björkegren. In this environment, young Barnevik had room to maneuver. He gave the organization a strategic rigor that had not existed before, say veterans who have been interviewed.

"I was given huge support from the top right from the start," says Barnevik himself. "When Björkegren realized he could not become managing director, he let go and gave me room to get into his role as executive vice president."

The situation may seem slightly familiar to readers of this account. An elderly board chairman, combined with a passive managing director who allows a young, driven, intelligent but inexperienced person great freedom of movement in the organization. So it had been during World War I, when old Carl Wilhelm Sebardt and the manager Tord Magnuson had tried to counter-balance the impatient crown prince Karl Fredrik Göransson. And so it had been to an even greater extent when the aging Karl Fredrik Göransson and the evasive Eric W. Forsberg cleared the way for the technically gifted and driven Carl Sebardt.

There are several problems with this situation, which were not at all unfamiliar in the long history of Sandvik's management. Young impatient leaders may need to be counter-balanced. The second problem has to do with the question of responsibility. Who was responsible for the expansion of Sandvik after the war or who was responsible for expansion taking place too fast on several fronts in the 1970s? Top management cannot deny responsibility for something that they themselves had delegated for reasons of weakness or convenience.

It was hardly young Barnevik's fault that the Group was moving full speed ahead everywhere at the very moment in the 1970s when a long period of economic boom and growth was turning into a period of setbacks in the global market.

In this terrible turmoil, it was still Sandvik that managed to survive without external support. Sandvik's business concept, with a focus on cemented-carbide cutting tools, rock drills, extruded and cold-pilgered tubes, and advanced cold-rolled strips with their various refined products, withstood the hardest test conceivable. No sails were reefed when the storm came, but the ship survived anyway.

By that time, the self-confident Percy Barnevik had already gone to the United States to personally tackle Sandvik's biggest problem: its weak share of the world's largest market.

Sandvik's plant in Düsseldorf, Germany, early 1980s.

“When I continually pointed out our major problem, both the new cemented-carbide division manager and the managing director Arne Westerberg told me to go and do it myself. I don’t regret accepting their challenge at all, as those were the happiest years of my life,” Barnevik says.

In the U.S., he had the chance to punch above his weight and capture market shares. He got to battle a large organization such as General Electric, and a dynamic competitor in the person of Jack Welch, head of GE’s subsidiary Carboloy, who would later lead all of General Electric. Later they would meet as antagonists at a higher level, with Welch as GE’s CEO and Barnevik as the head of ABB.

Barnevik went back and forth across the continent and tried, via Seattle, the southern states, the East Coast, and New England, to encircle the heart of the engineering industry around Detroit and Chicago, where the competitors were strongest and the customers biggest.

Sandvik’s policy of direct sales was problematic in the United States, as was the concept of taking over from distributors who grew above a certain size. Among them, Sandvik had been blacklisted. Distributors were the norm in the U.S.:

“The distributors said, ‘why should we trust you? You’ll return home after a few years and we’ve had bad experiences with Sandvik people’”, Barnevik reported later.

There is good reason for this narrative to revisit the continuing adventure

in the U.S. market. Barnevik certainly expanded sales, but this did not solve every problem. On the contrary, his successor was almost a disaster.

The United States happened to be the meeting place for two of the most interesting young men in the Swedish business world at this time. Barnevik talks about his first encounter with Jan Stenbeck, who was of the same generation. Stenbeck’s big brother Hugo was still alive at that time.

I came from a home with frugal parents and Sandvik had a frugal culture too. Jan was from the upper class and represented something entirely new to me. We were in one of the finest restaurants in New York and he ordered two different main courses and I one. ‘Is anyone else coming?’ I wondered. No, he just felt like having both dishes. On another occasion he pressed a huge bill into the waiter’s hand to get the best table by the window, one that needed to be booked well in advance. I learned that he always had a bundle of banknotes in his pocket to solve such problems, such as when he needed to go to Chicago and the plane was full.

I appreciated him as a creative and intelligent person, and we met frequently. We never became real friends. But because I built up the U.S. operation and did my job, he saw me as a future president of Sandvik. He said so himself.

That was, however, not how it turned out in 1980, when Jan Stenbeck and the other two members of Kinnevik’s leadership troika appointed a new Group management team for Sandvik. The unexpected new Sandvik president was Steel manager Lennart Ollén, and Arne Westerberg took over the job of chairman of the board from Jernkontoret’s president, Ragnar Sundén, who had joined the board for a few years following Hugo Stenbeck’s death.

Barnevik, who did not want “to hang around and manage Westerberg’s failures,” sounded out the market for another top job, and Asea’s chairman, Curt Nicolin, persuaded the aging Marcus Wallenberg to take on a man with a beard as a chief executive. Wallenberg did not like men with beards.

Jan Stenbeck regarded Barnevik’s defection as terrible treachery.

A few years later it was time for the next big change, when Göran Ahlström from Halmstad’s Järnverk was first appointed vice president and then in 1983 president to succeed Lennart Ollén at the annual general meeting. Ahlström soon announced a radical reorganization of the Group with effect from 1984. The lines of business were divided into seven business areas with strong decentralization.

All this was happening as Sandvik was inexorably slipping into a dangerous crisis due to high costs and recession



Lennart Ollén and Göran Ahlström were managing directors during a turbulent period.



A DRAMATIC TRANSFORMATION

On August 19, 1983, the steel company Fagersta (like Sandvik, controlled by Kinnevik) held an extraordinary general meeting and the board made the surprising proposal that the company should acquire the investment company Kinnevik for one billion kronor. It was the new head of Kinnevik, Jan Stenbeck, who was behind the plan. His idea was to implement a reverse takeover to gain control over the family empire together with the Klingspor and von Horn families.

The plan was for Fagersta initially to buy the inner circle's shares in Kinnevik, and then bid for other shares, with payment to be made in Fagersta shares. Fagersta would later change its name to Kinnevik.

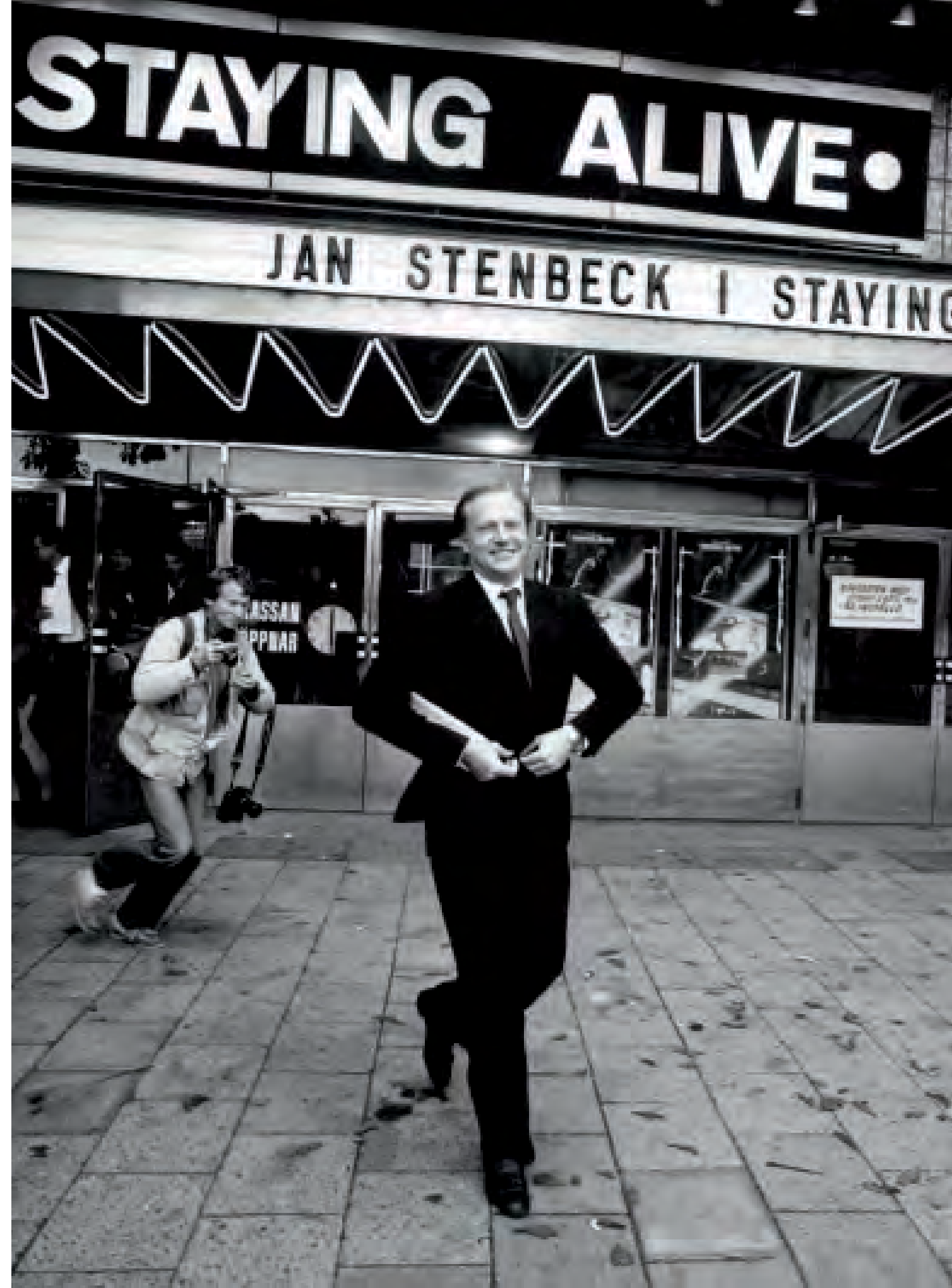
The reason for the radical deal was that previous disagreements between Jan Stenbeck's deceased older brother Hugo and his sisters had turned into a family feud. If the sisters sold their shares, which a legal process had entitled them to do, the Stenbecks' history as a family of financiers might be over.

Jan Stenbeck had taken control of Fagersta five years previously by exchanging a block of Sandvik shares for Fagersta shares with strong voting rights. A year later, he had exercised an option to buy more, so that Kinnevik gained full control.

Jan, who had previously been reserved and unknown to the general public, now showed his true colors as a confident financier with experience from Wall Street. The mass media were charmed by his relaxed, humorous manner. He asked the owner of the cinema where the meeting was held to replace the name John Travolta on the sign outside, so that it read 'Jan Stenbeck in Staying Alive.' It was not just disco movies that arrived from the United States at this time, but also a new style in the financial market. The stock exchange had just awakened from a slumber that had lasted since the 1930s. New share dealers were being hired at the stockbrokers and commercial banks. The short-term money market had started to roll.

Soon, devaluation profits for exporting companies, combined with a closed capital market, would turn financial Sweden into a pressure cooker. The Swedish krona had been devalued, while the U.S. dollar was soaring due to President Ronald Reagan's new supply-side policies. Another aspect was the U.S. Federal Reserve's high interest rate cure, stopping inflation by increasing

A family feud forced Hugo Stenbeck's youngest son, Jan, to a power-brokered deal whereby the family's company Kinnevik in its new form was banned from the Stockholm Stock Exchange. This, along with a crisis of overexpansion within cemented-carbide tools, contributed to Sandvik gaining a new main owner. The picture depicts Stenbeck once he went public about going to battle with his sisters.



Testing of cemented-carbide tools at Sandvik Coromant's test workshop in Sandviken, 1981.

the value of the currency. From a starting position of SEK 4.30, the dollar rose to SEK 9.74 by March 1985.

The Swedish car industry, previously threatened with closure, was focused on the United States, and began to report record profits. A company that also thrived in the new environment was Skånska Cementgjuteriet, with profits coming both from its overseas projects and from successful Swedish real-estate transactions. Cementgjuteriet and the car company Volvo would later form a new industrial ownership constellation in Sweden as their liquidity grew. Among the new players on the stock market was the Fourth National Pension Insurance Fund (AP4), which focused entirely on shares. A number of other big savings funds were also launched by banks to sell shares in 'risk-free packages' to customers.

Previously, shares were not 'for widows and orphans' but, with the support of new academic theories of risk equalization, the world's banks abandoned all misgivings about the risks of shares. In addition, investors outside Sweden bought Swedish shares for nine billion kronor in 1983, a massive increase.

During this expansive stage of the Swedish stock market, Stenbeck's deal would have dramatic consequences for the control of Sandvik. The stock exchange council decided first to examine the Fagersta deal. What was the

situation with regard to the requirements for disclosure of information and equal treatment? One of the auditors quit. Two weeks later, the verdict came: trade in Fagersta and Kinnevik shares was halted and the prospectus issued by Stenbeck was rejected. A few more weeks later, the two companies were expelled from the Stockholm Stock Exchange. A new ethics investigation was launched because of what had happened. This meant a severe loss of prestige for Jan Stenbeck. However, he managed to complete the deal. The support from the family's old banking partner, Handelsbanken, was very important for the outcome.

By coincidence, in the midst of this process the already troubled Sandvik issued a shocking piece of news: the Group had lost more than 200 million kronor on an employee's currency speculation. Given that the krona had been devalued and the dollar just kept on rising, it was not surprising that this and various other currency policies failed.

This, though, was the straw that broke the camel's back. During the two years in which the stock market had begun to perk up, Sandvik had reported only profitability problems and cutbacks. The company's crisis had begun in 1980, when profits began to fall. The decline accelerated in the following year. As early as 1981, the then president, Lennart Ollén, had cut the size of the organization by more than 2,200 people, in Sweden mostly by personnel taking early retirement. The following year, the number of employees in the Group fell by almost another 4,000. The profitability problems were made worse by serious problems in three newly acquired companies: Eurotungstene in France, Wimet in the UK, and Disston in the U.S.

Accounting is the art of the possible, someone once said. Sandvik should perhaps have reported a loss in 1982, instead of a profit of 68 million kronor. That was actually the year when the company lost 130 million kronor on currency futures.

What was the real situation at Sweden's best steel and engineering company? Not even the cemented-carbide division seemed profitable any longer, and the company acquisitions made appeared to be failures.

Sandvik shares had not kept pace at all with the stock market frenzy, the like of which had not been seen since World War I. In three years, the *Affärsvärlden* general index had quadrupled, while Sandvik shares went nowhere.

In the spring of 1983, Skånska Cementgjuteriet bought ten percent of the 'depressed' Sandvik shares in the hope that they would recover. Two leading Sandvik individuals were involved in insider trading and had to resign immediately. The shareholders who sold included Investor and Providentia, which had other problems to deal with during a generational change in the Wallenberg family. The new Cementgjuteriet shareholders quickly became concerned at Sandvik's poor performance.



Cementgjuteriet's rapidly expanding share portfolio now also included 25 percent of SKF, 25 percent of Grängesverken, and 40 percent of the investment company Säfveån. Long-term financial investments in a construction company overflowing with money had created a new power center in the Swedish business world. The stock exchange boom gave company management an appetite for shares.

In contrast, the Stenbeck sphere appeared weakened. A few weeks after Kinnevik's temporary expulsion from the stock exchange, the head of Cementgjuteriet, Bengt Haak, orchestrated a dawn raid, in which he quickly increased Sandvik's holdings to 20 percent and allied himself with AP4 and SPP, which held a further 10 percent. The new major shareholders were then able to demand an extraordinary general meeting and appoint a completely new board. "We will give Sandvik the best board of any company on the Swedish stock exchange," declared Cementgjuteriet.

Prior to the EGM, which was arranged for October 24, 1983, Sandvik shares rose to two and a half times higher than their crisis valuation around a year earlier. The two sides battled for control. Jan Stenbeck had to give in and sell his Sandvik holdings shortly before the meeting. In conjunction with this, Arne Westerberg quit as chairman. The newly appointed Göran Ahlström chose to remain, against Jan Stenbeck's orders that he, too, should resign.

Four years earlier, Percy Barnevik had resigned as one of Sandvik's executive vice presidents to take care of the Wallenbergs' company Asea. The fact that he now appeared as board chairman of Sandvik meant that Stenbeck subsequently not only saw Barnevik as a sworn enemy, but also suspected that the Wallenberg family had played a role in the battle for ownership.

Percy Barnevik himself describes his decision as follows:

In August 1983, I received a telephone call from Bengt Haak, who appealed to me on behalf of himself and the pension funds to take the role of non-executive chairman of the board. I had a strong emotional attachment to Sandvik, so I told my chairman Curt Nicolin that I was thinking of accepting. The fact that Asea's profits had grown so much during my time meant that I thought I had a strong bargaining position. But the board rejected my request. Sandvik is a Handelsbanken company, they said. I stood my ground, and it was Nicolin who eventually settled the matter by declaring: "I would rather have eighty percent of Barnevik as head of Asea than a hundred percent of anyone else."

Before Percy Barnevik had left Sandvik in 1980, he had sent a memo to Stenbeck suggesting measures that should be implemented to clear Sandvik of the mistakes of the 1970s, in particular the company's expanded acquisition pro-

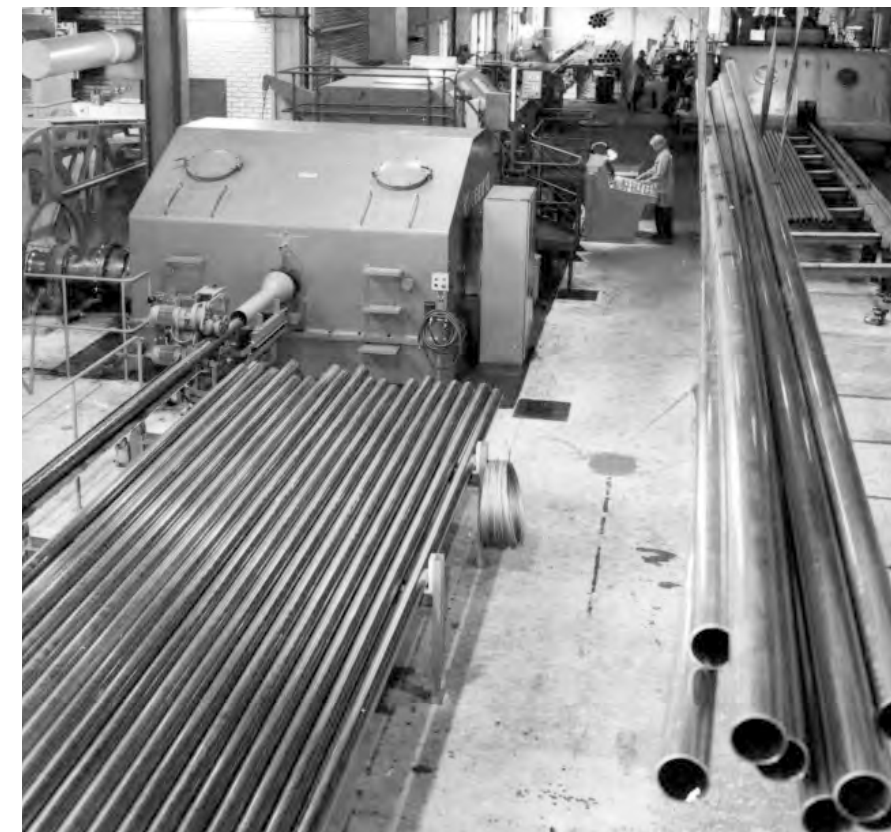
gram. This document was produced again now that he as the new board chairman was once more involved with Sandvik. It was important to come to terms with history: to start again and put the sins of the past behind them.

At Sandvik, the president, Göran Ahlström, had already been busy dismantling the Group's very centralized management. He and Percy Barnevik began working on the new program of change. Both Ahlström and his predecessor, Ollén, had followed a similar line to that of Barnevik. They wanted to break up the old chain of command by creating seven different business area managers and putting them and their organizations in charge of their own operations.

Since 1975, Sandvik had had a divisional structure with the president and executive vice presidents at the top. The subsidiaries outside Sweden, the divisions, and the top management easily generated bureaucracy and paralysis between themselves.

"Our objective with the proposal is to delegate responsibility and achieve increased awareness of results and costs at all levels, as well as reduced bureaucracy and shorter decision-making paths." Such was Ahlström's justification

Cold pilgering of tubes in Sandviken, 1982.



Per-Olof Eriksson was president 1984–1994, a time of belt tightening that resulted in renewed profitability and market confidence.

for the new regime. It would be of great importance to later developments.

There was no lack of friction between Göran Ahlström and the impatient new chairman, who quickly wanted to show the world his ability to act. Percy Barnevik led one of the largest ‘clear-outs’ ever implemented in the accounting of a Swedish company. Everything that could be charged to the 1983 bottom line was thrown into the pot—a total of more than one and a half billion kronor! This loss was partially offset by Sandvik selling its 15 percent shareholding in the hydroelectric power company Krångede at a capital gain of 450 million kronor. The balance of inventory write-downs, currency exchange losses, and other items against capital gains and operating profit eventually resulted in a loss of almost 700 million kronor. This was the second reported annual loss for Sandvik in 115 years. Canny stock market analysts cheered, as the stage was now set for future profit improvement. The income statement included not only past costs but also some future ones yet to come.

After just over six months as president, Göran Ahlström had to make way for Seco Tools’ president, Per-Olof Eriksson. The new group of business area

managers was presented with a new president. Some reacted with surprise.

Percy Barnevik explains: “Of course it was unfair to Göran Ahlström, but I chose between keeping him and getting maybe eighty percent and bringing in Per-Olof Eriksson to get one hundred percent. As Seco president, Per-Olof Eriksson had the perfect training for the task.”

Per-Olof Eriksson and Percy Barnevik had come to know each other in the 1970s while being involved in projects of Sandvik’s subsidiaries. Eriksson was a technical physicist who had come from Uddeholm to Sandvik’s product area tube in the 1960s. Later, as a Sandvik man, he had been given the task of invigorating the new part-owned subsidiary, Seco Tools, whose other part-owner was Fagersta (later Kinnevik). At first, he met with distrust from the Fagersta people. But the informal Eriksson won them over with his strategy of being the number two company in the market in relation to their parent company Sandvik: “We try harder!” Now began a radical era of savings in Sandvik’s history with P-O Eriksson as the new president, who had also learnt at Seco Tools what small, independent units could achieve. He personified the new model with its decentralization of decision-making power and stubborn focus on costs.

More important than anything else was the fact that Sandvik Coromant vigorously dealt with its organization outside Sweden. The biggest realizable savings from closures were to be found in France, and cuts were also required in countries like West Germany and the UK.

But the most important problem was still the United States. Sandvik’s American competitors sold their cutting tools through distributors, which was out of step with the company’s sales methods in the rest of the world. During Barnevik’s mandate, Sandvik had adapted to the American environment, and his successor had dramatically increased costs without improving market shares.

Sandvik now began a counteroffensive under a new Swedish U.S. manager with substantial American experience. Two-thirds of the 300 distributors had their contracts ended, and within two years Sandvik had hired its own sales force to cover the biggest customers. The product range was rationalized and production plants in the U.S. were restructured. After just two years, the losses had been turned around, and Sandvik was moving towards leadership of the toughest market of all.

The revitalized Sandvik was now organized into several business areas (in addition to Sandvik Coromant):

Sandvik Rock Tools developed and manufactured rock drilling tools that were marketed by Atlas Copco. It had good profitability, which sometimes irritated the Atlas people. It had made its own marketing investments in tools





Roller bits from Sandvik Rock Tools.



Coated indexable inserts have significantly improved the productivity within the manufacturing industry.



Stainless steel materials and special alloys developed for the most demanding markets.

for coal mining, roller bits for open-pit mining, and raise-boring equipment. Among other things, this laid the foundation for the business area's separate development after the link with Atlas Copco was severed.

Sandvik Hard Materials was the third area outside the steel sector with other cemented-carbide products like wear parts and the carbide powder itself.

Sandvik Steel was the extension of the old Sandvik with some unresolved Swedish structural issues.

As early as in 1979, Sandvik had taken over the supply of hot-rolled strips to its arch-rival Munkfors in the Uddeholm Group. In 1984, the 'special steel structure' was in place, which mainly affected welded stainless steel tubing. Sandvik became a 25 percent shareholder in a newly created tubing company, Avesta Sandvik Tube AB, with operations in Fagersta, Nyby and Storfors. Sandvik gained the exclusive right to sell the strategically important product of welded tubes in the main markets. Sandvik also became a 50 percent shareholder in Fagersta Stainless AB, which mainly manufactured wire rod, the starting material for stainless steel wire, which was also a strategically important product. Above all, it was decided that the steel melting operations in Fagersta and Uddeholm would be shut down, which ultimately 'rescued' Sandvik's metallurgy department.

Sandvik Saws and Tools was a classic product line of tools for consumers and industrial consumption. It brought the company's brand to wider consumer markets. However, the failed acquisitions in the 1970s reduced the desire to expand and diversify.

Sandvik Process Systems, with its headquarters in West Germany, was a problem area after the belt technology had been supplemented with technology for various applications in the chemicals industry, food industry, and materials handling. The business area retreated to its old position one step earlier in the processing chain. Later, it would make a major venture into sorting systems for logistic companies, which became a new setback.

Sandvik also had Seco Tools, which competed directly with Sandvik Coromant. In the 1960s, Seco had changed its direction by investing in the new American inserts and also developing a very successful milling tool, the S25M. Seco was also able to respond to Sandvik's titanium carbide-coated inserts by referring to an old German patent.

Per-Olof Eriksson never incorporated what was previously Fagersta's jewel in the crown into the Group. Instead, he bought the rest of the shares in Seco Tools from Kinnevik in 1986-87. In the autumn of 1989, Seco Tools then entered a successful new phase as a listed, more independent competitor to Sandvik. Previously, the management had acquired a large part of the run-down Carboloy from General Electric. The British wear parts operations

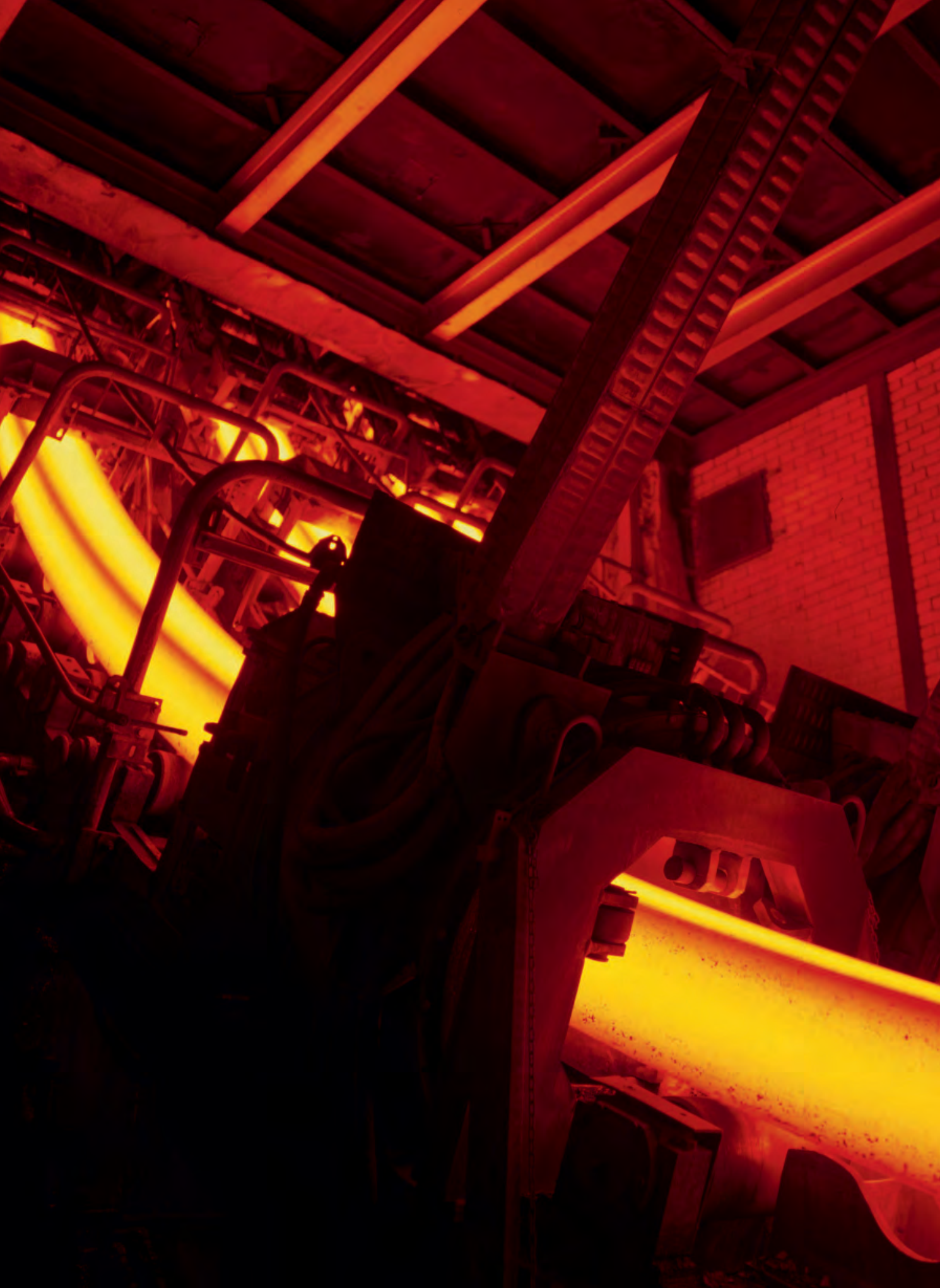
went to Sandvik. Seco Tools and Sandvik would go on to compete closely with each other on the stock exchange up until fall 2011, at which time Sandvik announced its offer to acquire the entire subsidiary.

Sandvik's shares first needed to be substantially revalued. The Stockholm stock exchange had languished after the 1920s crisis and the Kreuger crash. In the mid-1930s, the stock exchange had recovered to a level that would be maintained, in real terms, until the 1960s. Anyone who bought shares did so with a view to a dividend and in 1950 Sandvik's total dividend payout had risen to just over three million kronor a year. If we exclude the new capital and the effects of inflation, the Göransson family earned a real dividend growth of three or four percent a year. One can therefore say that the family became richer and richer but at the same time, the company, with its capital requirements, expanded out of their hands, a fate suffered by many owner families.

Until Skånska Cementgjuteriet's share purchase in 1983, the real dividend rate remained the same. Inflation had also increased all values much more, roughly in the same way as during World War I. The fact that the Sandvik share price rose more than 30-fold in value in 50 years after the Kreuger crash

The factory for the manufacturing of cemented-carbide powder in Coventry, England.





The steel melting plant and the hot rolling and forging mills went through a restructuring. Sandvik started with continuous casting in 1981.

therefore actually meant that it only rose roughly threefold in real monetary terms. This did not prevent the company's shareholders from counting themselves lucky that they were not clinging to bonds, like many other people. Besides the share price appreciation, they also had the dividend yield, of course.

This partly explains how, after decades of deep slumber, the stock market suddenly took off in the 1980s. There was still some inflation to compensate for, and the underlying real growth had not been rewarded adequately in terms of market values. Sandvik, which happened to experience its cost crisis just as the rally began, appeared particularly undervalued.

That was why Per-Olof Eriksson, considered by many to be the "most parsimonious president on the stock exchange," was also the most favored for a short period of time. When reports of higher profits came in the spring of 1985, the Sandvik price went through the roof, increasing by a factor of three in twelve months!

During Eriksson's first four years, sales did not increase if inflation is taken into account. Real costs, however, fell as loss centers were eliminated so that the profit margin returned to its former levels of the good old days. Book losses from the big cleanup in 1983 were also recovered in large part as book profits.

The new shareholders seemed once again to have done a brilliant deal.

CRISIS FOR ROCK TOOLS, BUT SUCCESS FOR COROMANT TOOLS

In August 1989, Sandvik terminated its partnership with Atlas Copco. The decision was made after the latter bought competitor Secoroc from Kinnevik. Things looked bad for Sandvik's rock drills. Atlas's competitor Tamrock immediately expressed an interest but was not an adequate replacement.

For Sandvik's president Per-Olof Eriksson, who had come to know the culture of Seco Tools and was thus also close to Secoroc, owned by Kinnevik, this disturbing situation was not new. The partnership with Atlas Copco was indeed 40 years old, but Sandvik Rock Tools had only one customer: Atlas Copco. All the deliveries went there. Contact with the market was too poor and pricing was not adapted enough to the different markets. This made the risk high.

A round of negotiations between Eriksson and Peter Wallenberg had recently resulted in a new agreement in 1987, giving Sandvik access to all Atlas companies in the world. This agreement had therefore not been long lived.

The people at Sandvik were of the opinion that Atlas Copco's success was based on Sandvik's technology, while mechanical engineers from Atlas Copco regarded drills as an accessory that could be bought in a market. The partnership had always involved such discussions, but top executives had defended the original arrangement even if they negotiated adjustments.

Eriksson had renegotiated the entire ownership of Seco Tools with minority owner Kinnevik. Were there opportunities to achieve something similar with Secoroc as with Seco Tools, with continued competition?

"I talked with Jan Stenbeck and believed we had reached an agreement several times. But it ended with Atlas Copco buying Secoroc to operate parallel to us as suppliers," Eriksson says.

Tamrock phoned Sandvik the evening of the same day that the contract was terminated. "Together, you and I are stronger than Atlas Copco and Secoroc," said the Tamrock management, demonstrating their Finnish 'sisu' (strength of will).

Not many people believed this, however, especially not when Atlas Copco went ahead and bought British rival Desoutter. As competition intensified and a price war began, few believed that Sandvik Rock Tools in its former guise and Tamrock would exact cruel revenge.

Drilling of a hydropower-plant tunnel in Svartisen, Norway, using Sandvik mineral tools.

Turning with Sandvik's high-powered cutting tools.



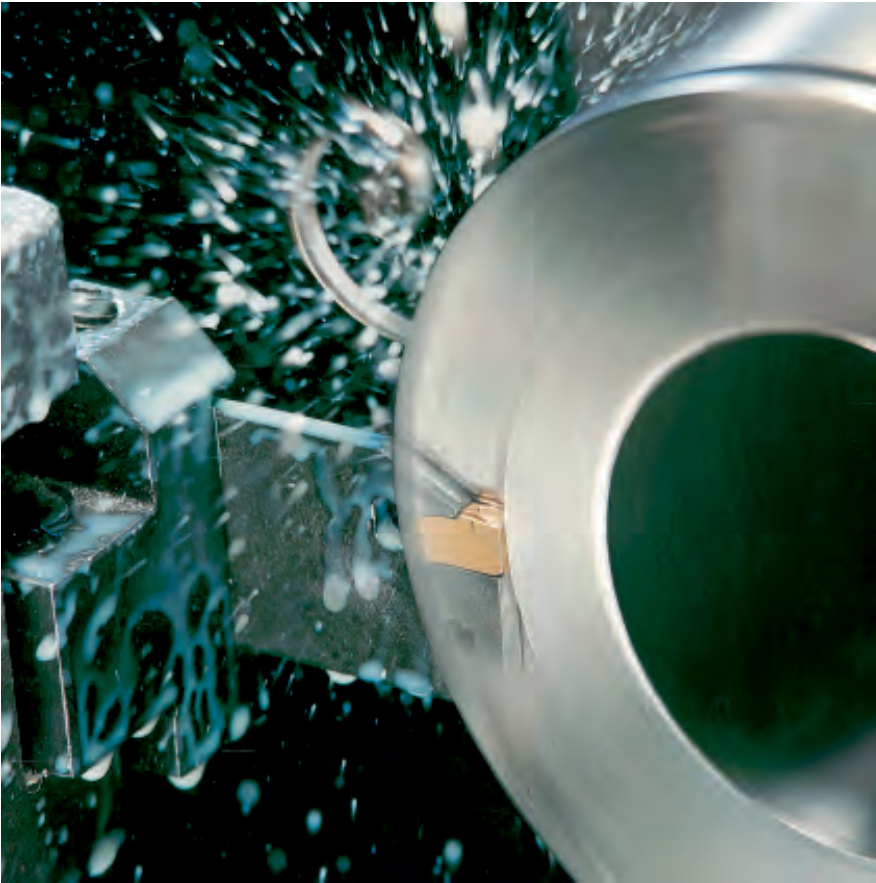
During the 1970s, Sandvik was first with indexable-insert tools for parting and grooving.

At Sandvik, the manufacture of hollow drill steel had begun at the beginning of the century. The technology remained primitive for a long time. Long, heavy drills that quickly became worn had to be transported up out of the mine to be reformed and retempered. In terms of weight, sometimes more drill steel than ore was transported in the mine.

It was Atlas and Sandvik who developed the ‘Swedish method’—portable rock drilling machines based on push leg feed and equipped with light-weight, efficient, and durable drills of steel and cemented carbide.

The reason why the Finnish conglomerate Tampella, of which Tamrock was a division, entered the drilling market was Finland’s difficulties arranging currency for imports. A protected domestic industry was established. Gradually Tampella also began making machines for the mining industry.

By around the mid-1960s, Tampella’s mining engineers had acquired enough experience for the company to compete in parts of the world market. In 1969, the name Tamrock and the orange color of the machines were given to the mining division as a kind of coming of age present. Yellow was other-



wise the customary color for construction equipment. The company was now in partnership with both the American company Jarvis Clark and the Swedish company Fagersta. The latter would soon put its rock drills in a separate company under the name Secoroc.

Technological developments in the industry, led by Sandvik and Atlas Copco, were coming thick and fast. Longer holes with a larger diameter required more sophisticated threads of the extension rods and larger drill bits. Pneumatic drilling machines became stronger, which put greater demands on the materials in the drills and the rods. The heavy hydraulic machines were equipped with new extension rods that were even more durable. The holes became deeper and deeper and the energy losses that occurred with each new extension rod forced the hammers to follow down into the drill holes.

This progress soon caused the use of chisel-shaped cemented-carbide inserts with an integral drill to become old-fashioned. As early as in the 1960s, inserts were replaced by round pins, known as ‘buttons,’ that were pressed into the hole with an almost precise fit and were supported from all directions during drilling. The need for regrinding fell by 75 percent.

For Sandvik, the trend towards ever-larger roller bits that consumed more and more carbide was interesting. This was why roller bits with diamond-coated cemented-carbide inserts were added to the product range via the purchase of the U.S.-based Strata Bit Corporation, which was hardly a successful acquisition. However, the new oil drilling technology at sea made extreme demands.

Development also branched out in other spectacular products. The mining and construction industries needed to drill shafts in the mines without using explosives. The response to this demand was the development of raise boring heads that were up to six meters wide and that could eat into rock vertically from below, operated by heavy machines. Sandvik soon led the way in this field.

In surface mining and construction, customers sometimes needed to drill through several different soil layers of varying hardness, some of them prone to collapse behind the drill bit. The Odex method was one way of solving these problems. First came an eccentric drill bit followed by a slightly smaller diameter tube, which was fed in gradually during drilling. Because the drill bit could be folded up when the work was finished, it could be pulled back out through the long tube and then re-used.

It was this expertise about rock drilling tools that, in 1989, dramatically lost its marketing channel. How much would Tamrock be able to help?

Tamrock’s parent company Tampella had certainly expanded to become one of the largest industrial conglomerates in the Nordic region in the late 1980s, but few analysts believed it had much future. Out of nearly 7,000



Odex equipment in use in construction in Hong Kong, China.



employees, only 800 were outside Finland. The company's operations were unprofitable, particularly the power equipment business.

The Tamrock division, with 2,000 employees, was in a better position. The company had seized more and more contracts from Atlas Copco, and had become strongly established during the 1980s, especially in the Soviet Union.

The Tamrock division was led into a more expansionary international phase mainly by the determination of the upstart among Finland's banks at that time. The management of SKOP Bank wanted to get involved in slightly bigger industrial companies, and Föreningsbanken was only too willing to get rid of its problem child. SKOP would now put some impetus behind Tampella. Tamrock therefore began buying foreign companies, at the same time as its partner Secoroc was taken over by the arch-rival Atlas Copco at the same time as Tamrock's dealings in the Soviet Union collapsed following the fall of the Berlin Wall.

In 1989, Tamrock management became interested in buying the Eimco Group within the U.S. conglomerate Baker Hughes. The Eimco Group was about the same size as Tamrock and focused on the mining of coal and other soft minerals. The French company Secoma was acquired in the following year. Tamrock was suddenly a multinational company. It made every possible beginner's mistake: the sellers were overpaid and too many of Tamrock's resources became tied up in the mergers.

It was with this company that Sandvik now started collaborating. In early 1991, the Tamrock division became an independent subsidiary, with Sandvik as an external owner of nearly 20 percent with the right to appoint the president. Sandvik's board had already exercised this right earlier in the partnership. At the Tamrock board meeting in December 1990, surprised company employees were introduced to their new president, the Dane Ole Jacobsen, who at the moment was responsible for Sandvik Rock Tools. Jacobsen, who agreed to move to Finland, had previously had a long career at Sandvik Coromant.

A situation that already looked bad when the Soviet trade collapsed became even worse when investments in the international mining industry fell by 40 percent. Finnish banks landed in a deep crisis, a few years ahead of the Swedish ones.

At Jacobsen's first management meeting with Tamrock Oy, the tone was hard. The new subsidiary Tamrock was predicting ten percent lower sales in 1991 and a significant loss. "How can we break even in this new situation?" asked the new president, and pushed for cuts in all countries in which the company was active. Factories were closed. Tamrock, which had had 4,500 employees at most, halved its workforce. But that did not completely stop the outflow of money.



Production of drill rigs in Tampere, Finland.

The test mine at the factory in Tampere, Finland.



Clas Åke Hedström, president and CEO 1994–2002, who managed the acquisition of several major companies, including Finnish Tamrock.

Improvements in the market were slow in coming, and the battle with Atlas Copco became tougher.

Luckily, the other part of the cemented-carbide business at Sandvik had performed well after the previous crisis. The various merger problems had been sorted out, the situation looked better in the U.S., and the new head of Coromant tools, Clas Åke Hedström, signaled in the autumn of 1984 that the crisis was over.

The then 45-year-old engineer made a cheerful impression. But sometimes his colleagues spoke of an iron fist in a silk glove. What Hedström decided he wanted, he pushed through. From 1980 he was the manager of the Cutting Tools product area, and later of the independent business area Sandvik Coromant.

Now that the recession was over, Hedström may not have believed in a return of the 1960s' growth rates, but there was still potential for cemented-carbide tools to replace tools made of high-speed steel. This belief was supported by the transition to more expensive machines and the greater utilization of them. Further, fewer and fewer analysts believed that the engineering industry was in the process of abandoning cutting in favor of powder-metallurgical methods or compression molding. With demands being made for smaller series, more frequent model changes, and finer tolerances, the material-saving molding tools were simply too expensive.

Hedström and his organization were at the heart of Sandvik's rapid return to business success in the 1980s. He ran a training program throughout the entire business area for all managers with subordinate personnel. In total, 750 people received their first coaching in leadership skills. He implemented a systems development program in order to radically reduce the time to give a quote to the customer of specialty tools. He even introduced a trainee program. Sandvik Coromant became the model for other business areas.

As mentioned earlier, the rate of innovation in cutting tools was high from the beginning. As mentioned previously, it began in 1958 with the T-Max tool system, the product that probably meant the most to Sandvik Coromant. This system gave cemented-carbide tools a four or five-year head start in the market. Indexable inserts had first revolutionized the technology, and it was remarkable how these seemingly insignificant small components could continually evolve with changes in shape and coating. Quality in particular was sensationally improved in 1969 with a thin layer of titanium carbide (Gamma Coating).

Cutting, however, is not just about high efficiency during the machining operation itself. When inflation increased wages in Sweden and elsewhere, it became increasingly clear how expensive the time was when the machines at

the customers were idle. How could the customer's handling of Coromant tools be streamlined?

In 1969, Sandvik launched a new system for clamping and positioning the inserts in milling cutters. Wedge clamping in T-Max milling cutters meant that the inserts could quickly be secured after having been reversed or replaced. There were several different improvement stages of this kind.

The T-Max Automatic was an insert-holder for copying and profiling operations. The T-Max could be fitted with a magazine containing ten inserts that could be automatically exchanged in the space of a second on the receipt of signals from the machine's control system. The insert-holder was no great success to begin with, but it was a pioneering system. Machine manufacturers responded with machines that could perform a variety of operations in the same setup. This meant not only that each machine was utilized better, but

Mounting of indexable inserts in a milling cutter, 1970s.





Since being introduced by Sandvik in the 1980s, modular tools have become a cornerstone within metalworking.

The Coromant Capto modular tool system contributes to higher productivity by diminishing downtime.

also that the total number could be reduced. Numerically controlled lathes for rotating workpieces and multiple-operation machines for stationary workpieces were two machine types that took over the engineering market.

One positive side effect of this was that the number of parts being simultaneously worked on decreased and there were fewer rejects. Costs fell on all fronts.

The machines were equipped with revolving discs that could transport a dozen different tools. The potential of each cutting tool could be exploited well by a machine that could change its operation mode in many different ways. Processing costs fell even more.

Yet there remained surprisingly much to improve. Despite all the changes, few machines were in operation much more than a third of their available time. Switching workpieces and tools still took longer than that.

A brand new tool system was therefore needed that would reduce the time required for tool changes in many different ways. The Block Tool System was launched, which had a number of different cutting tools but all with the same type of common coupling. This was Sandvik Coromant's next really big leap forward, comparable with the T-Max and Gamma Coating. Each cutting tool could be equipped with an ID chip so that the machine could easily locate the



most suitable tool for each operation. Within three years, Sandvik Coromant had sold 3,200 Block Tool units.

Sven Wirfelt, who was still with the company, had concluded that it was better to change the entire tool. The next development after the Block Tool was the Coromant Capto, which was launched in 1990. It was a conical polygonal coupling that would become the industry standard.

Cemented-carbide cutting tools themselves represented only a fraction of the costs in a large system at the customer's. As a result, it was soon possible to price the tools according to their performance, not according to the costs of material and labor used in producing them. However, this assumed that the customers—the world's engineering companies—understood the value of streamlining and constantly reducing their costs.

For Sandvik Coromant, it became important to market the products by giving customers comprehensive product information, training and service. The global Multi Service campaign of the 1970s gave Sandvik higher sales costs than its competitors, but it laid the foundation for the company's market leadership. Twenty-five different Coromant training centers had now been created around the world, with equipment and machinery for practical and theoretical instruction in cutting. Sandvik was leading the development in one of the engineering industry's most important processes at a time when products such as cars, airplanes, household appliances and other items were becoming cheaper, while also becoming more sophisticated and material efficient.

At the start of the 1990s, Sandvik's cemented-carbide tools and rock drills inhabited two different worlds. The tools business looked increasingly strong and the rock drill business was in really bad shape.

Fortunately, throughout its partnership with Atlas Copco, Sandvik had marketed its rock drilling tools under the Sandvik Coromant brand, and Sandvik employees had done much of the technical service. This meant that customers were aware of Sandvik, and the company's marketing people knew with whom to communicate directly.

However, Atlas Copco launched a new organization, Atlas Copco Rock Tools, to try to defend the sales it had previously enjoyed with 'Sandvik products.' This was done concurrently with the new marketing of Secoroc products, which meant that there were now three market players instead of two.

The result could only be a price war.



The unique combination of strength, stability, flexibility, and precision has contributed to making Coromant Capto the ISO-standard.

FROM RESTRUCTURING TO GLOBAL EXPANSION

In 1994, the 56-year-old *Per-Olof Eriksson* announced that he would resign as president and become a full-time member of the corporate boards of some renowned companies. He had accepted an offer from Volvo to join its new board. Sweden's largest company wanted to focus on its core business of cars and trucks and move away from food, pharmaceuticals and cross-ownership. This occurred after a palace revolution against Pehr G. Gyllenhammar, who had been forced to step down as chairman. Eriksson would be involved in creating Sweden's new world of corporate ownership, and this was underlined by the fact that he would soon also become the chairman of the investment company Custos, which belonged to the Volvo/Skanska ownership sphere. Something was also about to happen with the ownership of Sandvik.

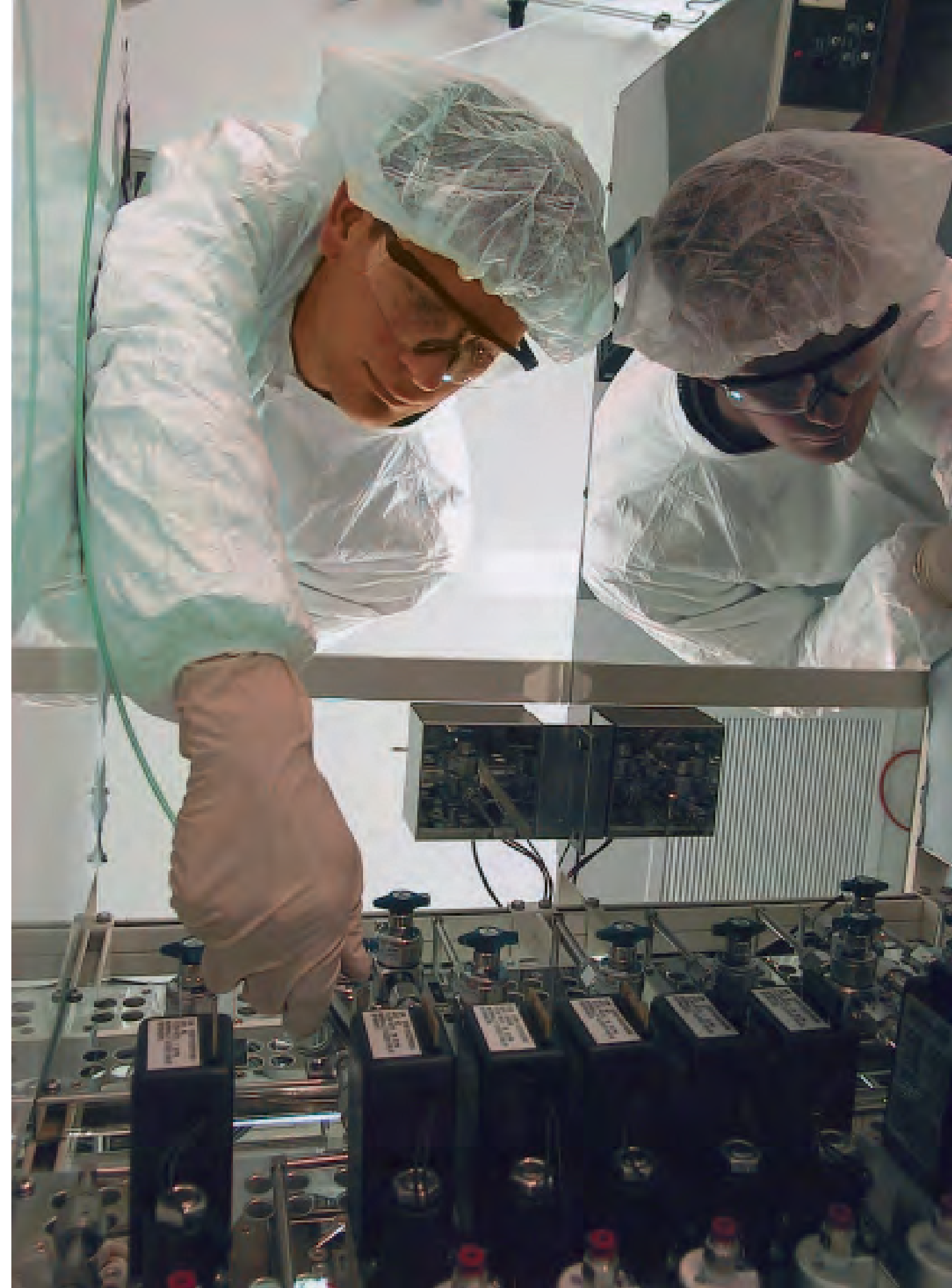
Eriksson's ten-year leadership had been marked by consolidation, decentralization, and thrift. The company's profitability had received a much-needed boost, and the balance sheet had been substantially replenished. Business ventures that had proven to be mistakes had been cleaned up or sold. This year Sandvik was headed for a record profit of four billion kronor. It was time to step down now that everything was going well.

However, the journey towards this good state of affairs had not been undramatic. Swedish industries had experienced another crisis of high costs during the second half of the 1980s, when wage increases slowly but surely eroded the impact of the 1982 devaluation, and the generous health insurance regulations meant that industrial companies had to keep extra employees to cope with 'Monday disease.' On top of everything, the combination of high inflation and special tax deduction rules had created a property bubble, which burst in 1990 and dragged the entire banking sector into a deep crisis.

As a result, in the following very difficult years, over 400,000 additional people became unemployed in Sweden during one of the century's worst recessions. The crisis was finally resolved by a dramatic devaluation of the krona when it was allowed to float freely in the autumn of 1992. This currency devaluation by more than 25 percent meant that Swedish export companies no longer had cost issues.

Sandvik's turnover fell for three consecutive years and staff numbers were reduced by a total of 4,700 employees, which would have been more if some of the unions hadn't agreed to shortened work weeks. The sharp devaluation of

Equipment used in the production of semi-conductors for the electronics industry is made in Sonora, California, U.S.



Production of cemented-carbide cutting tools in Langfang, China. The plant was opened in 1994 and has expanded in stages.

the krona was the main cause of Sandvik's new record profits and strong sales growth, by 26 percent in 1993 and 16 percent in 1994. Sandvik's loans in foreign currencies became more expensive to repay, but revenue from abroad was revalued upwards.

Sweden was still important for Sandvik in several ways. No less than 38 percent of Group sales were exports from Sweden and 35 percent of employees worked in the country. Most major international Swedish companies had greatly reduced their employee numbers in the country in a short time, but Sandvik had maintained about the same level and had expanded its organization outside Sweden.

In short, Sandvik had not moved away from its dependence on wage developments in Sweden and on the krona's fluctuating value.

Sweden was not the only country lacking economic equilibrium. In Japan, the long period of super growth had ended with a real estate bubble like Sweden's. The yen then remained stubbornly high, and drove the economy into deflation. In the Middle East, Iraq had begun a war with Kuwait, which led to a NATO operation to stem the invasion. This initiated an international recession.

Most surprising of all was that the Berlin Wall fell and then the entire Soviet empire. A huge, centrally planned economic structure fragmented. At

the same time, a new economic superpower was about to introduce itself: China with its billion-plus population.

Per-Olof Eriksson's time at the helm had resembled that undergone by Tord Magnuson 70 years earlier. In a time of constant storm, it is best to stay calm. Eriksson had resisted the temptation to buy companies in the late 1980s, when they were at their highest valuations of 20 times earnings. He had recently been looking for takeover candidates, but had still rejected all proposals to increase Sandvik's holdings in Finland's Tamrock, upon which the Soviet Union's fall had had a shocking effect.

Eriksson was perhaps best as a leader when crises were happening in quick succession. Now that the world once again seemed full of possibilities, a number of people within the organization welcomed his successor, Clas Åke Hedström, with joy.

Hedström describes the still ever-present chairman Percy Barnevik as "expansive without being careless." Employees were aware of his desire to seize on long-term challenges and persistently implement them.

Barnevik had ideas of merging Sandvik either with SKF or with Atlas Copco. But it was the high-speed steel tools that were moved from SKF to Sandvik. Hedström felt that the high-speed steel companies, which had mainly targeted small customers via distributors, could become dangerous

In Chomutov, Czech Republic, tubes for umbilicals for the oil and gas industry are produced. The plant also includes a research center for welding high-alloy stainless material.





Examples of the range of products for metal cutting, 2006.

Ultrasonic testing of tubes in Charost, France.

competitors when they started using cemented carbide. Sandvik's new chief executive had originally joined the company as a 26-year-old recent graduate of the KTH Royal Institute of Technology. At Sandvik, he would serve in various positions until 2009, in what was one of the company's longest and most successful careers ever, totaling 44 years. In fact, his relationship with Sandvik was even longer, as he had worked as a trainee in the company as a student.

Hedström met many of the personal requirements for being a good manager, mainly through good strategic and operational skills, a long-term approach, the ability to inspire employees, a constant presence, and an excellent understanding of technology. "I began my time as president by looking more in depth at our business deals and the structure of the entire company," he says, looking back. "Of course, I was already well acquainted with the cutting-tools operations."

The idea of creating fewer but stronger business deals was soon launched within the management team. It should be possible to grow twice as fast, especially in light of what happened in Asia. The Asian tigers were in a dynamic phase even while Japan was experiencing a crisis. China had taken off in a similar manner and in India a newly appointed government had introduced a more liberal policy.

"We needed a stronger focus on research and development than we had at that time within the Group as a whole, and constant change was the only way forward," Hedström says.

He launched the 3R (renew, revise and revitalize) program, which was developed to guide all aspects of the Sandvik organization's operations. Sandvik was going to need its saved venture capital.

Each of the business areas should have the strength to create shareholder value via good profitability and growth. To make this possible, each business area should be able to become the market leader in its segment, sell its products and services as a value package, and maintain a good balance between products for consumption and investment in its market.

The new management team quickly realized that there were too many business areas. For example, Sandvik Hard Materials should be part of Sandvik Tooling, given the many links between them. A more streamlined version of Sandvik Process Systems should be paired with Steel in view of the technology. Sorting Systems was a better fit within another company.

The Saws and Tools business area was not large enough in its market, just sixth in the world, and none of the major competitors were prepared to sell. It was therefore time to give up this product segment, the one best known to the public.

The big problem child was, however, Sandvik Rock Tools. Profitability was



In 1996, Sandvik became majority owner in the Indian company Choksi Tube, which manufactures extruded, pilgered, and finished seamless tubes.

so poor that management either had to sell it or create something entirely new. In order not to lose market share, Sandvik had been forced to compete on price. The available option to get out of a low margin situation was to do something more with Tamrock.

Hedström thus presented the matter to a partially new board, which welcomed the change in direction but remained cautious about the suggestions for Tamrock.

As mentioned earlier, a new approach to stock market risk had changed the world's financial industry. By combining shares into risk-balanced portfolios, in which the public could buy fund units that were more 'stable' in value, the banks and the new mutual funds paved the way for a savings revolution in the West that greatly increased the availability of venture capital for companies and business deals. This new emerging approach included the idea that companies should not 'accumulate their cash in the corporate coffers,' as Per-Olof Eriksson's Sandvik had done. 'Over-liquidity' would instead be returned to shareholders through either share repurchases or dividends. Companies that wanted resources could get it by going to their owners with expansion plans. Such was the new logic, about which hardened industrialists were often skeptical.

Consultants developed new models of shareholder value, in which calculations of share value were not based primarily on the company's equity and



earning capacity, but instead more on present value computations of the cash flow that future expansion might be expected to create. Microsoft Excel was a new user-friendly spreadsheet program adopted by every young financial analyst. New assumptions about future growth rates, margins, and interest rate levels could therefore dramatically change the 'justified' share price of a company overnight. A generation of MBAs graduated from the business schools with these new frames of reference and calculation tools.

This was something different from the rather slow adjustment to the company's equity levels and dividend capacity that had characterized Sandvik shares' nearly 130-year journey to date. The advantage of the new approach was a stronger future orientation; the disadvantage was increased risk taking.

Within the ranks of Sandvik's owners, one dramatic event was occurring after another. In 1994, Skanska still controlled 26 percent of the votes in the company, with Robur (which was part of the ownership sphere of the Swedish savings banks) as the second largest shareholder with about ten percent. The SHB sphere and the Swedish general pension funds (AP funds) were not far behind. But Skanska's ownership stronghold faltered after Volvo's management abandoned its cross-ownership between the companies.

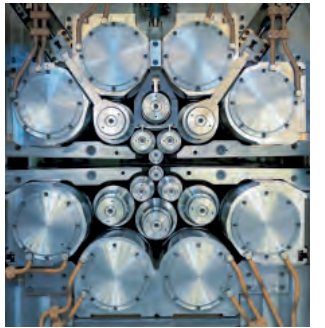
To protect Sandvik's interests, Barnevik had previously been forced to assume the chairmanship of Skanska. His idea was clearly to try to create a new ownership stronghold in Sweden with the new mutual funds as long-term owners. It was one of the most remarkable balancing acts in the circle of Sweden's corporate owners when Barnevik wielded the chairman's gavel of three companies: ABB, Sandvik, and Skanska.

He had envisaged a future with Custos and the mutual funds as stable owners of Sandvik and Skanska, but the new fund owners were not cut from the same cloth as the old-time families and investment companies. The former were always open to making quick deals that appealed to the general public. The Custos shares, along with their considerable voting power, therefore ended up almost immediately in Öresund, where two new financiers had gained more room to maneuver in the wake of the great financial crisis: Sven Hagströmer and Mats Qviberg.

The Custos route was thereby closed for Barnevik and Sandvik.

Who would now have ownership control of Sandvik? Skanska could not retain it. The Wallenberg sphere was asked, but had its hands full with its existing companies. Atlas Copco was considered to have the upper hand in the battle for market shares in the mining sector. Why mess things up by adding Sandvik when capital was scarce? That left Handelsbanken and the closely related investment company Industrivärden, which had never been very far from Sandvik's side.

"When I gave up hope about the mutual fund owners, there remained only



Cold rolling of precision strip steel for use in products such as razor blades, flapper valves and components within the electronics industry.

Low profile loader from Sandvik at a platinum mine in South Africa.

two long-term ownership strongholds in Sweden possible for Sandvik,” said Percy Barnevik.

“I talked to Bo Rydin of Industrivärden and with different people I knew within the Wallenberg sphere. But the only interest came from within Industrivärden. So you could say that despite my failure with Custos, Sandvik ended up in the right hands anyway.”

Led by a managing director coming from Sandvik, the Finnish company Tamrock had weathered the crisis by implementing major cuts. In 1995, Tamrock acquired from its domestic customer Outokumpu two manufacturing arms: Rammer, which made hydraulic hammers, and Roxon, which built mining conveyors. Throughout the year, Clas Åke Hedström, who was also on Tamrock’s board, discussed various future options with the owners in Finland.

The weakened krona did reduce the incentive to find cheaper production outside Sweden, which had been dramatically transformed from a high-cost country into almost a low-cost country. A second contributing factor was the

substantial streamlining efforts made during the crisis years at the beginning of the decade. Here, Sandvik led the way among Swedish companies with its program to increase capital efficiency.

Costs, though, were not the only reason for internationalizing Sandvik’s production. Some heavy products, such as stainless steel tubes, could not compensate for costly long transport distances, and other manufacturing segments needed to be near their customers. Further, the governments of some of the high-growth countries favored companies that set up factories. Furthermore, much of the product range also required service and application engineers to be locally available.

All this is why during the 1990s Sandvik’s organization outside Sweden expanded dramatically by 53 percent to almost 25,000 employees. In the previous decade, that number had shrunk by 16 percent after the expansive 1970s.

The corresponding rates of change in Sweden were a nine percent decrease during the 1990s and a decrease of 23 percent during the 1980s.

Accordingly, the impression left by the 1990s is that the globalization of the Sandvik organization resurged strongly after a number of years of almost being in the doldrums, while the decline of domestic production was slowed by a weak currency. Of course, the really big retreats occurred in batches during the recession years at the beginning of each decade.



MINING EQUIPMENT—A THIRD LEG

In February 1996, a dramatic chain of events began that would change the players in the mining equipment sector. The Norwegian engineering group Kvaerner bought the Finnish company Tampella's energy operations and gained the right to take over 26 percent of the rest of the company, which basically meant Tamrock.

Sandvik's president, Clas Åke Hedström, acted immediately and registered an interest in buying Kvaerner's Tampella shares to protect Sandvik. For various legal reasons, the parties could not negotiate until April, when Hedström presented Sandvik's bid at a meeting in Oslo. The CEO of Kvaerner asked for a respite of a few days to consider.

However, the very next day the Swedish mining company Svedala entered the game with a bid for all of Tampella's shares, offering to pay with Svedala shares. Kvaerner's CEO, who was clearly not interested in becoming a partner in Svedala, accepted Sandvik's cash offer after a few days.

The fact that Sandvik now owned 26 percent of the parent company and 20 percent of the subsidiary Tamrock did not stop Svedala's management, who believed that Svedala and Sandvik could jointly own Tamrock. In a move that further complicated the deal, after a few weeks the Finnish company Rauma decided it wanted to be involved too, and bought shares on the stock market adding up to 14 percent of the total.

A former broker at SE-Banken explains how he was ordered by Hedström to buy everything of Tampella he could get, up to just below 49 percent. This operation was successful, and the next step was to convert the shares of the subsidiary Tamrock into a three-year convertible loan in the parent company. This maneuver meant that at any time Sandvik could choose to own a total of 57 percent of Tampella's shares.

Svedala's British consultants said that the operations broke the law and that there was an obligation to bid for the entire company, but Swedish regulations differed from British ones.

Due to Sandvik's new ownership position, Hedström became chairman of the board of Tampella in the fall of 1996 and was able to gain an overview of the business. In the midst of these events he also agreed to Tamrock acquiring the Austrian company Voest-Alpine Bergtechnik, which was part of the large state-owned company Voest-Alpine.

Chile is an important mining market for Sandvik. The large Santiago plant assembles and services equipment for the mining and construction industry in the country.





Products under the Kanthal brand include metallic and ceramic resistance material and heating elements.

The idea of exerting total control over mining equipment—both drilling machinery and rock drills—had already arisen during the portfolio review of 1994. Sandvik had bought 20 percent of Tampella’s subsidiary Tamrock, an injection of cash that was greatly needed by the Finnish company. But was it reasonable to bet on a new market partnership that could sooner or later be recalled?

Shareholders demanded something other than a half-hearted venture together with a company that was weaker than Atlas Copco. Judging from their recent track record, neither Sandvik Rock Tools nor Tamrock was facing a bright future. Year after year, Tamrock’s earnings had been in the red by a few percent. Meanwhile, the margins of Sandvik Rock Tools had fallen from the 20 percent level during the Atlas era to a few percent as a result of the price war that had started.

The board, though, had made up its mind. The Group would stay away from mining equipment in particular and all machinery in general. Sandvik Rock Tools had to try to survive on its own merits. The old experience of forward integration, especially Conveyor’s purchase of food machinery in the 1970s, showed that there was a big step between Sandvik’s operations early in the value chain and the manufacturing and service of equipment done by the company’s customers. The machinery expertise of Sandvik’s engineers was certainly world class, but that did not mean they were the best at managing a machinery business.

Nonetheless, the dramatic events led the board to support a defensive plan for Tamrock and Sandvik Rock Tools. At the end of February 1997, Sandvik’s half-owned subsidiary Tampella changed its name to Tamrock Oy on the Helsinki Stock Exchange. In 1997, Sandvik raised its stake in the company from 49 to 93 percent through purchases on the stock market and through a takeover bid.

Another reason why the business press called Hedström “Sweden’s JR” was that he implemented a hostile takeover in 1997 of Kanthal in the Trustor Group.

Trustor was an investment company that had been founded by two industry leaders during the various changes of ownership in the 1980s of the Swedish steel industry. The owners had found it difficult to gain the stock market’s confidence. In addition, the companies they owned were developing in different ways. The best performer was the listed company Kanthal, which had maintained a strong position in the small niche sector of metallic resistance materials since the 1930s, and which now also manufactured high temperature ceramic materials. The worst performers were the suppliers to the automotive industry.

Since the start, Kanthal had focused on the international market, and had succeeded remarkably well in Southeast Asia. As mentioned earlier, Sandvik had a production partnership with this company. It was only after Trustor’s owners failed to take over the whole of Kanthal, and one of them subsequently died, that Sandvik presented a bid in early 1996. Management’s assessment was that Kanthal, which was undervalued in the market, would fit well into Sandvik’s structure.

Trustor’s remaining principal owner also happened to be the CEO of Kanthal. His clear ambition was to become the owner of the healthy company himself and to get rid of Trustor’s other loss-making operations. However, his financial freedom of action became more and more limited as the losses in Trustor’s automotive component companies grew. He made a failed attempt to personally bid for the entire investment company, with the plan that Sandvik would become an active minority shareholder of Kanthal.

In the spring of 1997 the protracted affair took a surprising turn. Trustor would now be sold to a titled British financier who had a mixed reputation. As part of the sale, the Swedish majority owner of Trustor would take over the investment company’s shares in Kanthal. Sandvik appeared to be blocked but sharply increased its bid, and Trustor’s majority owner, who had 29 percent of the capital and 49.9 percent of the vote, gave way under



Testing of industrial furnaces at the production plant in Hosur, outside of Bangalore, India.

At the plant in Hallstahammar, Sweden, electric resistance material and heating elements are manufactured.



pressure from the other owners. He sold his multiple voting shares of Trustor to the British lord and Trustor's corresponding power shares and warrants in Kanthal to Sandvik. He also won from the deal, as Sandvik's increased bid for the subsidiary Kanthal was also the price he received for his shares.

Sandvik completed the Kanthal deal by making an equivalent bid to its remaining owners, who had reason to be pleased at the increased share price. Work to integrate the new subsidiary began at once.

But what was the real interest of Trustor's new principal owner in his company? It soon became clear that the British lord was a front man for three young Swedish adventurers. With the help of their multiple voting shares, they could take control of Trustor's board and plunder the large cash holdings generated by the Sandvik affair. They only partially succeeded. Trustor's minority shareholders managed to recover some of the money that had been transferred to foreign bank accounts in a long series of transactions. The media described to fascinated readers how the three young Swedes scattered money from "the great stock market coup" around them in various luxury hotels and beach resorts. The legal proceedings against them attracted great attention and went on for a long time.

In 1997, Sandvik's new business operation CTT Tools also acquired Precision Twist Drill in the United States, with 1,600 employees, and a major restructuring program was initiated. This deal did not attract similar attention. The restructuring would never really succeed.

After a cautious start, Hedström and his management team had now spent five or six billion kronor on buying companies. The series of deals came to a head in November 1997, when Sandvik made an offer for all of Tamrock and began building up a new organization for mining equipment, Sandvik Mining and Construction, based in Sandviken.

In the autumn of 1998, a cost-cutting program began. Factories and other units in the United States, Brazil, Chile, and South Africa were closed and the number of employees was cut by about 1,000 within two years. In contrast, the factory in Tampere in Finland was extended and streamlined.

Right from the start, machines, equipment, and tools for the mining and construction industry constituted the Group's third-largest business area. The business area was responsible for 22 percent of Sandvik's total invoicing, and had sales of more than nine billion kronor compared with six and a half billion for its rival in the mining and construction sector, Atlas Copco.

Sandvik Mining and Construction was smaller than Sandvik's two largest business areas, Sandvik Tooling and Sandvik Specialty Steels, but was signifi-

cantly larger than the other four. Sandvik had thus gained its highly sought-after third leg in addition to cemented-carbide tools and specialty steels.

In terms of its earnings, though, Sandvik Mining and Construction at first appeared to be the least successful of all the business operations. Reduced demand combined with restructuring costs reduced earnings to almost zero. However, things would pick up greatly in subsequent years.

From the beginning, Sandvik Mining and Construction was a major market player in competition with other suppliers such as Atlas Copco. The business area's various subsidiaries possessed a thorough collective knowledge of the processes of mining and construction companies. Sandvik would therefore be able to offer its customers added value in the same way as it could for cemented-carbide tools or for specialty products in stainless steel.

The big challenge was to be found in the after-sales market. Equipment and machinery were merely components in the huge service and maintenance-intensive operations of underground mines, quarries, bulk materials processing sites, and large infrastructure projects. Unplanned stoppages in this type of capital-intensive processes could lead to big financial losses. Sandvik therefore wanted to see itself as an improver of the efficiency of its customers, not only by supplying better mechanical engineering but also by

Sandvik's expanded presence in China translates into opportunities for continued growth in Chinese mining and construction markets.





marketing regular servicing and maintenance. It was necessary to create and demonstrate a value that had previously not been sufficiently visible.

The long-term business potential for the sale of tools, service, and spare parts contracts was often significantly greater than for the actual machinery investment. It was reasonable that customers paid according to performance, perhaps per drilled meter or per number of tons produced. These payment models resembled those in other parts of the Group.

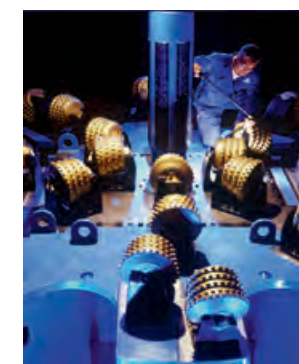
A new organizational structure for Sandvik Mining and Construction was introduced in 1999. The business sectors were split up along four different product lines. The original Sandvik Rock Tools and Tamrock were combined to form Sandvik Tamrock, which manufactured rigs for surface and underground drilling as well as all the rock tools for them. The program also included loaders and trucks for underground mines and hydraulic hammers for materials processing and demolition. This business sector—which operated factories in Finland, Sweden, France, Canada, Brazil and India—targeted the world’s metal mines and their contractors, as well as the construction industry. Just as during the previous collaboration with Atlas Copco, Sandvik was on site when mine shafts had to be blasted, power dams and roads built, and materials crushed.

A service organization of 1,000 engineers was created for this business sector, with two new regional spare parts units: in France and Canada. Sandvik Tamrock focused on repair and maintenance and long-term contracts for spare parts, tools, and service.

At this time, the business sector’s newly developed products included the Tamrock Pantera above-ground rig and the Sandvik Sixty tools system, which together made it more efficient to drill straighter holes. The new Toro 2500 underground loader became the world’s largest.

Voest-Alpine Bergtechnik constituted its own business sector, because Sandvik did not have the corresponding experience of processing coal and other soft minerals. The acquired company had specialized in areas that were logical choices given its background in Zeltweg in Austria, close to both Germany and the Alps. The underground mining of coal and other soft minerals for the region’s energy companies and chemical industries was big business. The alpine construction industry had been doing tunnel mining and rock excavation since the 1800s. The company had traditionally manufactured various cemented-carbide tools for its machines. As well as having factories in Austria, the company had plants in France, the United States, South Africa and Australia.

Driltech Mission formed the third sector, producing drilling rigs and rock tools for rotary and DTH (down-the-hole) drilling. These were surface drilling products for open-pit mines, large-scale excavation sites, exploration



Sandvik’s underground loader Toro 2500 was the world’s largest of its kind.

Köping, Sweden, is a main site for cutter production.

In Schöppenstedt, Germany, rollers are manufactured for material-handling plants within the mining industry.

A Sandvik employee discusses tools solutions with a customer in Malaysia.



Surface drill from Alachua, Florida, U.S.



In Zeltweg, Austria, road-headers for excavation of soft rock are manufactured.



Demolition and recycling equipment is produced in Lahti, Finland.

drilling, and water-well drilling. The products were developed and manufactured in facilities in the United States, Mexico, and India.

Finally, Roxon was an engineering company and components manufacturer offering equipment for conveyors and systems for handling bulk materials. Roxon, which manufactured its products in Finland, Sweden, Germany and Australia, had customers throughout the materials handling chain, not only among the miners. The company required an extensive system of workshops close to customers in many different markets.

Right from the start, Sandvik Mining and Construction had a broader offering than its competitors. None of the customer areas was completely unfamiliar to the Sandvik organization. The new challenge was to manufacture, market and maintain the machines. Few organizations in the world had better knowledge of machines than Sandvik, as its business idea had long been to understand and improve the processes of its customers. The world's various machinery manufacturers purchased knowledge from Sandvik for all their value-added stages, from materials and components to functions. Ever since the 19th century, Sandvik's engineers had been designing or improving the company's own machines and factories.

From there, though, it was still a large step to marketing in-house produced machines to an external market. The situation for mining and construction equipment changed when Atlas Copco integrated the drill manufacturer Secoroc. Collaboration between the manufacturers of machines and drills became necessary for survival. Another development was the restructuring that was occurring among customers. The ever-increasing size of the mining and construction corporations forced suppliers to have broader product ranges and more geographically dispersed organizations.

This development of Sandvik Mining and Construction transformed Sandvik into a more global business than it had been before. In particular, the Group had a growing presence in the mining countries of the southern hemisphere such as Chile, Peru, South Africa, and Australia. A subsidiary, Tamrock Luoyang Machinery, was established in China, with the Chinese Ministry of Railways as a minority shareholder. With its demand for mining products, China was central to the business area's success from an early date.

In Australia, Sandvik had a long tradition, and all of its business operations were represented there. Trade contacts with Australia dated back to the 1920s. However, with the formation of Sandvik Mining and Construction, a new era for Sandvik began in the country, and the majority of sales there are to the mining and construction sectors. Australia not only became one of Sandvik's key markets to the mining industry, but also one of the Group's strongest overall markets, with several thousand employees.

In addition to Australia, South Africa also quickly became one of Sandvik's

key markets, with employee numbers reaching 2,000. Sandvik had been present there for many years, hibernating for the duration of the trade embargo. Africa as a whole emerged as one of the world's most promising mining areas, as the number of military conflicts there steadily declined.

Within the largest business sector, Sandvik Tamrock, factories were rationalized and marketing organizations combined. The new product series, Axera, with drill rigs for drifting and tunneling, solved problems for mines and tunnels that were short of space to house bulky equipment. AutoMine was a new automated loading system that was first installed in the Pipa Norte mine at El Teniente, Chile, in 2004.

This development model was no different from the rest of Sandvik's, where the pattern was that 40 percent of sales came from products launched in the past five years. Sandvik Mining and Construction took the lead when it came to new techniques for rock excavation, new cemented-carbide tipped tools, and machines for them.

Major investments were made in the aftermarket segment, so that service offerings better met the demands for availability, better utilization, and improved performance. The goal was to increase the sale of services, tools, and spare parts from 40 to 50 percent.

Production of rock-drilling tools at the plant in Perth, Australia.



The factory in Svedala, Sweden, makes equipment for mobile and stationary crushing plants.

The new millennium began with two expansive years, and the operating margin rose to 11 percent. Mining and infrastructure projects were crucial drivers of the growth that accelerated after the Asian crisis. Demand began to increase for gold, silver, copper, zinc, nickel, uranium, iron, coal, and other commodities. As prices rose, so, too, did interest in searching for new ore deposits. Sandvik's new business area later also became involved in the field of mineral exploration, with several acquisitions in Sweden, Chile, and Australia.

In Finland, Rauma, which had participated in the Tampella deal and thereby stopped Svedala, had begun manufacturing crushers in cooperation with Sandvik Tamrock. However, Rauma, which had changed its name to Metso, wanted to buy all of Svedala.

Instead, European Commission requirements gave Sandvik the chance to acquire most of Svedala's crushing operations. The companies then went their separate ways, which was another stipulation by the Commission.



Having many different brands may seem to be a natural consequence when a large company is created through mergers and acquisitions. The acquisition process must not disrupt contact with the customers. Established brands create a sense of security.

Customers of Sandvik Mining and Construction, however, soon found the diversity of brands and purchase channels to be confusing, and not all brands in the product range were equally well known. Surveys showed that the Sandvik brand was the only one of them that could compete with the Group's main competitors.

That is why the business area soon discontinued both the name Tamrock and all the brands Tamrock had acquired. Since then, the business area has offered its entire product range to customers under a single brand: Sandvik.

What distinguished the new third business area of Sandvik Mining and Construction from the rest of the Group were the machines. From its position as the world's leading manufacturer of rock drills and drill bits, the company entered into the manufacturing of machinery and vehicles. This was a break with tradition but not with expertise. From its Tooling business area, Sandvik had great familiarity with mechanical engineering, and its own machine equipment was often developed or refined in house.

Anywhere large open pits needed to be excavated, mine sites drilled, or roads and large hydroelectric projects built, there, too, would be Sandvik machines, Sandvik tools, and service technicians wearing overalls emblazoned with the Sandvik logo.

Demand from the new industrial nations grew so strong that this business area was well on its way to becoming the Group's largest in terms of sales.



Diamond tools for mineral exploration are among the products made in Nora, Sweden.

BETWEEN DEEP FINANCIAL CRISES

There was no mistaking President Hedström's pride as he presented Sandvik's focus on e-business at the beginning of the new millennium. *Business Week* wrote: "B2B, the best bet yet!" The business world was thronged with start-up B2B portals, where companies could begin trading car parts, electricity, paper, or chemical products.

Unlike the brand-new companies with fancy names, Sandvik had a robust tradition when it came to computers and what they could be used for.

At Sandvik, the Internet and e-business were the answer to an old dream of being able to reach anyone, anywhere, any time with an unlimited amount of information. As early as in the 1980s, there appeared small, inexpensive PCs that could be connected to in-home systems via a standard telephone modem or computer network. In the 1990s, these computers became portable, and account managers or field salesmen could take them along on their travels.

Around 1990, document file types were developed that could be read on any computer using the programming language HTML. Documents could be moved across a wide range of computers, compressed, rewritten, and sent. The files could be combined to create websites that other computers could search for using software called browsers. The Internet was born. After a decade of rapid development, there was already talk of 3G, mobile communications with a high data transfer rate. The situation was reminiscent of the breakthrough of electricity a century earlier.

For Sandvik, the Internet would become a channel for repeat business with both new and old customers, primarily small businesses and small orders. A smooth channel for online sales could save resources for both the company and the customer. Supplying each customer with specific information would tie them more closely to the company. Among Sandvik's tens of thousands of standard products, often only a few were relevant to each individual customer.

In the spring of 2001, the first projects were launched in Denmark and Sweden. In Denmark, Sandvik Coromant had already tried e-commerce for three years. Three months later, 18 countries would have online stores featuring Sandvik products. Sandvik had also joined Endorsia.com, which had been launched by the SKF Group in 1999 and was an independent online distributor of industrial products.

Even more exciting was Tailor Made, a computer system that had been

Sandvik was a pioneer within e-commerce for industry. Sandvik Coromant has had a well functioning distribution via that channel for more than a decade.



Tailor Made is a winning concept within Sandvik Coromant, allowing for quick delivery of specially adapted products to customers.

developed by Sandvik's engineers and that allowed customers to input and specify their requirements for boring tools and milling cutters. The system quickly produced a blueprint for customer approval before forwarding the order to the Sandvik Coromant factory with the most appropriate geographic location. Delivery time was reduced by 75 percent.

In the future, customers would also be able to go in and search among all the hundreds of thousands of Sandvik's certificates instead of keeping them in their own archives.

What happened next? Endorsia is still in business and e-commerce is a big part of Sandvik's sales. But personal contact continues to be the foundation of the Group's sales operations.

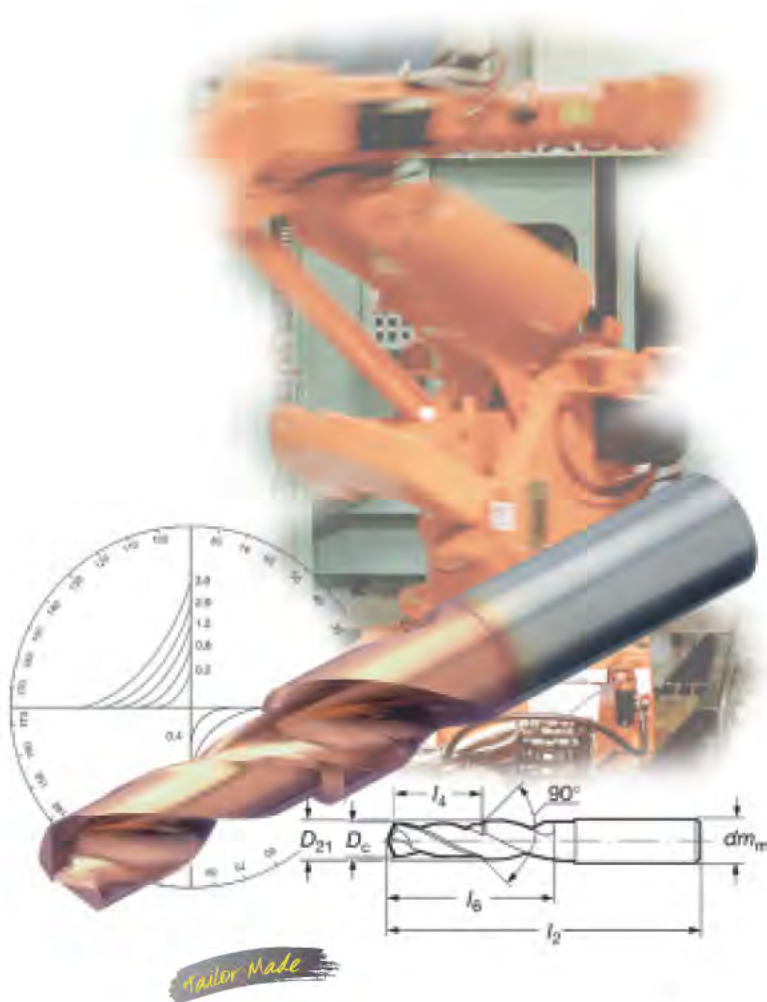
The new Web technology has changed the cutting tools market. In principle, after four or five years of fine tuning, three types of players are competing in the online sales market. There are Sandvik and its competitors, who are trying to create as close and valuable relationships with their customers as

possible by letting them access their systems. There are also the big independent online distributors, who offer a very broad product range and some services. Finally, there are cheaper channels for customers who can manage without help.

The new information society also affected other areas in addition to marketing and sales. Multinational companies like Sandvik increasingly found themselves in an international media society, in which various players were advancing their different and sometimes incompatible strategies.

In the business world, the contradiction between the short-term profit motive and a long-term plan for viable development is an old one. Sandvik's founding family dreamed of overcoming these contradictions by creating a model society supported by a profitable company. In the new global media society, the contradictions and the efforts to deal with them developed in a different way.

Research and development of new tool materials, new products, and better production equipment are major areas for Sandvik, seen here, for example, at the competence center in Västberga, Stockholm.



From the beginning, the most noticeable factor was the change in the financial world. In the United States and Britain, the major institutional owners—the savings funds and pension funds—had entered the game as early as the 1980s. Global investment banks like Goldman Sachs and Morgan Stanley acted as the extended arm of investment funds in major deals and in the ongoing valuation of companies' worth. A rapidly growing corps of financial analysts used the new computer technology to instantly calculate the 'justified share price' upon each release of new information.

The focus shifted from companies' various operations to such factors as comparability of accounting, risk analysis and informed short-term forecasts. Externally, companies would provide an 'easily analyzed' and reliable picture of their business. With small savers frequently moving in and out of the market, the large institutional investors of necessity had to favor companies that offered the opportunity for regular trading without share prices fluctuating wildly. It could be argued that a few thousand large, international, listed companies achieved a privileged position because they had the amount of shares in trade required for large daily transactions.

In the world of shareholder value, the basis of a favorable stock market valuation was a steady and growing cash flow. For company managements who wanted to preserve their share price it was vital to constantly present such an external image. Negative anomalies could have major consequences if they could not be shown to be temporary.

However, forces from other parts of the new information society were also affecting the big corporations. International non-governmental organizations (NGOs) had long existed, and the Internet now gave them new opportunities to exert an influence.

What had previously been called the 'stakeholder model' (and referred to a company's role in relation to its customers, employees, shareholders, and society) returned in a new guise entitled Corporate Social Responsibility (CSR). In the new information environment, companies that behaved unethically could easily be revealed and exposed. Companies that were not characterized by diversity would become rigid and uncreative. Both the brands of a company and its ability to attract employees could be damaged, and thereby also affect cash flow growth.

The traditional Anglo-Saxon approach to dealing with many different demands involved crossing them off a checklist one by one. The advantage was greater clarity about what was what, and the disadvantage was an increased adherence to outward form at the expense of content.

With its informal ownership system, Sweden became one of the countries that most rapidly adapted to this new situation. This was probably because the ruling Social Democratic party was considered to have consistently opposed

the family business model and private ownership since World War II. When the economy and corporate ownership systems were then rapidly liberalized during the financial crisis of the 1990s, the resulting ownership vacuum enabled both Swedish and foreign fund holders to make considerable advances.

In fact, as early as the mid-1990s, there was greater institutional ownership of industry in Sweden than in the United States and Britain. In addition, the new information technology connected the Stockholm Stock Exchange (now part of Nasdaq OMX) to the high-frequency international electronic trading systems, which had been partly instigated by Swedish systems developers.

For a Swedish company that had grown from a national and informal information culture into a global and more formal one, it was natural to become involved with these new models. Sandvik was an interesting example of this rapid adaptation. This is reflected not least in its annual reports, whose focus shifted from detailed descriptions of the business areas' activities to two types of documents: one that would make it easier for independent analysts to provide forecasts of cash flow, and the other to ensure that Sandvik followed the various codices that had been prepared by the international NGO sphere, and subsequently by politicians and the business sector in consultation with various stakeholders.

Another driving force was the need to act more clearly in relation to all the new employees within the Group. As described earlier, this involved writing down and putting into print an informal corporate culture, so that new

Production of cemented-carbide inserts in São Paulo, Brazil.





Various ways are pursued to increase the number of female employees. In recent years, the Group has intensified its efforts towards diversity and gender equality.

The company's investment in sustainable development is evident in various projects. The subsidiary Sandvik Asia in Pune, India, has transformed a previous industrial dump site into a verdant Eco Park.

employees and managers from many different countries could receive training, guidance, and support in Sandvik's values.

1997 can be regarded as the beginning of Sandvik's gradual adaptation, as that year's annual report contains a chapter on 'Sandvik's human capital.' Sandvik gained executives from 23 different nations, and most of the organization was quite young. Even in the oldest business operation, namely in Sweden, 30 percent of employees were under 35.

In a recruitment ad aimed at women students that year, Sandvik had used a picture of a young woman on a motorcycle with the tagline "Cubique technique" but had not stated any gender equality ambitions at that time. With its strong technical orientation, the Group had more than four male employees for every female one. Six years later, in 2003, the first woman joined the Board and the Group also acquired its first female head of a group staff unit.

In 2006, increased equality of opportunity at work was established as one of the Group's social objectives, together with zero accidents and reduced absence due to illness. By then, women held about 30 percent of the staff positions and 12 percent of the management positions. The lowest proportion was among the worker positions at 11 percent, which explains why the overall proportion of women has decreased slightly as the Group has expanded.

Like other Swedish industrial companies, Sandvik still has a long way to go to achieve gender equality. One main reason is that fewer women choose to

study technical subjects, so the possible recruitment base still contains relatively few women. Management believes that diversity issues, which include gender equality, are strategically important for the company in the future. Various activities are underway to improve the balance between men and women in leadership positions and also to increase the number of female executives worldwide. Sandvik's focus on diversity in its various aspects has been strengthened in recent years.

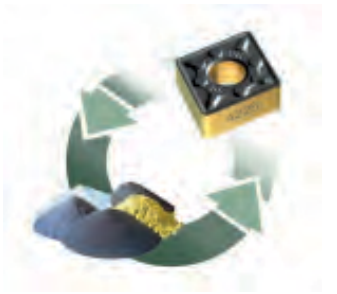
The new strategy presented in the autumn of 2011 would finally focus more on diversity with specific regard to the issue of having many nationalities on staff. The strategy asserts that "diversity serves as a bridge between Sandvik and the marketplace, and therefore the composition of Sandvik's employee base must better reflect the marketplace."

The 1998 annual report contains a chapter on Sandvik and the environment. Among other things, the chapter gives an account of the environmental training program within Sandvik and the introduction of the international environmental management system ISO 14001. Subsequent years saw the development of an international standard for sustainability reporting, and by 2006 Sandvik had conformed to the third generation of this Global Reporting Initiative. From then onwards, this sustainability report has presented the Group's ambitions and evaluations with regard to its economic, environmental and social responsibility. In recent years, increasing emphasis has been placed on providing an account of corporate strategies and objectives with regard to the environment, health, and safety.

Financial risk management, which in the meantime had also gained a new chapter in the annual report, can certainly also be linked to sustainability criteria, but even more to the financial markets' opportunities to assess deviations between reporting events. Like other major listed international corporations, Sandvik was already following a very strict schedule that involved presenting each quarterly report at an exact stroke of the clock to a global corps of analysts.

The reaction from the investment banks, investment funds, and news agencies was almost instantaneous. Within a few hours, the share price was adjusted to suit the new information and the analysts hurried on to the next company. Interest in what was written in the newspapers the next day was marginal. Like other large corporations, Sandvik has since tried to add nuance and depth to this real-time reporting by organizing analyst conferences with management.

The politicians soon wanted to take the initiative to bring order into all these different requirements. The large corporations joined forces against the threat of getting a code 'carved in stone.'



The Group increasingly recycles used cemented-carbide material, thus reducing the negative effects on the environment and the use of natural resources, while simultaneously increasing Sandvik's access to raw materials.





Symbols for Sandvik's core values: Open Mind, Fair Play, and Team Spirit.

Accordingly, since 2005 a 'corporate governance report' has featured prominently in all Swedish annual reports for listed companies. Point by point, such a report describes how the company is handling the Swedish Code of Corporate Governance that had been developed by a special Commission on Business Confidence together with business organizations. The code is voluntary in that each company can choose to deviate from the recommendations if it has a good explanation, in other words, 'comply or explain.'

In the already well-organized Sandvik, the guidelines had been compiled in 2002 in the document *The Power of Sandvik*. A comprehensive program of internal training in fair play and the Group's core values was launched in 2004 and is still continuing. The contents of *The Power of Sandvik* that are communicated to the employees comprise:

- * The Group's business concept, vision, mission, strategies, and values
- * Organizational structure and job descriptions
- * Sandvik's Code of Conduct, which includes business ethics, human rights issues, equal opportunity, work environment, external environment, and community involvement
- * Administrative processes, operational guidelines and instructions (authority, approval rights, financial reporting, risk management, personnel policy, work environment, etc.).

"The triple bottom line (people, planet and profit)" refers to a more sustainable business world in which suppliers are subjected to audit and a company is audited not only in terms of its shareholders' desired return on their investment but also with regard to other stakeholders' demands for more sustainable development. The concept is somewhat reminiscent of the lectures given in the 1950s by old Karl Fredrik Göransson on the balance between various stakeholders in the company. The ethical issues of conducting business are eternal, but the way of addressing them is changing and evolving.

Thus began a new global oversight and vigilance, not only for Sandvik but also for all the world's listed companies. Faster information in the hands of more and more people led to adaptation in terms of both formal regulations and transparency.

There were, however, also other consequences. The problem with this kind of technological leap is that it also creates excessive optimism and convulsions.

The huge IT and telecom bubble in the American, technology-heavy Nasdaq exchange shook the global economy in a way that would have implications far beyond the new high-tech companies. It began with the total market capitalization on the Nasdaq rising by nearly 300 percent from the spring of 1997

to the spring of 2000. The inflated balloon then deflated such that its value two and a half years later had fallen to just below the starting position, a 75 percent shrinkage. On the global market as a whole, share value worth 70 trillion (!) kronor evaporated. Virtually all IT and telecom companies in the world lost between 90 and 99 percent of their inflated value. Anyone who invested at the top lost everything.

Against this background, it was gratifying that the U.S. financial system and world trade did not collapse. One reason for this was that the losses were instantly spread throughout the world's hundreds of millions of fund investors. The banks had largely gone from carrying credit risks themselves to acting as intermediaries for risk capital.

The Internet and 3G were not bubbles in and of themselves. The stock market made the mistake of overestimating the profits from the new technology and underestimating the competition that always makes consumers the real winners when new technology is introduced.

Financial crises appear to have become increasingly common, or perhaps the situation is one of a financial dislocation that has never been corrected. Four years earlier, in 1997, a chaotic pattern had begun in Thailand when the outflow of capital had forced the government to unpeg its currency. The crisis

The financial market has played an ever-increasing role in the work of the Group management. Former president Lars Pettersson (in the middle) at the Group's Capital Markets Day, 2009.



Lars Pettersson, second from right, together with Jörgen Wiman, center, were the first recipients of the Wilhelm Haglund Medal, in 1985. The prize winners are flanked by, from left, board chairman Percy Barnevik, president Per Olof Eriksson, and founder of the prize, previous president Wilhelm Haglund.

spread throughout Southeast Asia but hit Indonesia and South Korea hardest after Thailand. Interest rates were raised to defend purchasing power and currencies, but this triggered a chain of stock market collapses and real estate crashes. Subsequent currency revaluations led to bankruptcies. Economists are still debating what really made investors flee the Asian economies at this time. The crisis also affected Russia.

The large valuation bubble around the turn of the millennium had world-wide repercussions, but the banks and the financial system got off lightly. Shareholders and fund investors swallowed the losses. But in the States, politicians had already eased the way for the Wall Street banks to increase their lending, and the chairman (Alan Greenspan) of the Federal Reserve System (the U.S. central banking system) believed that low interest rates, by enabling even low-income Americans to buy their own house, would foster society's well-being and individual hard work.

The groundwork was laid for new problems.

Clas Åke Hedström left his post as the president of Sandvik in 2002 to become the chairman of the board. He was judged to have the personal qualities required to continue working with Lars Pettersson as president. Pettersson had previously been his successor at Sandvik Tooling.

Hedström's last earnings report was nothing to be ashamed of, even though

Sandvik's earnings had merely maintained the status quo for four years, most recently due to the weak U.S. market. The problems had spread to Europe, but the order intake was now improving. One particular dilemma was the American high speed steel subsidiary Precision Twist Drill, whose surplus value on the balance sheet had to be reduced by 700 million kronor.

To a standing ovation, in 2002 the AGM appointed retiring chairman Percy Barnevik as honorary chairman of Sandvik, the first in the company's long history. This occurred at the same time as he was forced to leave ABB during a profitability crisis and ownership battles. As mentioned earlier, he had made a unique contribution to Sandvik, first as a young enthusiastic MBA and then as representative of the owners and of the Swedish way of governance during a long and successful transition period.

The new president, Lars Pettersson, had a Master of Science in Engineering and was one of the first Haglund medalists in Sandvik in 1985—in other words, he was a true technology innovator. During his first six years in office, Sandvik was one of the favorite stocks on the Stockholm Stock Exchange. Then suddenly, one day in 2008, not even gold mining companies had the liquidity to pay for their purchases from Sandvik. For a few weeks, the entire global industrial sector suffered the most powerful deceleration effect ever to have occurred in peacetime.



The Wilhelm Haglund medal, in 18-karat gold, is given in recognition to the Product Developer of the Year within the Sandvik Group.



BUSINESS AREAS IN TRANSITION

During the new decade Sandvik entered into a dynamic period with success in many different product areas and markets. That era would be interrupted by the global financial crisis that began in the autumn of 2008. The difficulties in making a rapid comeback led to a new organization and new requirements. At this time, when the new industrialized nations represented an ever-increasing proportion of global growth, and a new crisis was building up in the world's financial system, the situation at Sandvik Mining and Construction, Sandvik Tooling, and Sandvik Materials Technology was as follows.

Of Sandvik's three business areas, the newly developed Sandvik Mining and Construction is the one that has most influenced the Group since the turn of the millennium, in terms of both business deals and globalization. No other business operation has expanded so rapidly. In terms of sales, Sandvik Tooling was overtaken in 2007, a year when the sales of the new business area increased organically by 25 percent.

Nor did any other operation have such a large service content. The fact that the aftermarket service on machines and equipment reached 50 percent of sales gave Mining and Construction an operational stability that was difficult to achieve by its fellow business areas, which were supplying materials, components, and tools. This fact did not prevent the entire Group from starting to focus even more on service.

Even more revolutionary was the shift to the south and east that resulted from the investment in the mining sector. A full eighty percent of Sandvik Mining and Construction's business was outside Europe, and only six percent of the employees of the business area worked in Sweden. Who could have imagined that Australia would become Sandvik's second-largest single market? The hunger for minerals also strengthened the investments in China, whose economy was becoming the world's second largest after that of the United States.

The expansion into the mining and construction field was caused by necessity. It was a make or break situation after the end of almost half a century of collaboration with Atlas Copco. The strategy was to build an equal competitor to that company, which had bought its own rock tools manufacturing

Production capacity in China has grown tremendously, as at this new plant in Wuxi which manufactures rock tools.

In Vespasiano, near Belo Horizonte, Brazil, a new plant for the production of machines and equipment serving the mining and construction industry is situated.





The UK-based companies Extec (top) and Fintec (bottom), manufacturers of mobile crushing and sorting equipment, were acquired in 2007.

capacity in the form of Secoroc. The strategy was achieved through a series of acquisitions, as depicted in a previous chapter.

Sandvik Mining and Construction was not fully fledged; additional acquisitions were made in mineral exploration and in crushing to complement the earlier purchase of a division of Svedala. Both the new companies that were absorbed in 2007, Extec and Fintec, were British. In 2003, the business area acquired Mazda Earth Technologies with its Toyo brand. This was a momentous deal in Japan, which had long prevented foreign acquisitions.

For a long time, Sandvik's new mining and construction business area had more than 20 brands—everything from Tamrock to Eimco and Voest-Alpine Bergtechnik. There were seven separate product companies, each of which ran its own affairs. Management at the time felt that it was too early to take out synergies.

Market trends, however, increasingly opposed this decentralized market strategy. The competition was tending towards fewer, larger suppliers of complete systems and solutions.

Sandvik Mining and Construction had a very broad product portfolio for its customers. The portfolio was broader than Atlas Copco's in mining, because the Austrian company Voest-Alpine Bergtechnik brought with it coal mining, but narrower in the construction sector. Of the American competitors, the giant Ingersoll Rand had previously sold off some operations, while

Bucyrus had expanded rapidly through acquisitions and was then bought by Caterpillar. The trend was toward complete solutions instead of individual products, and this was reflected in the emergence of the three major suppliers.

Unlike Sandvik Tooling, Sandvik Mining and Construction, for example, had no overlapping products in the same markets. As a result, a customer in one of the mining sectors or in the construction industry often had to deal with various Sandvik companies. Some customers objected to this. Customer surveys also showed that the Group's multitude of brands were fairly weak compared with those of its competitors.

In 2005, the new management of Sandvik Mining and Construction decided to reorganize the operations. Seven product areas became four customer segments: Underground Soft Rock Mining, Surface Mining, Underground Hard Rock Mining, and Construction, that is, three segments for mining and one for the construction industry. It was then decided that all equipment and products in these segments would be marketed under the Sandvik brand.

In addition, a new design philosophy with a uniform color scheme was introduced for all machines. The decision to give up a number of strong brands within their niche markets appeared bold but was outweighed by the overall benefit.

There then followed extensive work to create new systems for logistics,

A roadheader (opposite page) and a crusher painted in the new, standardized colors.

Following spread: Sandvik develops, sells, and installs products and total solutions for materials handling. Mineral mining preparation in India involves first removing the top layer of soil.







Underground loaders are guided by remote control using Sandvik's system Automine, in a mine in El Teniente, Chile.



The Group has an extensive safety program, requiring careful instructions and regulations at all production sites.

financial control, research and development, and other internal processes. The advantage of the new systems was not only greater efficiency in the existing organization, but also more opportunities to rapidly integrate new acquisitions into the right place in the business area. The new organization had a greater focus on service and more long-term customer relationships.

What distinguishes the mining industry from many other industries is its even distribution around the globe. Commodity assets are often located in large, sparsely populated areas. But behind the boom that followed the global economy's most recent crisis lie China's huge infrastructure programs, which require metals and building materials for major construction projects. One of Sandvik's largest factories for mining equipment is now located in China.

In terms of its products, Sandvik Mining and Construction was an entirely new phenomenon in Sandvik's long history. Never, except for Spooner's brief era of food equipment in the 1980s, had Sandvik engineers developed machines and large equipment in an unending stream. Drilling rigs, loaders, materials handling systems, and crushing equipment were launched one after the other.

Of particular interest was the Automine commercial concept, which involved the automation and remote operation of mining machinery and equipment. This was tested by the Canadian customer Inco and by Sweden's LKAB. In 2004, an extensive automated system for loading and unloading was installed in the Pipa Norte underground mine in Chile owned by the El Teniente company. A series of loaders was developed for very low reefs and seams, such as those in platinum mines. Among the most spectacular innovations was the blind hole system. Blind holes can be bored vertically upward from the mining level to special haulage levels.

Mining technology was undergoing rapid technological development, and the big mining customers in countries such as Australia and Brazil insisted on safety standards that had very obvious results.

However, the global crisis that began in the autumn of 2008 revealed weaknesses in the business area. Sandvik Mining and Construction was impacted more than its main competitors, and recovery was weak, especially for the construction side of its business.

The connection between the business area's large operations on the mining side and the smaller operations on the construction side is not strong enough for them to be a comfortable fit within the same organization. The technology may be the same but the markets are too different. The mining industry has few but large customers that focus heavily on productivity, customized solutions, and after-sales. There is also a very intense and strong relationship between the supplier and the customer. In contrast, the construction side of the business is distributor driven and has customers who are pre-

pared to compromise if they are offered a good price. Squeezed margins worsen profitability.

As a result, in future the operations for the mining and construction industries will be run as two separate organizations, Sandvik Mining and Sandvik Construction. The former, Sandvik Mining, will have its head office in Amsterdam, because that city has the optimal air connections with the mining industry's various markets, and is therefore very attractive to mining specialists. This move reflects a trend in the localization patterns for the control of global business operations. Sandvik Mining's goals are partly to defend the leadership position it has already acquired and partly to increase its profitability to the same level as that of its main competitors. Because Sandvik Mining already had an operating margin of 17 percent and a return on capital employed of 35 percent in the spring of 2011, the organization's task is to further improve what is already very high profitability.

Sandvik Construction, which is less than one-third the size of Sandvik Mining, has a small main office in Stockholm and a large resource unit in Shanghai, at the heart of the organization's biggest market. Sandvik Construction's place within the Sandvik organization is not as self-evident as Sandvik Mining's, and Group management wants to see clearly improved

Participation at various fairs has long been a vital tool for keeping contact with current and potential customers, for example here at IMTS, the international manufacturing technology show, in Chicago, U.S., 2010.



The plant in Westminster, South Carolina, U.S., produces tools for metalworking.

profitability within the space of two to three years. Various alternatives will then be evaluated, either for growth and expansion, or, if an acceptable profitability level has not been reached, a decision will be made on the divestment of all or parts of the business unit. Comparable profitability figures in the spring of 2011 were 5 percent margin and 11 percent yield, which is one-third of the levels for Sandvik Mining.

In the field of cutting tools, Sandvik had captured the global leadership at the end of the 1980s, and Sandvik Tooling became the Group's largest business unit in the decade that followed.

The Group prevented the technology from stagnating by investing in new research. Tooling's American competitors chose their own path. For example, companies such as Carboloy and Valenite were regarded as cash cows to be milked dry for all they were worth in what was seen as a mature industry that had reached the end of the road. That was why they lost their advantage in their domestic market and became takeover candidates for Seco Tools and Sandvik respectively.

In the new China, the company, as one of a few global players, had received permission to start a wholly owned manufacturing company for cemented-carbide products. Chinese industry could not afford to say no to Sandvik's

technology. In eastern Europe, Sandvik Coromant had acquired its major competitors. The closely related high speed steel companies within the newly acquired CTT Tools had been developed in the same way. The problem that was emerging more and more clearly was a lack of coordination and synergy.

How should such a diverse collection of new and existing operations, stemming from both acquisitions and organic growth, be organized? The management of Sandvik Coromant, who essentially also managed all the Group's other cutting tool brands, implemented a strategy. A new organization was built up using resources from each company that was to be included.

The central organization did not expand but rather shrank slightly, even though the new Sandvik Tooling was given a management that was separate from Sandvik Coromant, which was still the leader, but among equals.

It was during this process that two new major international deals matured. One involved the very well-run German family business Walter AG, whose founder had no successor within the family, and wanted to place his company in the best possible strategic position. It took long joint discussions with the German competition authorities before getting the go-ahead. Walter would be allowed to continue developing its corporate identity and competitiveness even under Sandvik Tooling.

The other company open to acquisition was the previously mentioned North America-based Valenite, which, like Carboloy, needed a lease of new life. Valenite would also be allowed to continue working from its historical base, which in this case was heavily focused on automakers.

A customer survey commissioned by Sandvik showed that customers who purchased cutting tools wanted to have alternative suppliers in order to access various approaches. Tools users within the same client company could favor different brands.

Customers appreciate the differences in the services and quotations offered. In France, for example, car manufacturers and other companies had, of course, known for a long time that the "3S" (Sandvik Coromant, Seco and Safety) were part of the same group of companies, but buyers still regarded them as separate suppliers with long traditions. For this reason, Sandvik Tooling, unlike Sandvik Mining and Construction, decided to continue offering a variety of brands that were free to design their own marketing. If Sandvik Coromant was perceived as a full-range supplier and the market leader, then Germany's Walter, for example, was more of a niche provider of specialized engineering tools. In contrast, Safety was something of a specialty brand for car manufacturers, and the subsequently acquired Wolfram Bergbau was focused on a specialty area. In one respect the brands would not compete, and that was price. Others could fight over the low-price segment of the market.



So called Application Centers geared toward service development have recently been established. This unit, designed for the automotive industry, is situated in Bietigheim outside of Stuttgart, Germany.

Sandvik acquired the German cutting tool manufacturer Walter AG in 2002. Here, the plant in Münsingen, Germany.





Austrian Wolfram Bergbau was acquired in 2009. Company holdings include a mine and an ore dressing plant in Mittersill, Austria.

Tools for the manufacturing of aluminum cans are produced in, for example, Barcelona, Spain.

When a customer purchased brands such as Sandvik Coromant, Walter, Diamond Innovations, and Wolfram, they were all part of the Sandvik family, which could also be said of Seco Tools, which is a part of the business area Sandvik Machining Solutions since 2012. Sandvik Machining Solutions is a master of the engineering industry's key technology area: metal cutting. Here, Sandvik is the market and world leader, whatever the product or technology involved.

For Sandvik and its competitors, the constant launch of new products and production methods has therefore been crucial to the positive trend. Not many years of low innovation are needed for competitors to catch up or take over the lead. With R&D costs corresponding to about six percent of sales, Sandvik Machining Solutions, is the industry's leading knowledge-based company, which also explains its successes and strong market position.

The acquisition of the Austrian company Wolfram Bergbau in 2009 meant that Sandvik gained better access to tungsten, one of the key components of cemented-carbide products. Wolfram has leading expertise in tungsten production, from the mine to the finished cemented-carbide powder, and has a cost-efficient facility to utilize recycled materials. The acquisition in 2007 of the former General Electric-owned North American company Diamond Innovations gave Sandvik access to world-leading expertise in and the production of superhard materials such as synthetic diamonds and cubic boron nitride. These materials are used to create extremely durable products for metalworking.

Traditionally, machinery and tools were developed separately, but gradually more and more machinery manufacturers adapted their products to the performance of the tools. The advantages are that the machines can be used in better, more versatile, and more productive ways. With Coromant Capto, for example, the customer can turn, mill, and drill by making quick changes and without impacting quality and accuracy. This benefits small customers in particular.

Expenditures on cutting tools form only a small part of the total production cost, but have a crucial influence on productivity and profitability. Sandvik sells productivity and/or cost savings. The Group offers a range of advanced products made from various hard materials and for a variety of uses.

Customers are mainly found in the general engineering, aerospace and automotive industries and oil and gas extraction sectors, as well as in electronics and medical technology. Customers use the company's products to process steel, cast iron, aluminum, titanium, composites, and other modern materials.

The largest geographical markets are Europe, North and South America,

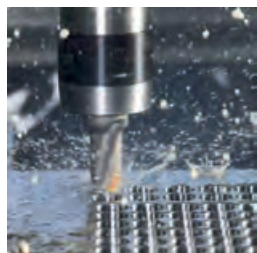
and Asia. In Europe, Sandvik took an early lead, but in the United States and the rest of North America the breakthrough came later, in the 1980s. In Asia, there are four Japanese competitors, Mitsubishi, Sumitomo, Toshiba, and Kyocera, which together are larger than Sandvik. However, Sandvik is the leader in China, and the Chinese market looks set to establish itself as the largest for Sandvik Tooling. Competition within the various customer segments often drives the development of increasingly lighter and stronger components, and this creates more difficult challenges for tool suppliers. As mentioned above, lighter materials are generally more difficult to machine, and require even more advanced tools, which also wear faster. This trend favors Sandvik.

The challenge is to distribute products manufactured according to exactly the same standards, wherever the customers are in the world, and to do it very quickly. The tools are mostly made of cemented carbide but also of other hard materials such as synthetic diamond, cubic boron nitride, ceramics, and high speed steel.

Sandvik usually claims that the correct tool selection can affect a customer's total costs by as much as 20 percent, while the cost of the tools themselves is far less. As a global supplier, Sandvik Tooling can offer customers training

The move by aircraft manufacturers to lighter materials saves fuel but put greater demands on tool performance—a move beneficial to Sandvik. The Group's tools for metalworking are key to productivity and profitability in the field.





Sandvik products are used for drilling, turning, and milling.

Assembly of a nuclear fuel element consisting of sealed zirconium-alloy cladding tubes containing UO₂ fuel pellets.

at some thirty application centers, productivity centers, and similar facilities around the world, and has the power to introduce numerous new products each year. This ability creates a competitive advantage, and not only with the big customers.

In the strategy work implemented by the new Group management after the crisis, Sandvik Tooling was regarded as being too broad after the acquisition-driven expansion of recent years. In order to gain a better focus on the core business, the more limited Sandvik Machining Solutions was created. This would reinforce Sandvik's global leadership within advanced cutting tools and explore the possibilities of broadening the offerings. Growth and profitability were to be increased.

The operations that did not belong to the business area's core were moved to a new, more financially driven business area, Sandvik Venture. This business area includes product areas that have limited ties to the other business areas. They include Sandvik Process Systems, Sandvik Hard Materials, Diamond Innovations, Wolfram, Dormer, and those parts of Sandvik MedTech that involve medical instruments and implants. The business area's task is to create opportunities for growth and profit in smaller but attractive and fast-growing operations.

Sandvik Machining Solutions, in its new form with Sandvik Coromant, Walter, Safety, and, as planned, Seco Tools, is slightly smaller than the largest business area, Mining, even though the operating profit is still the best. In spring 2011, the operating margin is an impressive 26 percent and the return on capital employed is 31 percent. It is hardly possible to make any giant gains in profitability, but the growth could be better.

The business area Sandvik Materials Technology encompasses the steel operations that were the Group's first line of business.

Today the business area is associated with advanced materials technology for the most demanding industries and environments, new innovations, and fields such as super alloys and nanotechnology. As a consequence of this continuous evolution of advanced materials, the old carbon steel business disappeared long ago. The business area is positioned to be able to play an important role in the ongoing development of the energy sector, both in terms of traditional forms of energy such as oil, gas, and nuclear, and renewable energy sources such as fuel cells and solar cells.

Sandvik's nuclear power customers did not reach the numbers that visionaries within the Group had hoped for during the pioneering days of the 1960s, when several tube mills were built. But the halt to nuclear expansion in most of the world may have been the reason why Sandvik could establish itself fairly painlessly as the world number two (after Japan's Sumitomo) in





Finned tubes for the production of ethylene, the main raw material used in the plastics industry.

Strip steel is used to make products such as flapper valves, knives, components in electric shavers, springs, and wood bandsaws.

Wire of stainless steel and nickel alloys for springs, medical applications and welding operations, as well as for wirelines in the oil and gas industry.

seamless tubes, for which the nuclear power plants were important customers. If cemented-carbide cutting operations were characterized by fairly small tools and components sold to a wide variety of customers, then the manufacturing of seamless tubes was more spectacular, with very large factories for various production stages. Hospital-style cleanliness requirements were combined with a steel mill's display of powerful forces and heat differences. Each customer had its own specific requirements for safety and material strength.

In 1992, Sandvik and Japan's Sumitomo chose to collaborate on a big new factory for the extrusion of seamless stainless steel tubes in the United States. The Japanese contributed 30 percent of the Swedes' expansion of the successful pilgering mill that had existed in Scranton in the U.S. The reason why competitors did not rush into the seamless tube niche market was also because welded tubes were constantly gaining market share. They were cheaper to make, and welding methods were constantly improving. Seamless tubes could therefore only defend their position when the requirements were extreme or when the thickness demanded it.

Typical examples of seamless tubes include steam generator tubes for nuclear reactors using pressurized water, and heat exchanger tubes for boiling water reactors and for large chemical plants and pulp mills. Another product was stainless hollow bar, which was produced as tubes and came in standard sizes to be sold to the mechanical engineering industry for the manufacture of machine components. Sandvik's expertise in materials meant that various grades of materials could be developed that were suitable for particularly demanding environments: oil refineries, phosphoric acid factories, and oil wells in extremely corrosive environments. Composite tubes, which consist of two different materials, could withstand reactive chemicals from the outside and high pressure from the inside.

One development project that put all of Sandvik's materials technology skills to the test early on was the previously mentioned umbilical tubes. These appeared in the early 1980s, when the world's oil industry began to operate at ever-greater ocean depths. Working in close cooperation with customers, Sandvik Materials Technology has solved the materials technology problems step by step, and over the years has developed and introduced a range of increasingly sophisticated materials for this purpose.

Just like its umbilical tubes, Sandvik's stainless steel tubes in very large dimensions have also experienced major successes in the oil and gas extraction industry.

Sandvik Materials Technology has also invested in completely new market segments through acquisitions. When Kanthal was acquired in 1997, it had already had the time to develop the global market's most complete range of

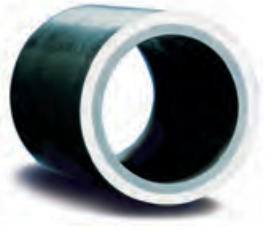
resistance materials made of various alloys and ceramics for heating, plus bimetals for measuring and controlling temperatures.

Kanthal's corporate operations were gradually integrated into Sandvik's Wire product area. Kanthal thus ceased to be a company name, but still remains as Sandvik's brand of heating technology products.

While the cutting tools and rock drills were each recovering from their respective crises and taking over the global leadership position, Sandvik's original steel business continued to be merely a survivor. The business area always made a profit, but this was not enough to be a part of Sandvik. The business area rarely accounted for more than one-fifth of the Group's results.

The steel operations no longer appeared to play such a central role in the Group, despite some efforts on the tube side and the acquisition of Kanthal. Without an advanced knowledge of materials, however, there was a clear risk that Sandvik would have to refuse new opportunities.

Sandvik Materials Technology was the result of more than 140 years of materials evolution and specialization. Some production lines had survived and others had been closed or sold, so that now there were about 50 production units and more than 8,000 employees. About thirty companies around the world sold Sandvik's steel products, which varied widely in type and usage. Their common denominator, though, was that they belonged to Sandvik's families of advanced materials, and they were the result of world-leading



Composite tubes for black liquor recovery boilers for the pulp and paper industry. An outer stainless layer protects against corrosive flue gases. The inner low alloyed material works well against the steam/waterside of the tube.

Production of hydraulic and instrumentation tubing in Arnprior, Canada.





metallurgical and R&D activities. The level of added value was so high that the products could rather be called engineered products than commercial steel. A new management team began a very systematic program of change and development. This involved developing work processes and then disseminating the best and most efficient work methods (known as 'best practice') throughout the organization. Management invested large sums in developing the product portfolio, and focused on increasing productivity within production, logistics and sales.

The product portfolio clearly reflected this change. When the program of change began, about five percent of sales came from products launched in the previous five years. Ten years later, that percentage was four times larger, and the goal is to increase it to a quarter of sales. The key to such a continuous and rapid product change process is shorter lead times in product development plus a faster phase-out of more standardized products. The goal is that it will take between one and three years to go from concept to market launch, which is an unusually short time in the industry. Products and materials that can be easily copied by others must be phased out.

Ordinary carbon steel, which had originally dominated the market, does not exist any longer, and ordinary stainless grades are also on their way out. Three-quarters of the materials that the business area works with are specialty alloys and superalloys, and one-third are unique to Sandvik.

The future of Sandvik Materials Technology lies in a few areas of highly advanced materials, where only a few competitors (and often none) possess comparable knowledge. An important prerequisite for being able to continue this evolution of materials is the business area's materials research unit, which is among the world leaders. In addition, expertise and efficiency are required at all processing stages.

Powder technology is an example of an area that is taking market share from conventional metallurgy. Via acquisitions and corporate partnerships, the business area has strengthened its position in the powder technology segment, including products for the rapidly growing energy sector. With powder technology, for example, the shape of the products can be tailored precisely to customer requirements.

If the choice of materials is becoming more clearly defined, this does not mean that the customers are coming from fewer industries. For example, when an oil company wants tubes for long-term deep-sea use, or when energy companies want components that can handle extremely high temperatures, or when fertilizer manufacturers want tubes that minimize the risk of explosions, then the solution to these varied requirements is found within the same family of materials. The same holds true for the medical products industry, where Sandvik supplies high purity stainless materials and titanium alloys for



Powder technology is an increasingly important area for Sandvik Materials Technology.

Advanced components for the energy sector and other markets are produced using powder technology.

Sandvik has an extensive customer offering for the global oil and gas industry.

Sandvik manufactures material for implants as well as cemented-carbide tools for machining implant material.

orthopedic implants, surgical instruments and pacemakers. The common denominator in all these cases is extreme demands on materials technology and the necessity of making the impossible possible.

What does the future look like? Where are the market positions and where is the growth?

Most of the evidence points to the fast-growing energy sector, which is already the business area's largest customer segment. This is where the strongest growth is expected. Sandvik retains its old position in tubes for the nuclear power industry. Even though the rate of expansion may weaken after the Fukushima disaster in Japan in 2011, the focus on increased safety will at least favor suppliers with advanced technologies that can contribute to safer nuclear power plants.

The same holds true for offshore drilling. When Hurricane Katrina swept through the southern United States in 2005, not only the city of New Orleans was flooded. Ten oil rigs were also set adrift. Onshore control of such oil wells would appear to be safer, but requires even longer umbilical cables and oil



pipelines. The demands on materials technology and tubing expertise are therefore continually escalating.

Sandvik Materials Technology has a wide range of specialty products for the oil and gas industry and for other power generation industries in the form of both tubular and welding products. When it comes to new energy sources, the Group offers coated materials for fuel cells, solar cell panels, and components for thermal power, Stirling engines, and wind power.

Perhaps the next major focus area will emerge from one of these fields. The challenge for the new business area management now is to show that the traditional product lines can be as profitable as those in mining equipment or cutting tools. The tougher profitability demands mean that the business area's earnings must be significantly better within two to three years in order for alternatives to growth or expansion to be considered.

Three business areas have thus become five, of which Sandvik Mining and Sandvik Machining have aggressive strategies. They will continue to defend their respective leadership positions within the mining and engineering industries. In contrast, the most important goal of Sandvik Materials Technology and Sandvik Construction will be to achieve profitability within their respective businesses. If this turns out to be impossible, structural solutions will be required. Sandvik Materials Technology is the third-largest business area but it is a second-division team in terms of its results.

The more entrepreneurial Sandvik Venture contains various types of businesses. One operation to be moved here was Sandvik Process Systems. Operations within the acquired medical technology companies that did not meet expectations were also transferred to this business area following write-offs of SEK 1.2 billion. A process to divest this unit began in 2011. Other units within the business area are strategic, even though they cannot be integrated, and can be developed as part of the search for new investment areas for the technology company that is Sandvik.



Production tubes in large dimensions for the extraction of oil and gas.

FROM AN INTERNATIONAL TO A GLOBAL BUSINESS

During the 1990s, Sandvik went from being an international business to becoming more and more globalized. Its network of subsidiaries, production close to local markets, and service was certainly already being expanded after World War II, but the Group was now acquiring and establishing companies and units of an entirely different independence and stature. Distribution, warehousing, and information were adapted to this new situation. The Swedish market shrank in importance, such that at the time of this writing, it lagged behind the United States, Australia, Germany, China, and South Africa in terms of sales. The proportion of employees in Sweden is now about 20 percent.

It is difficult to draw definitive conclusions about a period that is still ongoing. But it is clear that the era of the global economy that began in the 1990s is one of the most tumultuous in economic history. Sandvik quickly adapted to the new opportunities.

When Sandvik was born in the 19th century, the world economy was characterized by free trade and colonial powers, but was later divided into protectionist blocs after World War I. In the 1990s, the world finally saw the East bloc's Comecon, China, and the rich countries' OECD integrated in the same liberal system.

A genuine revolution occurred when the Soviet Union withdrew its troops from eastern Europe, and India announced a new economic policy. China had already embraced competition in its economy.

The Uruguay Round of free trade talks did drag on, but this was not detrimental given that the winds of free trade only grew stronger. The Maastricht Treaty turned Europe into a single market, and the privatization of state enterprises was occurring everywhere. Such equally strong liberal gusts of wind had not been evident since before 1880.

As if this was not enough, the worldwide information network, the Internet, made its appearance, and gradually linked the world's businesses in a fine-meshed and super-efficient electronic system.

China's giant economy steamed ahead during the entire decade and into the next at a breakneck pace. By the time the country was able to demonstrate its new modernity in conjunction with the 2008 Summer Olympic Games, its economy had grown about sixfold. Everything that occurred prior to this

India is a rapidly growing market for Sandvik, with advances in communication and other areas of infrastructure providing momentum for development.

Sandvik products were used to build the 2008 Olympic complexes in Beijing, China.





great achievement pales in comparison, but its model was, of course, Japan.

Countries from very different parts of the globe, such as India, Chile, Ireland, Canada, and Israel, also went up a gear, and scored growth rates that doubled their gross domestic product in just over a decade.

The Sandvik Group's own new globalization wave began in the subsidiary Seco Tools with the acquisition of Carboloy in 1987, when one of Sandvik Coromant's old arch-competitors disappeared. Another interesting acquisition at this time was the British company TI Stainless Tubes, a traditional rival on the tubing side.

In 1988, Sandvik acquired Mission Drilling Products, which made down-the-hole drilling equipment. The Swedish tool group Bahco with its large organization outside Sweden was taken over in 1991. And in the following year the high speed steel tools company CTT was acquired, which also included many subsidiaries outside Sweden.

From the former East bloc came a Polish manufacturing company from Tamrock via Voest-Alpine Bergtechnik. Sandvik's management showed great interest in eastern Europe after the dissolution of the Soviet Union, and by 1991 was already investing in Russia, Hungary, the Czech Republic, Slovakia and Bulgaria. Small engineering companies were taken over in eastern Germany and Serbia. This eastern European expansion campaign was crowned in 1994 with the takeover of Russia's biggest cemented-carbide company. Other acquisitions were the tube manufacturer Chomutov in the Czech Republic and the Baildonit cutting tools company in Poland. In hindsight, Sandvik was a little too eager in eastern Europe, and underestimated the time it would take for countries to move from a planned economy to a market economy.

In the autumn of 1994, Sandvik's Board decided on a new strategy for eastern Europe, India, China, and Southeast Asia under the impact of developments there. The wholly owned subsidiary Sandvik China was founded in Beijing, and the cemented-carbide tools manufacturing unit in nearby Langfang was opened that same year. Four new branch offices were opened in China.

In 1997, production of taps began in India under the new Titex brand. Capacity for solid carbide drills was also increased. Restrictions in this market were gradually eased.

Also crucial to this globalization were the acquisitions that led to the formation of the business area Sandvik Mining and Construction, with the Group's offerings for the mining and construction industries. This business area was later divided into two. Of the approximately 16,000 employees in these operations, only about one-tenth are in Sweden. Expansion within the mining equipment business area has also reinforced Sandvik's market shift southward and eastward in the world.



Production of taps in Pune, India.

Production of cemented-carbide tools in Korea.

In 1994, Sandvik acquired the cutting tool company Baildonit, in Katowice, Poland.



Sandvik's German head office in Düsseldorf.



Distribution center for cutting tools in Schiedam, the Netherlands.



Sandvik's French head office and plant in Orléans.

It is possible to tell the story of Sandvik from many different geographic points of departure. This chapter presents the evolution of the business activities in the largest markets in terms of earnings.

Six of these markets are still European, and Europe accounted for just under 40 percent of Group sales in 2010. Originally, this share was significantly larger, and it will shrink further as Sandvik expands in the Asian markets.

Germany, which is currently the Group's third-largest market, and by far the largest in Europe, has always been a key market for Sandvik, and was at times its biggest market outside Sweden. From the new Germany that was created in 1871 after the Franco-Prussian War came competition and stimulation. Krupp, which from the outset was a major steel competitor, later developed cemented carbide.

After World War II, Sandvik opened for business again in Stuttgart and Leipzig respectively in the divided Germany. The Leipzig branch was soon closed by the East German authorities. The Group experienced major success in West Germany with both its steel and cemented-carbide tools. The country grew into Sandvik's largest market outside Sweden prior to the Group's breakthrough in the United States. The business operations were built up in Düsseldorf, where the subsidiary adopted the name Sandvikstahl GmbH, then Sandvik GmbH, and now Sandvik Holding GmbH. A long period of acquisitions and expansion of production capacity followed. In 1994, Sandvik tried to buy one of its arch-enemies, Krupp Widia, but was turned down by the competition authorities. In 2003, however, Walter became a strong brand within the Group.

Sandvik Machining Solutions has the most extensive operations in the German market, and German customers are among the most demanding in the world. The precision engineering, wind power, and automotive supply industries are some of the business area's key customers in the modern era. Manifestations of this include an applications center for the automotive industry outside Stuttgart, and an expansion of capacity at the manufacturing unit for cutting tools in Schmalkalden. Walter has invested heavily in a new manufacturing plant in Münsingen.

The other business areas also have a strong technical foothold in this high-end market. Sandvik Mining's components from Germany, for instance, play a major role in various systems of materials transport and handling. Among the customers of Sandvik Materials Technology, the advanced chemical industry has been important. But virtually all German manufacturing sectors have influenced Sandvik in the materials field. Over the years, the warehouse in Düsseldorf, and later the one in Venlo in the Netherlands, has provided a large number of German clients with highly specialized stainless steel products in the tube, strip, wire, and bar product areas.

Another important market for Sandvik is France. In the early 1980s, the country was Sandvik's third-largest market after Britain and the United States. Only in Sweden and the UK did Sandvik have more employees. Relatively newly acquired companies, such as Le Burin, Broussaud, Safety, Tobler, and Eurotungstene, lay behind Sandvik's strong presence at that time. Since then, all these companies except Safety and part of Eurotungstene (which was transferred to Sandvik Hard Materials) have disappeared or been sold, but others have come in their place, so that today the Group has many more French employees. As mentioned previously, Sandvik's French distributor played an important role as an innovator in Sandvik's early years. The first French subsidiary came in 1923, and it was in France that Atlas Diesel and Sandvik made their breakthrough with "the Swedish method" for rock excavation. Another classic breakthrough in France was high-quality hydraulic tubing for the Concorde aircraft project and tubes for the country's large nuclear power program.

The French market is often characterized by close collaboration with large companies. For example, Renault played a major role in Sandvik's development for automotive customers, and the aircraft engine manufacturer Snecma was another customer that conveyed to Sandvik the requirements involved in the machining of new materials. The same type of customer relationship has existed with the razor manufacturer Bic. French expertise has thus influenced



Sandvik delivered titanium hydraulic tubes for the super-sonic aircraft Concorde in the 1970s.

Distribution center for steel products in Venlo, the Netherlands.





Sandvik's Italian head office in Milan.



The factory in Rovereto, Italy, produces tools for metal-working.

the development of both Sandvik's cemented-carbide products and its steel grades. French know-how in fields such as the automotive, aerospace, and food industries is the reason for Sandvik's continued strong presence in the country.

Italy is another of Sandvik's biggest markets. Like some other major European countries, Italy was one of the markets that Sandvik targeted first. The typewriter manufacturer Olivetti had become a customer as early as 1911. During the interwar period, the Group acquired an Italian saw manufacturer. But the real impetus came in the 1960s, when Italy experienced a period of rapid economic growth and expanded its engineering industry. In the early 1970s, six hundred people worked for Sandvik in Italy in seven different branches of the main operations based in Milan. Italy became the sixth-largest market outside Sweden. Thanks to various acquisitions in the 1990s, including a factory producing high speed steel tools in Rovereto in 1992, Italy was for a while in third place after the U.S. and Germany.

The reason for this strong focus on Italy is the advanced industry in the north of the country. Customers in cutting tools include mold manufacturers, energy companies, the automotive and aerospace industries, and the entire mechanical engineering industry. The Group is also the market leader in systems based on steel belts for the oil and gas, chemical and food industries, and in heat exchange systems in the glass and automotive industries, among others. The tubes business has major customers in such industries as oil and gas, chemical, processing, and food.

Sandvik Construction has primarily received large orders from Italy's motorway projects.

Even Russia has played a larger role in recent years than many people know. It was the orders for steel tyres for railroad wheels from the Russian railroad expansion that allowed the young company Sandvik to survive its first crisis in the 19th century. And the new subsidiary, Tamrock from Finland, which, together with Sandvik Rock Tools, formed the nucleus of Sandvik Mining and Construction in the 1990s, had a long history in the Soviet market. Without this presence, Tamrock could hardly have established itself so quickly, even though the company's presence later became a disadvantage for a while when the Soviet Union collapsed and demand dropped significantly.

The Soviet Union had built its own cemented-carbide factory as early as in the 1930s, and Sandvik had some business dealings with the country's large, centrally planned economy, including the cutting tools technology for a huge truck plant project in the 1970s. In 1995, Sandvik was able to acquire the leading Russian cemented-carbide manufacturer, Moskovsky Kombinat Tverdikh Splavov, which is now one of the regional pillars of Sandvik Machining

Solutions' organization. Large investments in the factory have been made since the acquisition.

The Russian economy's strong emphasis on oil, gas, and metals has characterized the Group's business dealings there. Sandvik Mining in particular has had a growing market. In 2000, the business area received a large order for drilling rigs and loaders for the country's largest nickel mine, Norilskiy Nickel in Siberia, Russia. Sandvik Materials Technology has participated in the modernization of nuclear power plants and has also delivered Rotoform systems to the huge Gazprom natural gas producer.

Not only Russia but also other countries in eastern and central Europe have grown in importance to the Group, partly through the addition of new customers, such as automakers like Skoda, partly through the Group's own production units for both mining equipment and tubes. Sandvik has made major investments in the advanced production plant for seamless tubes in Chomutov in the Czech Republic. In 2010, the Group received its largest order to date for umbilical tubes, for a total value of 700 million kronor.

The founding of Sandvik was partly a British project, based on a British invention and to a high degree based on British financing. As early as in 1871, the company had engaged an import agent for the sale of its products in the

Early on, the Russian railway industry was one of Jernverket's key customers. Today customers are found within a range of sectors, including the engineering industry.



Sandvik's British head office in Halesowen, outside of Birmingham.

UK. Sandvik set up its first subsidiary outside Sweden in Birmingham in 1914. One of the earliest products to be manufactured locally was conveyor belts. The UK was the first market outside Sweden where the company's steel products were sold. In 1956, the subsidiary began producing specialty tools in cemented carbide, and the purchase in 1973 of the cemented-carbide company Wickman Wimet was one of the first big international acquisitions. For a number of decades, Britain was the Group's fifth-largest market, just behind Sweden. Britain's transition from being Europe's manufacturing leader to being more service- and finance-oriented is reflected in that it is no longer among Sandvik's largest markets. But the country is still one of Sandvik's 15 biggest markets in terms of sales.

Sandvik's positions are strong throughout the British market, and several of the UK manufacturing facilities produce for export. This manufacturing includes mobile crushers, cutting tools, cemented-carbide powder and materials for medical implants.

In North America, Sandvik has grown rapidly. The three NAFTA countries (the U.S., Canada, and Mexico) are all among Sandvik's biggest countries in terms of sales.

In the U.S., which is currently Sandvik's single largest market, the Sandvik brand was launched as early as 1876 at the great world exhibition in Philadel-

phia, when the new industrial United States celebrated its centenary as an industrial nation following the end of the Civil War. Sales in the U.S. market began the following year. The first subsidiary was founded in Manhattan in New York in 1919. In the mid-1950s, the subsidiary was relocated to Fair Lawn, New Jersey. It took a long time in the early 20th century to bring proper order to the market, which for Sandvik's part was then dominated by two large customers: Ingersoll Rand for drill rods and Durham Duplex for razor blade steel.

Later successes in the U.S. included the stainless razor blade steel when Gillette was captured as a customer, and cladding tubes for the nuclear industry, where Sandvik was invited to participate in a jointly owned project, which was a proud moment for Sandvik's engineers.

It was not until the 1970s that the U.S. became Sandvik's biggest market, but cemented-carbide tools remained unprofitable for a long time and in the shadow of the big American competitors. The acquisition of Disston for saws and other consumer products was almost a disaster. The cutting tools problems were finally sorted out in the 1980s, and both Carboloy and Valenite would end up in the Sandvik Group, the former at Seco Tools and the other at Sandvik Tooling. Several other American acquisitions, though, were less successful, including the manufacturer of high speed steel tools, Precision Twist Drill.



Manufacturing of synthetic diamonds and other hard materials at Diamond Innovations, a company acquired by Sandvik, in Worthington, Ohio, U.S.

Hebron, Kentucky, U.S., is the home of one of Sandvik's three global distribution centers of cutting tools.





Precision wire from the plant in Palm Coast, Florida, U.S., is used, for example, in heart surgery.

Head office of Sandvik Canada, Mississauga, Ontario.

Sandvik subsidiary in Tlalnepantla, Mexico City.

Products made in Werther, Germany, include precision tubes for the aeronautics industry.

Following spread: Sandvik has long been active in Brazil, with a subsidiary opened in São Paulo already in 1949. The Group now has several manufacturing facilities in this densely populated city.

Following these investments into mining and construction equipment operations, the United States has become even more important to the Group. Sandvik has more than 4,000 employees in the U.S.; only in Sweden is the number higher. A very large proportion of the products sold within the North American Free Trade Area is also produced within it. Sandvik Machining Solutions' largest manufacturing plant is located in Westminster, South Carolina, while Sandvik Materials Technology has its main facility in Scranton, Pennsylvania. Surface drilling equipment is manufactured in Alachua, Florida.

Customers are found in nearly all Sandvik sectors, with key segments being the engineering, automotive, electronics, mining, and energy industries.

In the mining country of Canada, Sandvik established its first subsidiary in 1926, and as early as in the 1950s also founded a rock drill factory that became successful. In the 1970s, production plants were founded for inserts, studs and steel belt conveyors. Thanks to the tube division's expertise in steam generator tubes for nuclear reactors, Sandvik entered into a collaboration with Noranda that involved its tubes factory in Arnprior, Ontario. Local production then began of special tubes for the pulp and paper industry, to which Sandvik was already supplying compound tubes used in recovery boilers. The plant, which was later taken over by Sandvik, now makes such products as hydraulics- and instrument tubing. In Burlington, Ontario, Sandvik developed the low profile loader for platinum mining.

It is Sandvik Mining that has made Canada one of the Group's major markets in modern times. The biggest order ever came in 2008 and was for machinery for the excavation of soft rock. The Group's Rotoform system for sulphur pastillization has also achieved major success in the country's oil and gas industry.

In Mexico, Sandvik's subsidiary won a major order for 39 drill rigs in 2010. The country is also among the larger markets for the Group, which has been present there for more than 50 years. Operations began there in 1961 with specialty steel products and continued in 1967 with the production of both rock drills and cemented-carbide tools. Today, for example, blanks for solid cemented-carbide drills, and products for the country's oil and gas industry are manufactured at the plant in Tlalnepantla outside Mexico City, where the subsidiary also has its headquarters. When Walter was acquired it brought with it a further Mexican subsidiary.

Brazil is Sandvik's seventh-largest market overall. It is the second largest in the Americas, a position that it reached in 1978 and has retained since then. Sandvik's Latin American operations really took off when the Scandinavian airline SAS opened its South American route from Stockholm via Madrid in 1949. From then on, São Paulo in Brazil grew to be one of "Sweden's biggest industrial cities." The businessmen who took the shuttle service there from







Production of rigs for rock drilling in Santiago, Chile.



The plant for assembly of mining equipment in Jiading, Shanghai, China.

Stockholm included Sandvik employees, and the focus was on rock drilling products, tubes, cutting tools and hand tools.

1957 marked the start of local production of rock drills, which became one of several important pillars of Sandvik's Brazil operations, followed by cemented-carbide inserts six years later. But even the steel business established new production in the country. First came stainless steel wire in the 1970s, and then in the early 1980s the Group acquired a production plant for welded tubes. As Sandvik became increasingly aggressive internationally and bought some of its competitors, these brought with them a number of subsidiaries with Brazilian production operations. Brazil's importance as a production country, but also as a market, grew gradually. Today, most of Sandvik's business areas have Brazilian production. A number of plants are in São Paulo and its vicinity.

Sandvik Machining Solutions has customers in the automotive, aerospace, electronics, and engineering industries. Sandvik Mining has extensive operations targeting Brazil's growing mining industry. In Vespasiano outside Belo Horizonte is a large new assembly plant for mining equipment.

The oil and gas industry is among Sandvik Materials Technology's larger customers. The fact that Brazilian oil has a higher sulphur content and is extracted at greater depths is just one of the factors that favor increased business for Sandvik in Brazil.

Sandvik's presence in South America also includes its subsidiaries in such countries as Argentina, Chile, and Peru. In Santiago, Chile, the Group has a large factory making products for the mining and construction industries throughout the continent. The unit also includes the subsidiary's headquarters, plus operations of the business areas.

Despite its strong North American presence and success, today Sandvik's total Asian market is larger than the U.S., Canada, and Mexico combined. China and India are already among the Group's largest markets, by virtue of their billions of inhabitants and rapid economic growth. Only in Sweden, the U.S., and Germany does Sandvik have more employees, and no other countries come close in terms of potential growth. The same forces that moved Sandvik's centre of gravity from Europe towards America are pushing it towards Asia.

Sandvik has not regarded China as a potential location for cheap production. Instead, the Group sees business opportunities in the rationalization and modernization of Chinese industry. Quality demands are increasing as the engineering and mining industries are upgraded, and this favors Sandvik.

Anyone who wants to be a supplier to the huge Chinese market must have a

local presence to ensure high service levels, rapid deliveries, and a spare parts inventory sufficient for even the most demanding customer. Sandvik has had business relations with China for a very long time. In 1994, the Group began producing cemented-carbide tools in Langfang outside Beijing and the factory has since been significantly upgraded on several occasions.

Previously, many other Sandvik products were often imported into the Chinese market, but in 2008 the Group invested in three new production units for cemented-carbide products and tools, and this development is expected to quickly reduce the proportion of imports. A year later came a factory for the finishing of high-alloy hydraulic and instrumentation tubing, as well as heat exchange tubing. At the same time, another plant began producing machinery for the mining and construction industries. Three of these newly established factories are located in the city of Wuxi, and one each in Zhenjiang and Jiading outside Shanghai. All in all, Sandvik is represented in about 80 Chinese cities in the most important regions. In 2011, the Group reached agreement with a Chinese supplier of mining equipment to establish a jointly owned company for the production and sale of equipment to the country's mining industry. In addition, Sandvik acquired a company for crushing and screening.

Market breakthroughs in recent years include large orders for steam generator tubes to the nuclear industry.

Assembly of mobile crushing equipment at the subsidiary in Pune, India.





Manufacturing of cemented-carbide tools in Semine, Japan.

Quality control of polished steel belts at the factory in Kobe, Japan.

Nor is India, which is still regarded as a low-cost country, unusual in terms of production and service within the Sandvik Group. Indian production has exactly the same quality requirements as other units, and is well placed in the Group's quality audits. Products from India are shipped worldwide.

The situation was different in 1960, when Sandvik was invited to invest in domestic production in the country by the rulers of what was at that time a protectionist and underdeveloped economy. The subsidiary, Sandvik Asia Ltd., has changed as the country has developed.

In India, Sandvik's facilities include plants for the recycling of cemented carbide, the manufacture of cemented-carbide tools, high speed steel tools, and rock drilling tools, as well as of resistance materials and stainless steel tubes, and the assembly of machinery for the mining and construction industries. Sandvik's operations have expanded dramatically, and significant investments have been made in increasing its production capacity, in R&D, and in



the design and construction of systems for materials handling and research and development within materials science and engineering.

Any description of Sandvik's Asian operations must also include the Group's regional company in Singapore. From its distribution center near the airport, Sandvik's products are distributed to markets throughout Asia, Australia and New Zealand. The regional company was set up in 1969, but subsidiaries already existed in the Philippines, Malaysia and Thailand. In 1978, operations began in Indonesia, and in 2011 a subsidiary was opened in Vietnam. The new, larger distribution center in Singapore, which opened in 2006, ensures significantly shorter lead times and increased delivery reliability and punctuality to more customers in the region.

The Japanese market is of special importance to Sandvik because the Group's main competitors to date in Asia are located in Japan. In contrast, the market itself has remained weak since the country's major financial crisis around 1990. This has not prevented the Japanese production philosophy, *kaizen*, from having a stimulating effect on Sandvik's methods of continuously improving quality and efficiency, especially at its own cemented-carbide factory in Semine.

For a long time, the Japanese market could only be accessed via trading houses or the Swedish steel industry's joint venture, Assab. However, in 1961, Sandvik founded the sales company Sandvik Far East. Among other products, the Group exported tubes to the nuclear power industry in this rapidly developing new industrial nation. Japan was the China of that era, a tough competitor to European and American industrial companies. There were three cemented-carbide companies in Japan, and Sandvik was forced to set up business in Japan in order to keep these competitors at bay in their domestic market. The goal was to acquire a competitor, but this never succeeded. In 1976, Sandvik Coromant's factory in Semine in northern Japan was completed. Even though Sandvik had to settle for a position behind its competitors, sales grew such that Japan became the Group's seventh-largest market in 1986. By that time, automatic sorting equipment had also become a specialty in the Japanese market, though progress was slower in the rest of the world.

The first acquisition in Japan did not occur until 2002, when Sandvik Mining and Construction purchased Mazda Earth Technologies.

The Semine factory has been expanded several times. On March 11, 2011, one of the world's largest earthquakes occurred in the sea just east of Japan and triggered a tsunami. But the factory could be restarted only two weeks after the catastrophe.

Australia is the world's sixth-largest country in terms of area but has relatively few inhabitants, about 22 million. Nevertheless, it is Sandvik's second-biggest



Sandvik's head office in Smithfield near Sydney, New South Wales, Australia.

Following spread: The distribution center in Singapore is one of Sandvik's three global centers for cutting tools. It is strategically situated near the airport.





market, primarily via Sandvik Mining, which, together with Sandvik Construction, is responsible for 85 percent of Sandvik's invoicing in the country. The other large business areas also have an Australian presence.

To the historic gold rush area of Kalgoorlie and the iron mines in the desert of Western Australia to the rich coal mines in the eastern states, Sandvik supplies advanced machinery and equipment.

In Newcastle, north of Sydney, Sandvik is building its largest facility to date for the manufacture and service of mining equipment, not only for Australia but also for the global market. Australia's high demands on productivity and safety influence the entire Group's offerings to the world market.

Sandvik's mining equipment business has also led to Africa becoming an increasing focus of attention for the Group. The mining industry is growing strongly in countries like South Africa, Tanzania, Mali, Ghana, and Zambia. South Africa is currently Sandvik's fifth-largest market, which was unthinkable just a few decades earlier. Sandvik has a long tradition in the country. The production of rock drilling tools began in 1948. The platinum industry is particularly expansive in southern Africa. There are a number of promising projects in copper, nickel, cobalt, and gold in central Africa. Sandvik has companies not only in the above-mentioned countries but also in Nigeria, Zimbabwe, Botswana, Namibia and Algeria, plus offices in the Democratic Republic of the Congo and Mozambique. In some of the mining projects, Sandvik is working with other companies. Especially interesting in the long term are all the infrastructure projects already being implemented, planned, or envisaged on this vast continent.

This short presentation of the Group's global organization and operations illustrates that in Sandvik's case, globalization has meant the transfer of skills. Sandvik's organization and production facilities are spread around the world. This is a necessity in customer segments that require not only product quality but also continual service and enhanced cooperation. Sandvik can only develop further by being a close associate of the world's most demanding customers, wherever they are. Even though the Group's global strategy has mainly been developed and advanced by Swedes, its implementation and business deals have always been local. Reconciling a global endeavor with a local presence and adaptation is an apparently contradictory task that every leading international company today must learn to handle. Any company that cannot do so will soon have to hand over its leadership position to one of its competitors. This reality is emphasized in Sandvik's new strategy from 2011, which states that the Group strives "to become more global in its approach and organization but with strong local support."



Production of rock-drilling tools at Sandvik in Krugersdorp, South Africa.

Gold mining in Ghana with surface drilling rigs from Sandvik.

SANDVIK AND THE FUTURE

This is the story of Sandvik's first 150 years. No one knows how old a company like Sandvik may become, but a strong willingness to change and an ability to perceive business opportunities through continued technology shifts are key success factors. The fact that the future is almost always uncertain is something we must live with.

A new Group management and a new strategic direction were the result of a rapid reorientation initiated by the Sandvik board in 2011. The year before, Anders Nyrén, the board member representing the Group's majority owner, Industrivärden, had become chairman. He was succeeded by Olof Faxander from the steel conglomerate SSAB as president and CEO as of February 2011.

After six months, it was time for the new, externally recruited president to present his program for change and his new Group management. There were two main reasons behind the sweeping change. The first was that the financial crisis of 2008 had revealed that Sandvik had some problems in adapting that none of its competitors had in the same way. The second was that it was time for a change of generations in the previous Group management, which had been characterized by continuity after the changes made in the 1990s.

The most high-profile change was the move of Group management from Sandviken to Stockholm, which in practice meant that the more financial, economic and human resources types of activities came closer to the labor markets and education for specialists and their families. Over many decades, Sandvik had developed a world-class cluster of engineering expertise. It had been more difficult to continually recruit top specialists in order to maintain a global Group organization. The challenge had been not only to recruit people to Sweden but also to a smaller town that was regarded as being on the periphery.

What was notable with Sandvik was not so much that the Group head office would finally move, but that the town of Sandviken was among the last of the traditional industrial centers in central Sweden to lose a global corporate head office.

The other major change was—as described earlier—that parts of the three large business areas were detached to create new, smaller ones. The reason for this was the conviction that a stronger focus on core businesses was necessary.

Many view solar energy as a key to the world's energy future. Sandvik manufactures products for this growing area.

Anders Nyrén, president of the investment company Industrivärden, a major owner in the Group, was elected chairman of the board of Sandvik AB at the annual meeting in 2010.



Olof Faxander, president and CEO, here at Sandvik's Capital Markets Day 2011.

The broadening during the 1990s had led to expansion and success. But there was also a tendency that the most important and well-established operations were developed and altered at a slower pace. With three business area organizations, the way Sandvik operated had moved too far in the direction of matrices and control systems with too many managerial layers.

The third major change was the deliberate recruitment of senior executives from organizations outside Sweden. Every strong and structured system also easily acquires less positive characteristics. In Sandvik's case, there developed an inability to make full use of all the talents within the organization. It was difficult for a non-Swede to have a career all the way to the top. This was a growing problem given that more and more of the Group's employees were outside Sweden, and that the dynamism existed in markets far away from Sweden.

As described earlier, the Group's ambitions up to this point had focused on diversity from the point of view of gender equality. There was a need to also strive for diversity in the sense of many nationalities, so as not to miss out on business opportunities. That was the conclusion of Olof Faxander and his

strategy group from the Sandvik organization after six months of consideration. The new strategy was formulated as follows:

- * **AMBITION** to be world class in every core area,
- * higher **SPEED** in every process,
- * increased **FOCUS** in selected core businesses,
- * become truly **GLOBAL** in mindset and organization but with strong **LOCAL** adaptations.

The new expanded Group management of 12 members would in future automatically include the managing directors of the subsidiaries in China and India. The Group management that took over in 2012 also included three people who had made their career in Sandvik's global organization and who did not speak Swedish. Accordingly, five of the twelve most senior executives did not speak Swedish, a situation that accentuates the role of English as the corporate language.

Crises hasten changes that are waiting in the wings. As this 150-year journey shows, Sandvik has lived and changed through a large number of crises in the global economy. It is even possible to say that the company was born out of the first major crisis of liberalization in 1857, when railroad projects and new financiers created a financial bubble that forced the merchant capitalist Göran Fredrik Göransson to change direction after a bankruptcy.

Yet the crisis that came in 2008 was something new in terms of its speed and violence, though also its short duration. But the question as this book is being written is whether the disease has been cured. Ultimately, at issue is a balance between the old and new industrial nations – one that must run its course, just as it had in Sandvik's early years when new industrial nations challenged Britain.

Economists will long discuss why the collapse of one Wall Street investment bank, Lehman Brothers, caused the whole world's credit system to freeze up and world trade to fall by more than 25 percent in a single quarter. The only comparable event is the collapse after World War I.

It is clear that Wall Street's financial companies were experiencing a decline and greatly needed new ideas to expand their operations. Risk appetite increased. In addition, interest rates were extremely low historically, and big money managers were seeking higher returns without over-exposing themselves to the stock market.

New collateralized debt obligations (CDOs) backed by U.S. home mortgages promised the impossible—high yet safe returns. The credit rating agencies assured purchasers that the impossible was possible by giving CDOs



Customer contact is the driving force behind the assortment of products that Sandvik offers and the technical solutions that raise the customers' productivity and profitability. Close cooperation with customers has been at the heart of the company's business strategy since the time of Anders Henrik Göransson.



Sandvik's production capacity is constantly developing. Here, the modern plant for the manufacturing of cemented-carbide tools in Schmalkalden, Germany.

their highest rating. Using another financial instrument—or rather, an insurance arrangement called credit default swaps (CDSs)—those involved could also insure themselves with the U.S. insurance giant, AIG.

Another factor at play was the increasingly negligent handling of the underlying mortgages. The result was to create a property bubble whose tentacles stretched out to institutional investors around the world. When the bubble burst, the financial losses on U.S. housing assets were one-third as large as those from the high-tech bubble seven years previously. But who would pay this time?

Frictions and confusion abounded. No one could see their way through the bizarre securities, complex insurance schemes, fuzzy financial statements, lengthy bankruptcy proceedings, deposit guarantees and political processes. The result was not only delays but also contagion throughout the system. Credit volumes in the world's capital goods markets imploded.

That was why Sandvik's customers dramatically lost their financing to purchase new mining equipment or other products.

“In the past we experienced downturns due to decreasing demand,” explains Sandvik's former president Lars Pettersson. “Most crises were due to inventory overstock or understock, which gradually worked their way out

through the system. Today there is a completely different level of transparency, and inventories are maintained more on a ‘just-in-time’ basis. But instead we are being hit by financially caused crises, which could become even worse.”

Three rows in Sandvik's annual report for 2009 tell most of the story about the collapse that occurred. Order intake: –31 percent. Invoiced sales: –30 percent. Result after financial income and expenses: –3,472 million kronor. During Sandvik's third loss-booking year since the company's restructuring in 1868, the operating result collapsed by 14 billion kronor! But things could have been even worse if there had not existed a labor agreement from a previous crisis that allowed Sandvik to temporarily adjust working hours according to production demand.

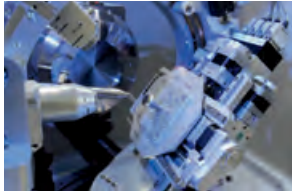
But Sandvik did enter the crisis with too high inventory levels. That was because on the mining equipment side, the company had previously competed with truck manufacturers over various components in short supply, such as hydraulic and control equipment.

The annual report for 2010 already showed a more normal appearance. Growth quickly returned in developing countries.

But as Sandvik experiences its 150th year and has emerged from its 24th recession, the new management team has no reason to feel sanguine. The

The development of new cutting tools demands a clear understanding of how the atomic structure of a material influences its performance in cutting operations. The use of structural models can help to precisely predict the properties of new materials.





Cemented carbide and other hard materials have a strong development potential, and Sandvik is investing significant resources within the area. Here the crystal structure of a cemented-carbide insert is analyzed in an x-ray diffractometer.

world's governments have invested huge sums of money to kick-start the global economy, an intervention that has led to problems as already large deficits in national budgets and high levels of indebtedness have worsened. In the United States, politicians in Congress are showing an inability to agree on a realistic financial restructuring program. In the European Union, politicians are having difficulty agreeing on how to handle growing debt problems in countries like Greece, Portugal and Italy. In the emerging economies, which were responsible for the entire dynamism of the global economy during the 2000 decade, there are signs of imbalances and wage inflation.

In the summer of 2011 the stock markets began to fall dramatically, and investors fled in panic to various "safe havens." The problem is that the global financial market is an ocean without safe harbors. All mass movements only create new problems.

The story of Sandvik demonstrates how a joint stock corporation works. It is hard to imagine dynamic industrialism existing outside the structure of a limited liability company, whose shareholders need not risk more than the money they invest in the company. Long-term and risk-taking financing is thereby possible. Ownership changes are fairly undramatic. Joint stock corporations can easily grow by inviting new investors or merging with other companies. Sandvik has absorbed hundreds of other companies over the years.

At least as interesting are the possibilities of sharing responsibilities and work duties. Complex knowledge can be collected and handed down the company's generations as long as there are customers who are willing to pay for this accumulated knowledge. Corporations like Sandvik have a theoretical chance of living forever, independent of all the people who come or leave, both employees and owners. But this situation only lasts as long as the company creates cash flow and capital growth. This requires continual development and adaptation.

Many analysts make the mistake of comparing corporations with nations. Inside a nation, people are born, live, and die. All their needs must be met. In contrast, in a company, people are temporary visitors; they receive their salary or return on their investment while they are active in the company. When we speak of nations' production, their GDP, this is the result of what is referred to as 'value-added' contributions from hundreds of thousands or millions of companies. Nations rarely go bankrupt or are absorbed. Companies, however, are constantly being established, bought, or closed down.

The value added of the world's biggest corporations is only on par with that of a developing country in Africa. Companies and nations are thus completely different institutions, with the former being smaller and more specialized, and also more easily mobile and less geographically tied.

Sandvik has its headquarters in Sweden and is an important company responsible for a few percent of the nation's exports. But its share of Sweden's value added is only tenths of a percent, although Sweden is a relatively small country. That is what even one of the world's major international industrial corporations looks like from the perspective of a small home nation.

Sandvik's employees who work in Sweden make up only about a fifth of the Group's total employee numbers, and the percentage is shrinking as the Group continues to expand in emerging markets. The proportion of sales in Sweden is only four or five percent of the Group's total. Both in Australia and South Africa, for example, more Sandvik products are sold than in Sweden. The majority ownership is indeed Swedish, and much would be required for institutions outside of Sweden to raise their ownership stake to above 50 percent. So that is how Sweden appears from the perspective of Sandvik's management.

Sandvik is one of the global companies that have developed since the 19th century and that increasingly thrive and work with knowledge and capital that transcend national borders. In particular, companies that began in small countries are breaking free of their national borders, just as Sandvik is doing.

What are Sandvik's biggest risks in the coming decades?

The new financial crises constitute a particular threat. Inventory cycles used to last two to three years. They created problems but these slowly got

Growing markets around the world are experiencing improved welfare and increased consumption. Sandvik's strategy includes an ever-greater presence in expanding markets.





sorted out. Today, the inventories of the world's industrial companies are low but something else has appeared instead: the financially driven crisis, which can be more dangerous and more unpredictable.

Two traditional risks are low-cost competition and a shortage of raw materials. Companies like Sandvik can only fight competition by maintaining a strong market presence, increasing productivity, and creating significant value for customers. In contrast, the supply of raw materials is less of a problem. Even the dependence on external tungsten producers has declined, because the new product area, Wolfram, has its own tungsten mine and a good grip on the recycling stage. The nickel price is certainly volatile, but Sandvik's higher level of value added means that the big nickel consumers are suffering more and earlier.

The energy side also faces risks linked to abrupt shifts in political policy. A combination of dogmatic belief and ignorance of the laws of physics and economics creates problems. For example, if it had not been for the politically motivated freeze in the energy sector in the 1980s, energy technology would have been two or three generations more advanced. Following the Fukushima catastrophe in Japan, some risk exists of new slowdowns to the expansion of nuclear energy.

With regard to potential political risks around the world, the Sandvik executives interviewed for this book express themselves diplomatically. The company does have large global operations and expects continued strong expansion in many emerging countries.

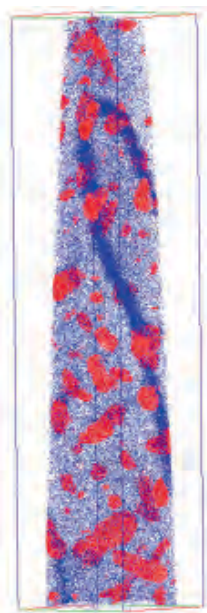
The only thing we know with a fair degree of certainty is that the development of the global market will once again be characterized by two huge new industrial nations. China has already surpassed Germany as the world's largest exporter, and Japan as the world's second-largest producer. India is coming along behind them. Together, China and India will soon account for a third of world production and consumption. Other highly populated countries are coming in their wake, such as Brazil, Indonesia, and Russia.

In the last third of the journey through time described in this book, Sandvik has acquired competitors and invested in a number of new research projects and market expansions. In the future, this transformation must be even faster and more responsive. There are also threats coming from the protectionist tendencies that now and again sweep across the world.

The transformation began with the crisis of the 1980s and continued during the financial crisis of the late 1990s. A constant increase in productivity has led machines to replace many of the manual jobs, but the engineers and business developers still remain.

Sandvik's knowledge clusters have become increasingly strong. They en-

As a result of Sandvik's long-term business commitment and strong presence in China, the Group is well placed to profit from the growth in consumption.



An atom-probe analysis of the Sandvik Nanoflex™ material, showing the microstructure in three dimensions with atomic resolution.

Sandvik is a high-technology engineering company that constantly develops products that give the customers greater value. Here, an alloy sample is examined in a scanning electron microscope.

compass patents, blueprints, and living knowledge about hundreds of thousands of advanced products made of high alloy steel, titanium, cemented carbide, and ceramics as well as highly sophisticated machinery and equipment. Each year, the Group launches a steady stream of new products, because advanced technology is perishable. What was new five years ago is everyone's property today.

The 150-year case study that is Sandvik shows how long business cycles are when they involve advanced technology, and demonstrates that it takes decades to establish market positions. Entrepreneurship is a constant and arduous learning process, and change is never ending.

Are employees part of the business concept? Are the products part of the business concept? Is market position part of the business concept? Is the organizational structure part of the business concept? The answer to all these questions is yes. Anything that a company can initiate that provides a competitive advantage will be a part of the money-making process.

President and CEO Olof Faxander has extensive experience in the steel industry and regards Sandvik's materials expertise as the key to success.

"It is only when this is transformed into added value for the customer that there will be profitability and the ability to survive. Sandvik survives on R&D but must never become so research heavy that it cannot get paid for its efforts", Faxander says.

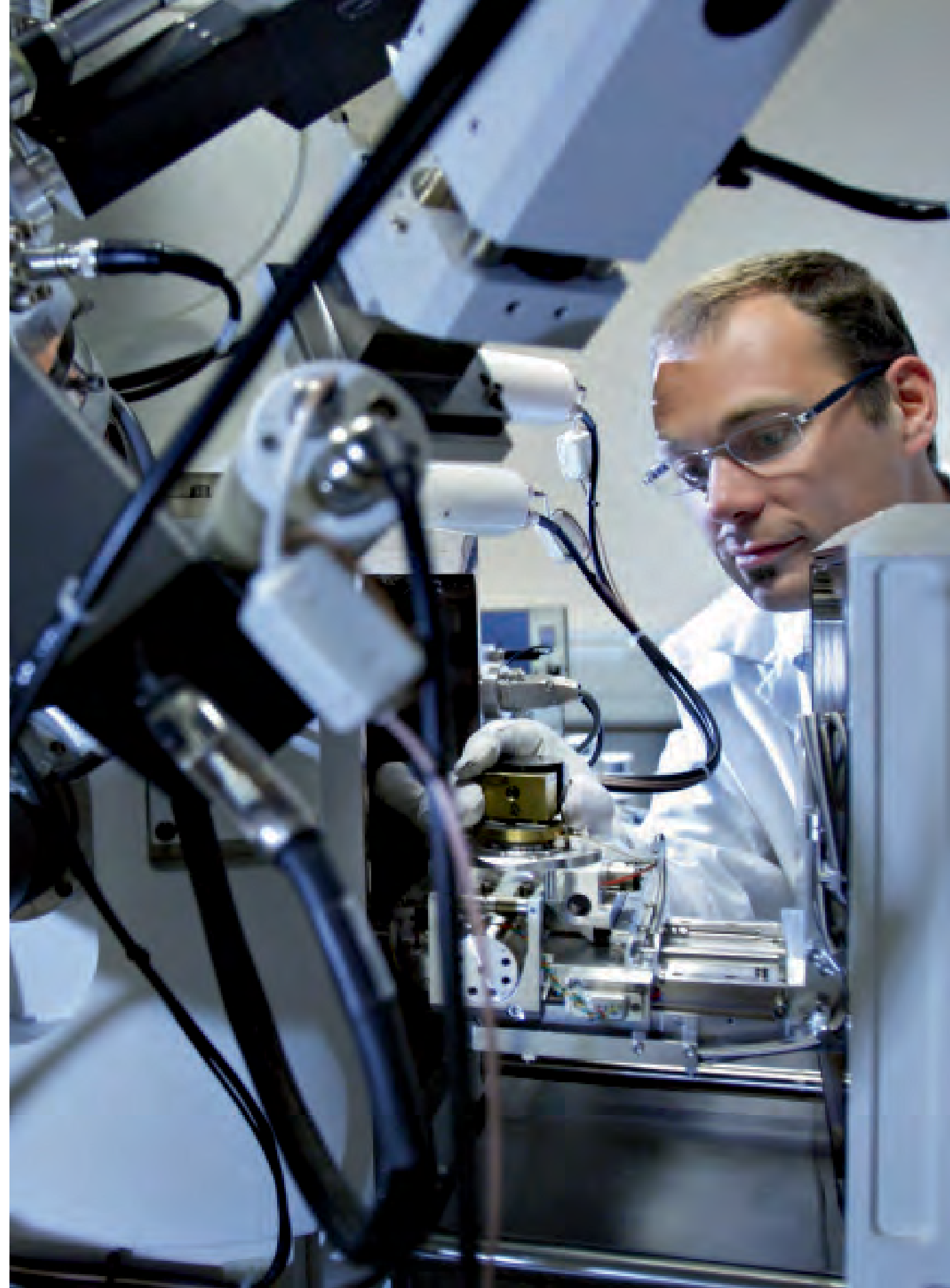
He wants to see a more agile Sandvik with even stronger growth in Asia and other expanding markets.

"I want to highlight the focus on patent protection that has characterized Sandvik since the 1940s," adds Chairman of the Board Anders Nyrén. "We must secure the income from our innovations, otherwise we cannot carry the weight of such large future investments."

What are Sandvik's financial needs for the future? The annual growth target is ambitious. Shareholders require a sustained high rate of return in order that investment in markets, acquisitions, and new technology can be made without the debt level creeping upward. Existing operations must yield 25 percent annually for the financial equation to balance. And, during the period up to 2024, growth must create new business volume as large as that created during the first 150 years. Such is the nature of exponential growth.

The company must not only defend its leadership in the technological fields that have previously been singled out. New ones must also be added on a regular basis. No technological field expands forever, and not all competitors can be prevented from entering. One or a few bastions will be abandoned.

We are talking about a company with a higher level of value added than



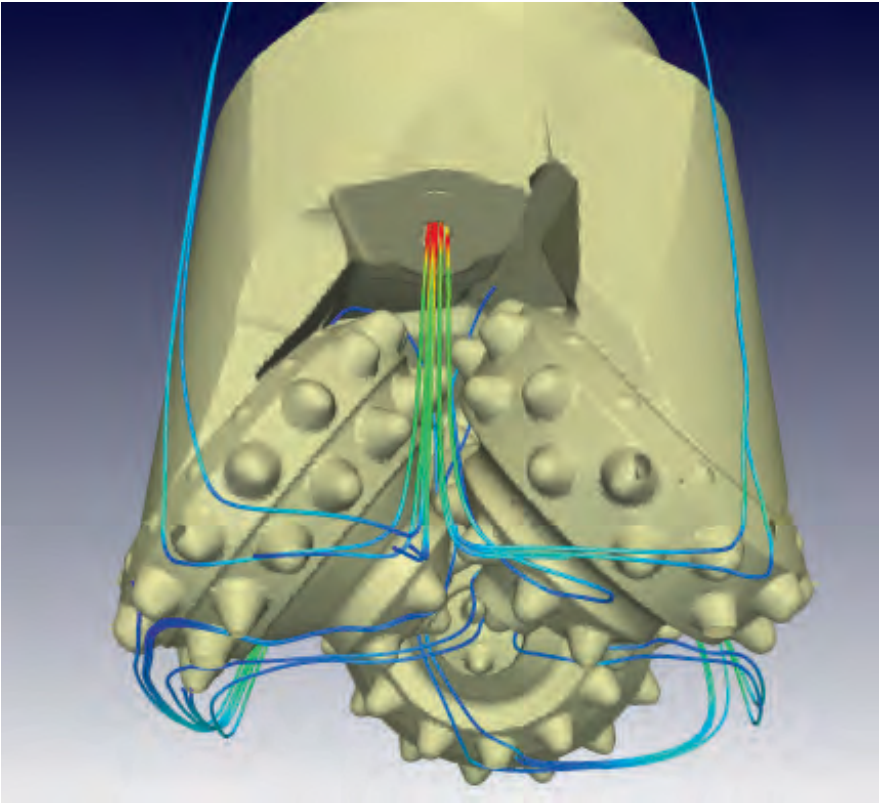
Sandvik is developing the next generation of rock-drilling equipment by simulating how the crushed rock in front of the tool can be removed more rapidly from the hole being drilled. This results in lower energy consumption and, in turn, more effective drilling.

nearly everyone else in the industry, a company that understands its customers' needs better than almost all its competitors. Such has Sandvik been in modern times, and such it must continue to be in an increasingly complex global economy.

There is thus every reason to be active. The company must maintain a major presence with local responsibility in all parts of the world. No market will remain protected against a prospective competitor, neither China nor Japan. Notwithstanding the high level of value added, production and logistics must still maintain the best efficiency that current technology allows. And this high level of value added requires a large proportion of direct sales to end customers. Otherwise, there is great risk of the customer deciding that other, less expensive products give equal value for money. The most expensive and highest value-added products on the market have a short 'best before' date. After five years, even a world innovation becomes an everyday product that volume manufacturers can master.

During a 150-year journey, it is not difficult to find examples of chance.

- * The founder, Göran Fredrik Göransson, went to London on another assignment when he bought part of Bessemer's patent, the foundation of the entire venture.



- * Management chose during crises, for example in the 1870s, not to 'milk dry' the existing production plants with various volume products for the domestic market.
- * The Göransson family of owners did not slow down the pace of major investments in the 1930s, not even in cemented carbide.
- * Management chose not to invest in the volume production of stainless steel sheet and plate.
- * By chance, Sandvik came in contact with a research department in the Swiss company Batelle that had mastered the technology of coating cemented carbide with an even harder surface.
- * Sandvik did not become a cash cow within Kinnevik, a growing IT and media group. New owners prevented this.
- * The board chose not to sell the rock drilling tools operation during the crisis in the 1990s.

These are just some examples. A company encounters these kinds of choices on a regular basis. Similarly, in a number of cases we have seen the owners or management make the wrong choices.

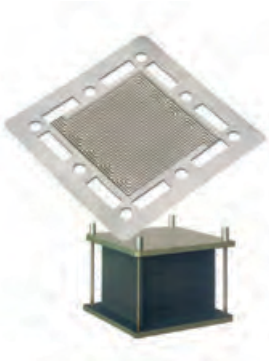
So far, this has been a remarkably successful corporate journey. If all goes well, it will continue to be characterized by good new choices of direction and development results.

Where will Sandvik's strong growth come from? There are clear favorable trends.

Developments in the energy sector influence several of the Group's business areas. Increased energy demand and the development of new energy recovery technologies favor Sandvik. The Group's customer offerings to the energy industry are extensive and increasing. Sandvik has great potential to exploit the growth in many different ways, ranging from advanced tubes to a wide variety of specialty products and materials. Some examples would be furnaces for solar cells, tools and technical solutions for the windpower industry, or products for flue gas purification. The key is to focus on the right products.

The trend toward new, lighter and stronger materials also favors Sandvik, because they are harder to process. Sandvik excels at developing tools that can better cut the kind of structures involved in these materials. Increasingly stringent safety and environmental requirements plus the desire for improved energy efficiency in various processes are examples of other trends that are driving demand for the Group's products in many different fields.

Sandvik's current business areas have evolved from the same environment and share similar business concepts. But apart from the organizational benefits, are there any technological advantages to keeping the Group as a single whole?



The area of fuel cells holds great promise for the Group.



It is never possible to say with certainty where the next focus area will come from— one that requires extra amounts of the Group’s resources and expertise. And, above all, there are areas, such as in the energy sector, that may require knowledge from several different business areas. A group such as Sandvik can quickly assemble project teams with broad expertise.

Finally, the Group’s advantages include the possibility of developing a joint infrastructure in communications, training, and sustainable development. A very large part of the knowledge and infrastructure is shared and can be funded jointly.

Wind power is another alternative source of energy whose importance will continue to grow. Sandvik has an extensive range of products and expertise in cemented-carbide tools and high-alloy materials which are essential to this area.

The 150-year history of Sandvik is also the story of how the world industrialized, that era when innovative ideas and methods first spread in full force out from their birthplace in Britain and Flanders. European nations like Sweden and Switzerland were particularly open to these new influences. Peripheral regions like Sweden’s northern Baltic coast were involved from the start, thanks to their wood and ore. It was there that Sandvik was born.

However, the most important nations soon became Germany and the United States, that vast country of immigrants that after the Civil War quickly assumed global leadership.

In the 1930s, it must have been universally believed that Sandvik was outdistanced by its German and American competitors, due to their huge domestic markets and protectionist policies. But Sandvik proved to be more open to international development and liberalization than its competitors outside Sweden. Not even Japan’s massive industrial expansion could slow down the Group’s growth and development.

Thanks to its strong focus on customer needs, a mature industrial enterprise from the geographical periphery could systematically expand and develop its range of product and service offerings. Sandvik has changed and evolved its base from being the refining of steel to becoming the knowledge of advanced materials and mechanical engineering, alongside extensive expertise about its clients’ processes.

In the course of a 150-year journey, a national company has been transformed into a global corporation.

SANDVIK'S TIMELINE

1855

The English inventor, Henry Bessemer, is granted a patent for a new process of producing steel: by blowing air through molten pig iron.

1856

The trading house of Elfstrand in Gävle, Sweden, acquires Högbo bruk and the Edske blast furnace at Hofors.

1857



Göran Fredrik Göransson travels to the UK to procure a steam engine for the Edske blast furnace. He acquires one-fifth of Bessemer's patent for a consideration of two thousand pounds and changes his business plans.

1858



On 18 July, the trials to produce steel utilizing the Bessemer process succeed at Edske.

1862

Högbo Stål & Jernwerks AB is founded on 31 January in Sandviken, Sweden, by Göran Fredrik Göransson and his associates.

1863

The canal is completed. A blast furnace and Bessemer converters are taken into production. One of the largest steam hammers in Europe and a rolling mill for tyres for railway wheels are installed.

1864

Sales are conducted through trading houses in Sweden, Norway, Denmark, the UK, Russia, Germany and France.

1866

Participation at the Stockholm exhibition. Högbo Stål & Jernverk and Göran Fredrik Göransson enter into receivership.

1868

The plant and equipment are acquired at the distress sale and the company is reconstructed under the name Sandvikens Jernverks AB (also called "Jernverket", the Ironworks). The Sandvik name is approved to mark steel bar. The oldest son, Anders Henrik Göransson, is formally appointed managing director of the company and the commercial capitalist Per Murén chairman.

1870

Anders Henrik Göransson travels extensively on sales trips and appoints agents in countries including Russia. Drill steel is used for tunneling operations in Switzerland.

1871

The Group's UK activities start through the import of the company's products by an agent in London and later in Birmingham.

1872

Jernverket participates in the Moscow Exhibition. Russia is the company's dominant market during the first half of the 1870s requiring railway material and bayonet steel.



1873

The earlier high demand in Germany slumps due to the financial crisis and a substantial bond loan is issued. Jernverket now has 440 employees.

1875



Important orders are secured from Swedish railway projects.

1876

Rolling of wire rod and cold-drawing of wire are started in Sandviken. Participation in the World Fair in Philadelphia, U.S. Sandvik is officially used as a brand name for the first time. A mill for drawing of wire is constructed and wire for the watch and clock-making industry is produced as well as for screws, bicycle spokes and springs.

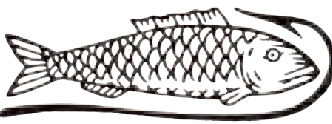


1877

Market prices are halved and chairman Per Murén injects capital to meet liquidity requirements.

1879

The Swedish national board of trade approves the use of the "Fish and Hook" trademark. Cold-rolled U-shaped wire for umbrella ribs is a best-selling product.



1880

Hot-rolling of strip steel starts in Sandviken.

1881

The new agent in France proposes production of various cold-rolled items, from corset springs to saw blades.

1883

Göran Fredrik Göransson becomes chairman. Production of cold-rolled and hardened strip steel is started.

1884

Agency in Germany.

1885

An agent is appointed in Italy.

1886

The new blooming mill is established. Jernverket's first hand saw is delivered.

1887

Sales to Japan commences. An agency is established in Switzerland

1888

Production starts of hot-rolled billets for seamless tube and pipe.

1890

Fire in the building complex for storing charcoal. Strip steel for gramophone springs becomes a best-selling product.



1891

New head office. The Group now has 1,120 employees.

1893

A mill for hot-rolling of wire rod, strip steel and tube billets is constructed in Sandviken.

1896

The first really good times since the start of the 1870s. 1,510 employees following recruitment efforts.

1897

Jernverket participates in the Stockholm Exhibition, Sweden. Customers and agents from around Europe visit Sandviken.

1898

Open-hearth furnaces using the Martin-process are installed. The Bessemer age has reached its summit.



1900

Göran Fredrik Göransson dies. His son, Anders Henrik Göransson, becomes the new chairman. He is already managing director.

1901



The shares of Sandvikens Jernverk AB are introduced on the Stockholm Stock Exchange.

1902



The Group starts to produce and deliver steel belts for conveyor installations.

1903

Large-scale electrification of operations is started and requires substantial investment.

1904

The Group opens contact with research scientists at Swiss watch and clock manufacturers through a partly-owned subsidiary.

1906

The employees in Sandviken form a section of the Swedish iron and metal workers' union.

1907

Production of hollow drill steel for rock-drilling is started.

1908

The steel melting plants are modernized. Four blast furnaces and six open-hearth furnaces are now in place. Ball-bearing steel is part of the product range.

1909

The general strike in Sweden is followed by a lockout. Production of razor blade steel is implemented and a holding acquired in a German manufacturer of razor blades. The first production outside Sweden is started: wire for pocket watches is produced at a majority-owned subsidiary in Switzerland.

1910

Anders Henrik Göransson passes away after 42 years as managing director. Tord Magnuson becomes the new president. Carl Wilhelm Sebardt takes up the position of chairman of the board.

1911

Billets for the re-rolling of tube and pipe are sold to the armaments industry in Germany and the UK. The hot-rolling mill is expanded. Orders are received for precision strip from a big typewriter manufacturer in Italy.



1914

The First World War breaks out. Foreign receivables are written off. Material for aircraft, ball bearings, gun carriage axles and weapon mechanisms are in high demand. Sandvik opens its first sales subsidiary in the UK.

1917

Tord Magnuson also assumes the role of chairman.

1918

The First World War ends. Record sales are reached due to hyperinflation. A UK subsidiary is established for conveyor belts.

1919

Jernverket's first subsidiary in the U.S. is established with an office on Manhattan in New York. A new forging mill is built in Sandviken, equipped with a large hydraulic press.

1920



Electric melting in an induction furnace is introduced. Karl Fredrik Göransson becomes managing director.

1921

Sales decline 65% during the financial crisis. The unemployed workers request the use of their pension savings as hardship money. The first loss is recorded since 1868. Production of stainless steel is started.

1922

Lidköpings Vikingsågar is acquired. Jernverket participates in the Peace exhibition in Tokyo, Japan.

1923

A subsidiary is established in Paris, France.

1924



The first seamless tubes made of stainless steel are introduced in the market. A decision is taken in favor of a new tube rolling mill due to the demand from the chemical industry.

1926

A subsidiary is set up in the U.S. for the production of watch and clock springs. Another subsidiary is founded in Montreal, Canada, and a sales company is established in South Africa. Investments are made in a blooming mill as well as in mills for the hot rolling of tube, cold rolling of strip and drawing of wire.

1927

Sandviken becomes a municipality.

1928

Managing director Karl Fredrik Göransson starts subsidiaries. One is founded in Poland. The company in Stuttgart, Germany, comes under majority ownership

1929

Karl Fredrik Göransson also shoulders the role of chairman. The first electric arc furnace is taken into operation. Investments are made in cold-rolling mills.

1930

The substantial level of new investments forces the board to emit a new share issue in the amount of SEK 4 M.

1931

Investment is made in the partly owned Krångede hydroelectric power station. The first stainless steel conveyor belt is delivered. A jointly owned sales company is established in Argentina.

1932

Modernization is completed of the hot-rolling operations. A company is founded in Madrid, Spain. Fagersta develops cemented-carbide products.



1933

A separate building for the electric melting of steel is built. In Gothenburg, the first of six Swedish sales companies is founded. A company is established in Finland.

1934

The Group is the first in Europe to perform pilgering of tubes on an industrial scale. A subsidiary is founded in Denmark.

1935

Worldwide protectionism closes traditional markets for Jernverket's products.

1937



The Southern works for wire and saw production is taken into operation in Sandviken. Jernverket turns 75 and now has subsidiaries in Argentina, Canada, Denmark, Finland, France, Norway, Poland, Switzerland, Spain, the UK and the U.S.

1938

A saw blade production plant is acquired in Italy.

1939

The Second World War starts. Jernverket is now forced to reorganize production and to mainly direct itself to the domestic market in Sweden.

1942

The Coromant brand name is established following collaboration with KF's Luma-lampan. Cemented carbide-tipped integral drill steels are being developed.

1943



The first cemented-carbide tools for metal cutting are manufactured. Subsidiaries in Italy and Finland start their local production. Sandviken becomes a town.

1944

An investment program is prepared for the post-war years. Integral drill steels are utilized by customers.



1945

The Second World War ends. Exports' share of production increases to 37%. Iron ore from the company's mine in Bodås near Sandviken. Sales organizations in Germany and southern Europe destroyed by the war. Assab (Associated Swedish Steel AB) is founded with other steel companies for sales in distant countries.

1946

Cutting tools are sold in Finland and Poland. Sales of rock tools expand considerably. Financial reasons force a postponement of portions of the post-war investment program.

1947

Production of Bessemer steel is closed in Sandviken. Long-term agreements regarding rock tools are finalized between Sandvikens Jernverk and Atlas Diesel. The concept "the Swedish method" makes its breakthrough in rock drilling. Own production of cemented carbide is initiated.

1948



A part-owned plant for the production of integral drill steels is established in South Africa. Erik W Forsberg becomes managing director.

1949

A new company is set up in Germany. A subsidiary is founded in São Paulo, Brazil.

1950



Extension rods are developed for deep-hole drilling. The hot-rolling mill for strip steel and new works for tube production are taken into operation. Modernization of the production facilities in Sandviken initiated.

1951

Production of cemented-carbide products is started in Gimo, Sweden. Workers from countries outside Sweden are recruited to Sandviken. Rock tools production is started in Montreal, Canada. Sales companies are established in Schiedam, the Netherlands and in Milan, Italy. A sponge iron plant and a new rock tools workshop are built in Sandviken.

1953

The cemented-carbide production plant Coromant-fabriken, in Västberga, Stockholm, Sweden, is completed. Production of cutting tools starts in Fair Lawn, NJ, U.S. The rock tools plant in South Africa wholly owned.

1954

A new blooming mill is taken into operation in Sandviken. Rock tools account for all of the Group's profits when Steel, which accounts for 70% of sales, performs poorly.

1955

The Gammax turning tool, with a mechanically clamped insert, is developed and becomes a door-opener for tool sales.

Tools start to be marketed by the major subsidiaries. The U.S. subsidiary moves to new offices and production plants at Fair Lawn, NJ, U.S.

1956

Gimo concentrates on standard tools. The first computer is used in Sandviken. A machine is constructed for reaming tool holders for turning tools. Various special machines are designed for the production of cemented-carbide inserts.

1957



Wilhelm Haglund becomes new vice president of production. A new share issue is completed. The T-Max tool holder (picture) is presented in the U.S. Sandvik has developed a method of producing indexable inserts more cheaply than its competitors. Triumphant progress for Coromant cutting tools and for the manager Sven Wirfelt. The Indian Prime Minister Nehru visits Sandvik in Stockholm, Sweden (picture). The German subsidiary moves to new premises in Düsseldorf. Production of rock tools starts in Brazil.



1958

The Göransson family's role as dominant owner is taken over by the Stenbeck family in conjunction with the new share issue. The T-Max technology with indexable

cemented-carbide inserts and their tool holders, is introduced by Sandvik in Europe. The UK subsidiary moves to newly constructed offices and production facilities in Halesowen near Birmingham. Wilhelm Haglund new managing director.

1959

A larger new, electric arc furnace is installed. A strong management team is established in support of the newly elected managing director Wilhelm Haglund. "No more redundancies!" becomes the motto. Sandvik has a substantial lead in indexable inserts in Europe. The See plant in Sandviken that produces cold-drawn tubes and products manufactured from tubes, such as sports equipment, is acquired.



1960

The blast furnaces are closed. Big investments are planned in Sandviken: Tube mill 60, Press mill 62, Tube mill 63, Pilger mill 64, Cold-rolling mills 61, 63 and 64, Electric arc furnace 64, Hardening plant 65 and Tube mill 68. Two extrusion presses are of substantial importance for seamless stainless steel tube. A new grade of stainless steel for spring wire is launched. The market for hacksaw blades grows sharply. The Indian company Sandvik Asia (shareholding 60%) is established and a plant is constructed. Production units also built in Mexico and Brazil.

1961

The Knux turning insert is introduced and becomes a top-seller for over thirty years. Jernverket invests in new sales subsidiaries of its own in countries like Mexico and Australia. A regional office is located in Japan. A large investment in research and development is marked by King Gustaf VI Adolf inaugurating a facility for steel research in Sandviken (picture).



1962

A plant is opened in Brazil for both cutting tools and rock tools. The Group celebrates its centenary. The extrusion presses commence production in Sandviken and replace hot-rolling of tube. Coromantfabriken in Västberga has now been extended. Edge honing of cemented-carbide inserts is put into operation. Italian subsidiaries are merged in Milan. A subsidiary is founded in Warsaw, Poland.

1963

The share of exports regains pre First World War levels: 77%. The company develops cladding tubes made of zirconium alloys for the nuclear power industry and stainless razor blade steel. Low-carbon stainless steel is developed for the pulp and paper industry. Subsidiaries are founded in Barcelona, Spain, and in Vienna, Austria.

1964



Specially designed Sandvik saws are utilized when stone sculptures from the Abu Simbel Temples in Egypt are moved in conjunction with the construction of the new Aswan dam

at the beginning of the 1960s. The Group's employees now number over 12,000 following expansion outside Sweden. The first double-belt presses are delivered to the process industry. Subsidiaries are founded in Oslo, Norway, and in Ndola, Zambia.

1965

Conveyor belt production in Fellbach, Germany. Cemented-carbide plants are acquired in Germany. The ejector drill with brazed cemented-carbide inserts is an innovation in long-hole drilling. Subsidiaries are set up in Lisbon, Portugal, in Spreitenbach, Switzerland, in Manila, the Philippines, and in Wellington, New Zealand. Thin, stainless steel wire is developed for pacemakers.



1966

Sandvikens Jernverk has become an international group. Net sales are allocated as follows: Europe 66% (of which, Sweden 18%), North and South America 23% and finally Africa, Asia and Australia 11%. U-bent stainless steel tubes with very long lengths are delivered to steam generators in the nuclear power industry. The company is invited to produce cladding tubes in Kennewick, WA, U.S., in partnership with an American producer of nuclear fuel. In Sweden, rock tools plants are under construction for button bits and extension rods. In Halesowen, UK, cutting tool production is in the process of being expanded. The plant in Fair Lawn, U.S., doubles in size. Rock tools production is started in Australia. Companies are founded in Turkey, Chile, Peru and Malaysia. A campaign is initiated in Sweden to recruit women for the purpose of reducing the existing labor shortage.

1967

Arne Westerberg becomes managing director and Hugo Stenbeck is elected chairman of the board. The Sandvik Group is used as a concept for the first time in the annual report. The Parent Company now has 40

subsidiaries, of which 20 are production companies. Sales encompass 100 countries. In Mexico, production of cutting tools and rock tools is started. In Sydney, Australia, a plant is established for the production of rock tools. Companies are formed in Hong Kong and Venezuela. The word "steel" is removed from the names of the subsidiaries. A new clamping system for turning with negative inserts is produced: the T-Max P.

1968

The Group's annual sales exceed SEK 1 billion. The "Sandvik cutting data bank and data check" is introduced. T-Max tools for threading. Extension rods are fully carburized. Composite tubes for the pulp and paper industry. A regional warehouse is established in Singapore. A subsidiary in Thailand. Sandvik implements calculated depreciation in its annual reports.

1969



Sandvik is first in the world with surface-coated cemented-carbide inserts – Gamma Coating. New tools are produced for numerically controlled machines. The first cemented-carbide tools are sold to the Soviet Union. Steel-belt conveyors becomes a separate product area with head office in Fellbach, Germany. A subsidiary is set up in Singapore.

1970



Sales of cemented-carbide products account for 40% of the Group's sales.

A new steel grade is introduced for surgical needles (picture). Sandvik's free-cutting steel finds multiple uses in the mechanical engineering industry. Guldsmeshytte Bruk is acquired to supply pig iron. A trading company, Santrade, is formed in Switzerland with a subsidiary in the Netherlands. Companies are founded in Bogotá, Colombia, and in Nairobi, Kenya.

1971

The first Coromant school is started in Düsseldorf. Indexable inserts are produced with new geometries and chip breakers already at the sintering stage. Milling tools are introduced for processing aluminum in engine and gearbox components. Sandvik's rock drills are used for driving the world's longest road tunnel through the Saint-Gotthard Massif in Switzerland. Easy-to-handle extension rods are developed. Substantial orders from European nuclear power plants, and orders for hydraulic tubes in titanium for the supersonic aircraft Concorde. Steel operations in the U.S. move to Scranton, PA, where production of stainless steel tube and industrial springs starts. Outside Montreal, Canada, a cemented-carbide plant is built, primarily for studs to winter tires. The French company Safety is acquired – a manufacturer of cemented-carbide cutting tools.

1972



Roller bits are put into use for open-pit mining of ore. The company name is changed to Sandvik AB from Sandvikens Jernverks AB. Technical consulting in the field of cutting tools is organized under Coromant Multi Service. The new, unique, close-pitched milling cutter, the Sandvik Auto, gains a widened market in the automotive industry. The ejector drill is equipped with

a deep-hole-drilling cutter head with indexable inserts. Stainless flapper valve steel for compressors undergo further development. The new Sandflex hacksaw blade is practically unbreakable. The Sandvik 2000 Super-Cut hand saw improves cutting performance. Investments are made in advanced mainframe computers. A wire drawing mill is acquired in Barcelona, Spain, as is a plant for producing cemented carbide in Argentina.

1973

Sandvik acquires 65% of all shares in the Seco Tools group. The British company Wickman Wimet is acquired with units in Coventry, Featherstone, Glasgow and Nuneaton in the UK as well as units in South Africa. Sandvik now has 57 subsidiaries. The Odex eccentric drilling equipment is launched for drilling through difficult soil conditions to solid rock.

1974

A record year following the first oil crisis. Two plants for welded stainless steel tubes are acquired in the UK and Germany. Tubes for ethylene furnaces are developed for application in high-temperature processes. Ferro-nickel alloys are produced for use in relays and switches in the electronics industry.

1975

A new organization with four divisions. A new, high-strength steel is developed for oil sources located at great depth in difficult corrosive conditions with high temperatures. Stainless steel and alloy welding products such as strip electrodes and filler wire achieve significant success for pressure vessels used in the nuclear power industry. The Conveyor division delivers steel belts to customers in Japan for the automated sorting of goods. Wire drawing mills are being constructed in Spain and Brazil. The Saws and Tools division initiates a series of acquisitions and builds a new head office.

1976

Particle-board presses based on steel-belt pressing plates are developed. Production of cemented carbide is started in Semine, Japan. A sales company is founded in Kobe. The Group's European distribution center for tools in Schiedam, the Netherlands, is inaugurated by the King and Queen of Sweden.

The head office of the subsidiary in France is relocated to Orléans. Advanced computer technology is implemented in order processing, warehouse and production management as well as for financial reporting. Disston, an American consumer tool company, is acquired. The wire plant is opened in Brazil. The first short-hole drill with cemented-carbide inserts, T-Max U, is produced.



1977

The turnkey sale of a cemented-carbide plant to the Soviet Union is completed. Over 90% of sales are made on markets outside Sweden. The inserts in rock drills increasingly replaced by cemented-carbide buttons. Raise-boring heads with a diameter of two meters. A new grade of steel for tubes in refineries. Strip steel of chromium grades for sharp-edged tools. A plant for welding electrodes is established in the U.S. The head office in Canada is relocated to Mississauga, Ontario. Strip steel is rolled into textured steel for springs to safety belts in cars.



1978

Sales of cemented-carbide products now comprise half of Group sales. The Spooner company, which operates in the food-

processing industry, is acquired by the Conveyor division. A subsidiary is founded in Ireland. Small button bits are introduced which constitute the first step towards disposable drill bits.



1979

Lennart Ollén is appointed president and Arne Westerberg becomes chairman of the board. A decision is taken to erect a continuous casting plant in Sandviken. Partnership in Uddeholm Strip Steel. Kosta in Germany is acquired for holding tools. Acquisition of the UK company Osprey.

1980

Acquisitions include acquiring a majority holding in the French firm Eurotungstene, and five smaller companies. A new pilger mill is built for heavy-duty seamless tube in Sandviken. Block Tools, a system for rapid tool changes in turning is introduced, as is Varilock, a modular tool-holding system for rotating tools. The first unit of Sandvik Rotoform is developed for pastillization of liquid chemicals, such as sulphur, to solid form (picture). A plant for tool holders is established in Mebane, NC, U.S. A subsidiary is founded in Taipei, Taiwan.



1981

A substantial decline in sales leads to the restructuring and closure of units as well as a reduction in the number of employees

by more than 2,200 people. Sandvik Coromant launches the Delta Drill, which has a significantly higher capacity than conventional spiral drills. Sandvik Coromant introduces DD, direct distribution, from the central warehouses to the customers in Finland and Poland. A new material comprising cemented carbide and steel, Cast-in-Carbide, is presented for rolls in wire-rod-rolling in the steel industry. Umbilical tubes are developed for the oil and gas industry. Sandvik becomes part-owner of a steam generator manufacturer in Arnprior, Ontario, Canada. Continuous casting of steel starts in Sandviken. A subsidiary is set up in Zimbabwe. Open-hearth production with the Martin process is discontinued in Sandviken, thereby marking the end of all ore-based steel production. Scrap iron replaces ore as raw material.



1982

Many divestments are made of companies and units, primarily in Saws and Tools as well as in Process Systems, including parts of Disston. Even Eurotungstene is in the process of being divested. Fagersta's production of drill steel is taken over. A joint venture company is established with Fagersta for welded stainless steel tube. The first of Sandvik Coromant's Training centers (later termed Productivity centers) is inaugurated in Halesowen, UK.

1983

A dramatic year. Göran Ahlström becomes managing director and presents a new decentralized organization for the Group. Skånska Cementgjuteriet succeeds Kinnevik as principal owner of Sandvik. A new board is elected and the CEO of Asea, Percy Barnevik, becomes chairman of the board. Restructuring and divestments are performed in the organization also outside of Sweden.

The first loss in 62 years is recorded. The long-term holding in the Krångede hydroelectric power plant is sold to rescue the cash flow. A number of companies and plants are closed. Saws and Tools production in Sandviken is relocated to Bollnäs and Edsbyn among other sites. Inserts of cubic boron nitride and ceramic are introduced.



1984

Per-Olof Eriksson is appointed new managing director. The new decentralized organization is implemented with seven separate business areas, regional companies and service companies. Avesta Sandvik Tube (Sandvik 25%) and Fagersta Stainless (Sandvik 50%) are established in conjunction with the restructuring of the Swedish specialty steel industry. A new generation of tools for thread turning is introduced: the T-Max U-lock.

1985

Some partly owned cemented-carbide companies and Spooner are sold. A new, duplex steel is developed, SAF 2507, with applications including the manufacture of umbilical tubes for the oil and gas industry. A representative office is opened in Beijing, China.



1986



The 100th anniversary of the Sandvik hand saw. Investments are made in insert pro-

duction worldwide: a total of 45 production units now exist within Coromant tools. A new cemented-carbide grade, Dual Properties, is introduced for button bits. A new stainless steel for the production of methanol is launched. Seco Tools temporarily becomes a wholly owned subsidiary prior to flotation on the stock exchange. A share split of 4:1 is made.

1987

Seco Tools acquires its competitor Carboloy in the U.S. with more than 1,200 employees. Sandvik Hard Materials starts production of ceramics for individually-made dental crowns. Acquisitions are made in the cemented-carbide field in Denmark, Belgium and the U.S. The company in Arnprior, Canada, becomes wholly owned. The acquisition is completed of Sterling Tubes in Walsall, UK.

1988

Cemented-carbide drills are developed for the electronics industry. Q-Cut, a new generation of tools for parting and grooving is introduced. A manufacturer of down-the-hole equipment, Mission in the U.S., is acquired. A number of other acquisitions are completed including Metinox in the UK, for medical products in stainless steel. An internal bank operation and holding company is started in the Netherlands with a subsidiary in Switzerland.

1989

Investments in Eastern Europe start. A distribution center for cemented-carbide products is established in Kentucky, U.S. Cooperation with Atlas Copco in the rock tools area is terminated. A new generation of milling inserts, New Wave, records strong commercial success. The Impero tool company in Italy is acquired. A drawing mill for stainless steel wire is acquired in Mjölby, Sweden, as are file plants in Finland and the UK.

1990

Introduction of the modular tool system Coromant Capto for turning, milling and drilling. A Spanish cemented-carbide producer in Barcelona is acquired. In Japan, a new head office is inaugurated in Kobe. The subsidiary in Korea fully owned.

1991



The acquisition is completed of Bahco Verktyg, with production in Sweden, Germany and Argentina. Operations are integrated in the Saws and Tools business area. Sandvik's cemented-carbide mineral tools are utilized in the project for tunneling under the English Channel. A range of stainless steel grades with enhanced machinability is launched under the name Sanmac. Investments are made in Russia. Subsidiaries are founded in Hungary, the Czech Republic, Slovakia and Bulgaria. A major special tool unit is acquired in Schmalkalden, in Germany.

1992



Sandvik acquires 25% of the Finnish producer of rock-drilling equipment, Tamrock. The manufacturer of high-speed-steel tools, CTT Tools, is acquired from SKF and includes units in Sweden, the UK, France, Italy, Germany and the U.S. A decision is made to build an extrusion press in Scranton, U.S., in joint ownership with Sumitomo of Japan. The Tailor Made concept is launched by Sandvik Coromant for rapid delivery of tailor-made products to customers.

1993

The Sandvik Tooling business area is formed. Cemented-carbide rotary cutters are introduced in the production of diapers and other sanitary products. A range of ergonomic hand tools is created, primarily adjustable wrenches, screw drivers and pliers as well as a new handsaw with more efficient teeth. The subsidiary Sandvik China is founded in Beijing. A 5:1 share split

is performed. A joint venture company in wire drawing is started in Brazil. The Sandvik Nanoflex™ material is developed for eye surgery and electric shaver heads and is later utilized in many new medical and environmental engineering applications.



1994

Clas Åke Hedström president and CEO. Sandvik first in the world to produce diamond-coated carbide cutting inserts on an industrial scale. Russia's largest cemented-carbide plant, MKTC (picture) is acquired. A joint-venture for cutting tools, Sandvik Baildonit, is established in Poland. A plant for cemented-carbide tools is inaugurated in Langfang, China. A Czech plant in Chomutov is acquired for the production of precision tubes.



1995

The CoroMill product range is developed, which gives rise to an entire family of tool solutions for various milling areas. CoroKey, a new concept for the launch of indexable inserts, is presented. Ultra-fine-grain grades of cemented-carbide powder are developed for blanks to circuit board drills in the cellular phone industry. A representative office is opened in Vietnam.

1996

Sandvik acquires 42% of Kanthal and 49% of the Finnish company Tampella, parent company to Tamrock which is already partly owned by Sandvik. The Group becomes principal shareholder of Sandvik Choksi Tube, India, for the extrusion and finishing of seamless tube. Acquisition of the French tube manufacturer Precitube is completed.

A new stainless steel, Safurex, is developed for the synthetic fertilizer industry.



1997

A stock redemption of SEK 4 billion is completed. The Swedish investment company Industrivärden becomes the new major owner of Sandvik. Sandvik becomes the majority shareholder in Kanthal (picture). Sandvik acquires all shares in Tamrock with 5,000 employees, primarily in Finland, Austria, the U.S., Chile and Australia. The company presents the world's largest underground loader, the Toro 2500. Precision Twist Drill, an American manufacturer of high-speed-steel drills, is acquired as well as the steel distributor RGB in the UK. Collection of used cemented-carbide inserts for recycling of cobalt and tungsten is started. A new cold-rolling mill is opened in Sandviken. A new type of indexable inserts for turning, Wiper, is introduced to improve productivity and the surface finish. A new organization with three major business areas from 1998: Sandvik Tooling, Sandvik Mining and Construction, and Sandvik Specialty Steels. The minor business areas: Sandvik Saws and Tools, Sandvik Process Systems, and Sandvik Hard Materials remain independent.

1998



CoroMill 390, a new milling cutter with indexable inserts, is launched. Sandvik Coromant implements direct distribution to customers via central warehouses in Sweden, the Netherlands, the U.S. and later Singapore. Rationalizations, integra-

tions and divestments are performed in the new business area Sandvik Mining and Construction and the number of employees is reduced by 15%. A new tube mill is taken into production in Sandviken. Acquisitions include the German company Poppe&Potthoff's production of stainless steel precision tube and MRL Industries in the U.S., which manufactures furnace elements for the electronics industry. A joint-venture company in rock-drilling equipment is founded in Korea. Subsidiaries are established in Slovenia, Greece, Rumania, Ukraine, Bolivia and Ghana. Approximately 1,000 IT (information technology) specialists are now employed by Sandvik.

1999

Sandvik divests the Saws and Tools business areas and focuses the business on three core areas: Sandvik Tooling (Sandvik Coromant, Sandvik CTT and Sandvik Hard Materials), Sandvik Mining and Construction (Sandvik Tamrock, Driltech Mission, VA-Eimco and Roxon) and Sandvik Specialty Steels (Sandvik Steel, Kanthal and Sandvik Process Systems). The remaining shares in the Polish tool manufacturer Baildonit are acquired. Cemented-carbide tools for the production of aluminum cans are developed. CoroCut, a new system for parting and grooving is launched. Operations in Argentina are concentrated to San Justo. A representative office is opened in Bosnia and Herzegovina.

2000

Acquisitions include an Austrian drill rig manufacturer, the German steel belt manufacturer Hindrichs-Auffermann and the Australian company Beltreco, active in servicing the mining industry. Production of cemented-carbide powder in Stockholm is relocated to Gimo, where also a new plant for tungsten carbide is built and the manufacturing of solid-carbide tools expanded. The capacity for tool holders in Mebane, NC, U.S., is doubled. A subsidiary is founded in Croatia.

2001

An investment in the mechanical extraction of gold and platinum ore is made using Icutroc, a new method developed by

Sandvik. Automation and remote control of mining machinery is tested in mines in Canada and Sweden. The concept is named AutoMine. New grades of steel for wirelines, with wire lengths of several kilometers, are developed for the oil and gas industry. High-alloy tubes with fins on the inside are introduced for the production of ethylene within the plastics industry. A new Asian distribution center for Sandvik Coromant opens in Singapore. A stock redemption program is approved by the AGM. Crushing and sorting operations are acquired from Svedala Industri. Agreement is reached with the U.S. company Smith International to set up a jointly owned company for roller bits. Production of seamless tubes is closed down in the UK but increased in the Czech Republic for the oil and gas industry. A majority shareholding in Brazilian tool manufacturer Hurth Infer is acquired. The holding in the manufacturer of individually-made ceramic dental crowns Procerasandvik is sold. The remaining shares in the Indian company Sandvik Choksi are acquired. The shareholding in the Indian subsidiary Sandvik Asia is increased. The Chilean mining service company Bafco Minería y Servicios is acquired. Sandvik becomes one of five partners in the e-commerce site Endorsia.

2002



Clas Åke Hedström is named new chairman after Percy Barnevik, who is appointed honorary chairman. Lars Pettersson becomes new president and CEO. Wire production in Mjölby and manufacture of wear parts in Denmark are shut down. Sandvik Mining and Construction closes units in Nafta and concentrates production to Alachua, FL, U.S., and Burlington, ON, Canada. The acquisition is completed of the

North American tool company Valenite. The first acquisition in Japan is made through the purchase of the Toyo brand in the mining and construction industry. Sandvik Tamrock develops drill rigs and loaders for extremely narrow mine drifts for customers mining platinum. A majority shareholding is acquired in the German tool manufacturer Walter AG.



2003

The Sandvik Specialty Steels business area changes name to Sandvik Materials Technology with five product areas: Tube, Strip, Wire, Kanthal and Process Systems. Walter launches Tiger Tec, a new range of cemented-carbide inserts with a two-colored surface treatment as wear indicator. In Shanghai, a plant is started for the manufacture of processing systems and steel press plates and, in India, a plant for the assembly of mobile crushers. Sandvik Tooling inaugurates a new R&D center for materials development in Stockholm. The manufacture of cemented-carbide tools in Westminster, SC, U.S., is expanded while smaller production units are closed. Divestment is made of two units for the production of mining machinery in the U.S. Certification is completed of the first Productivity center unit within Sandvik Coromant.

2004

A program comprising surface technology products is launched: Santronic for the electronics industry and Decorex for consumer goods design purposes. A number of acquisitions are made in the cemented-carbide field, in countries including Germany. A majority shareholding in a Brazilian materials-handling company is acquired. A new distribution center is inaugurated for Sandvik Materials Technology in Venlo, the Netherlands. Technical Tooling in the U.S., a producer of tools for the manufacture of aluminum cans, is also acquired. A plant is started in Tychy, Poland, for the production of coal-mining machinery. Kanthal develops the production of high-temperature alloys

via powder metallurgy. Extensive training is initiated in Sandvik's core values (Open Mind, Fair Play, and Team Spirit).

2005



The new GC 4225 cemented-carbide grade becomes the world's best-selling grade. Acquisition of a minority share in a Chinese producer of cemented-carbide powder. China has become Sandvik's tenth-largest market measured in invoiced sales. A new generation of short-hole drills with indexable inserts, CoroDrill 880. Cemented-carbide powder is produced with a grain size under one micrometer. Teflon-coated precision wire has cardio surgery applications and composite wire performs key functions in pacemakers. A stock redemption of SEK 4 billion. Sandvik Smith becomes wholly owned. A review is performed of the Group's nine drawing mills for stainless steel wire with the objective of halving the number. A subsidiary is founded in Serbia.

2006



Australia has now become the third-largest market in the Group. A new generation of jumbo drilling rigs (picture) is introduced, equipped with a computer system for data regarding drilling conditions and diagnosis of the need for service. A new grade of steel is developed for heat-exchanger tubes in high-chloride environments, for example in refineries. Titanium is launched as a part of the Bioline product range for the manufacture of implants. The Finnish powder metallurgy company Metso Powdermet is acquired. A 5:1 share split performed of the Sandvik share. Production of cemented-carbide inserts in the U.S. is concentrated

to Westminster, SC, while production in Fair Lawn, New Jersey, is closed. In the UK, two workshops for special tools are closed. Tool production at Sandvik Tooling in Italy, Brazil and China is expanded. In India, a drill plant is built in Pune and a unit for recycling cemented carbide in Chiplun. Four companies are acquired within mineral exploration: Swedish-Japanese company Hagby-Asahi, SDS Corporation and UDR Group in Australia (picture), and the Chilean company Implementos Mineros.



2007

Cemented-carbide tools with integrated high-pressure cooling are launched. Kanthal develops gas burners for industrial furnaces. Sandvik Coromant's investment in Application centers starts in Stuttgart, Germany. New Insert Generation, a substantial range of newly developed products, is introduced for turning, milling and drilling. Walter opens a new plant for cemented-carbide inserts in Münsingen, Germany. Sandvik Coromant expands special tool workshops in Germany and the U.S. In Barcelona, Spain, Sandvik Hard Materials opens a new plant. Acquisitions are made of companies in the medical technology field in the U.S. and of Doncasters Medical Technologies in the UK. Diamond Innovations, a North American producer of tools using synthetic diamonds and boron nitride is another acquisition. During the year, the hardest form of cubic boron nitride produced thus far is introduced. Acquisitions include Australian companies in the mining and construction sectors as well as UK-based companies, Extec and Fintec, active in the manufacture of mobile crushing and sorting equipment. Divestments include Sandvik Sorting Systems, the French company Sandvik Tobler and holdings in companies producing welded tube. Subsidiaries are founded in Mali and Mongolia.

2008



Gobal financial crisis. Substantial cutbacks are made in staffing, production capacity and costs due to an extremely weak market trend and global overcapacity. The tool CoroThread, with a unique locking system for the insert, is launched for thread turning applications. Finally, after a hundred years of lead-alloyed steel for small watch components, environmentally-friendly lead-free steel has been developed (picture). Material is launched for fuel cells. Sandvik Tooling expands production capacity in Japan. New plants are started in Wuxi, China. A major assembly plant for mining machinery is inaugurated in Santiago, Chile, by the President of Chile. A research center for advanced alloys is constructed in Pune, India (picture). Acquisitions include the companies Teeness (anti-vibration tools) in Norway, Aubema (crushing equipment) in Germany, Corstor (supplier to the exploration industry) in South Africa and Eurocut (medical technology) in the UK. Office and warehouse are established in the Democratic Republic of the Congo. The Sandvik Calamo tube plant in Sweden is divested. A subsidiary is founded in Algeria.



2009

Sandvik's order intake and invoicing decrease by 30% during the global recession and the Group records its third ever loss-making year. Consolidation of the number of manufacturing units, reduction of inventory levels, cutbacks in staff numbers and reduced working hours are implemented. A Tooling engineering center is opened in India. Sandvik Mining and Construction notifies of the closure of thirteen units,

but inaugurates assembly plants for mining equipment in Jiading, Shanghai, China, and in Vespasiano, near Belo Horizonte in Brazil. The UK tool producer BTA Heller Drilling Systems and the Austrian tungsten producer Wolfram Bergbau und Hütten are acquired. Wolfram becomes a product area within the Sandvik Tooling business area and launches an ultra-fine grain grade of tungsten-carbide powder for micro drills in the electronics industry. The CoroMill 316 exchangeable-top end mill is introduced. A major order is secured for steam generator tubes to China. A subsidiary is founded in the United Arab Emirates. A new unit for pilgering and finishing of stainless steel tube is constructed in Zhenjiang, China (picture), in conjunction with a service center for precision strip.



2010



Anders Nyrén from Industrivärden becomes chairman of the board. Demand increases. Staff on a short working week revert to normal hours. A strategic collaboration is established within metal powder technology with Carpenter Technology. Kanthal is integrated into the new product area, Sandvik Wire and Heating Technology. Major investment in tube production in Chomutov, Czech Republic, and in Sandviken. Large orders for umbilicals to the oil and gas industry and large additional supplier agreements for steam generator tubes to the nuclear

power industry. China is now Sandvik's fourth-largest market. Investments in a new production facility in Svedala for crushers and in a new distribution center in Europe for spare parts to the mining and construction industries. Building commences in Newcastle, Australia, of the largest unit thus far for manufacture, assembly, distribution and aftermarket service to the mining industry. Sandvik Coromant develops products for growing industrial segments such as aerospace and wind power.

2011



Olof Faxander becomes the new president and CEO of Sandvik on 1 February. A long-term research and development collaboration is initiated with the Vasa Museum in Stockholm, which entails delivery of specially designed stainless steel bolts to preserve the 380-year old ship-of-the-line, Vasa (picture). A joint venture is started with a Chinese company for the production and sale of mining machinery in the Chinese market. Acquisition is made of a company in the crushing and sorting industry in China. A number of substantial supplier agreements are signed in regard to cladding tubes for the nuclear power industry, and are followed by decisions to expand production capacity in Sandviken. A new strategy is established focused on core businesses, growth markets and streamlined internal processes. A new organization with a market focus is decided with more active control of operations. Three business areas become five: Sandvik Mining, Sandvik Machining Solutions, Sandvik Materials Technology, Sandvik Construction and Sandvik Venture. A decision is made to move the group's head office from Sandviken to Stockholm. A process is initiated for divestment of the area within Sandvik MedTech that works with implants and instruments. In November,

a recommended public offer is made to the minority shareholders of Seco Tools in order to acquire all remaining shares in that subsidiary. In December, Sandvik holds an Extraordinary General Meeting and completes the offer to the minority shareholders of Seco Tools and resolves to transfer the registered office of the Board of Directors from Sandviken to Stockholm.

2012

The new organization comes into force on 1 January. Sandvik celebrates its 150th anniversary on 31 January.

APPENDIX

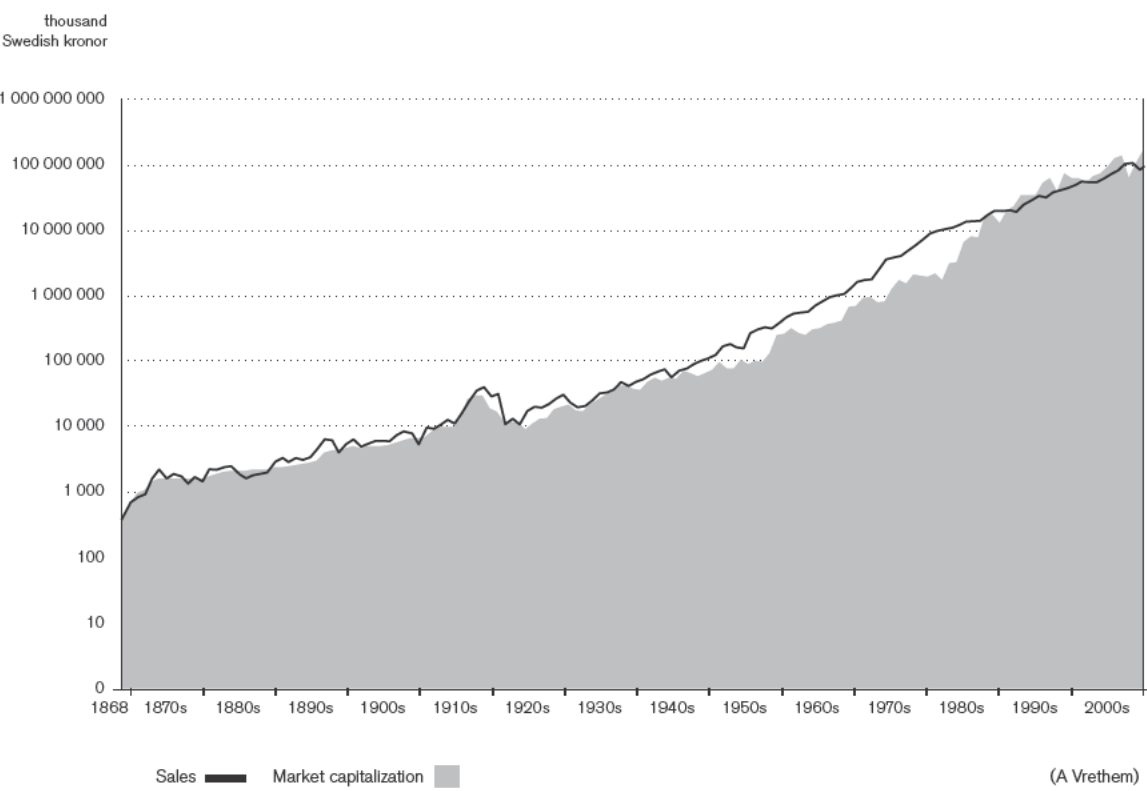
CHAIRMEN OF THE BOARD

Per Murén	1868–1883
Göran Fredrik Göransson	1883–1900
Anders Henrik Göransson	1900–1910
Wilhelm Sebardt	1910–1916
Tord Magnuson	1917–1929
Karl Fredrik Göransson	1929–1959
Gustaf Söderlund	1959–1967
Hugo Stenbeck	1967–1976
Ragnar Sundén	1976–1979
Arne Westerberg	1979–1983
Percy Barnevik	1983–2002
Clas Åke Hedström	2002–2010
Anders Nyrén	2010–

PRESIDENTS

Anders Henrik Göransson	1868–1910
Tord Magnuson	1910–1920
Karl Fredrik Göransson	1920–1948
Erik W. Forsberg	1948–1958
Wilhelm Haglund	1958–1967
Arne Westerberg	1967–1979
Lennart Ollén	1979–1983
Göran Ahlström	1983–1984
Per-Olof Eriksson	1984–1994
Clas Åke Hedström	1994–2002
Lars Pettersson	2002–2011
Olof Faxander	2011–

SALES AND MARKET CAPITALIZATION 1868–2010 (logarithmic scale)



Sandvik's long-term diagram detailing invoiced sales and market capitalization is interesting for several reasons.

The first is the distinct correlation between the company's invoiced sales and its market capitalization. When both curves diverge from one another, it is either due to optimism or pessimism on the stock market or that the profit margin in the company is above or below the level that prevailed earlier. It is clearly visible how optimism and the temporary profits made during World War I created an extreme situation and how

the profitability problems and pessimism in the 1950s resulted in the company being undervalued, with a subsequent recovery in the 1980s.

Another interesting observation is the impact of inflation on the perceived performance of the company. The period of inflation during World War I and after World War II gives the impression that the company was more dynamic than it actually was at the time. Conversely, the period of price stability before World War II and from the 1990s conceals a strong expansion in real terms.

The main conclusion to be drawn is that shares in a company with a sustainable business concept represent a solid insurance, not only in times of inflation.

FINANCIAL HISTORY 1868–2011

SANDVIKENS JERNVERK AB—the first hundred years until 1962.

Note 1

Year	Invoiced sales SEK 000s	Change compared with preceding year %	Result after tax, SEK 000s	Percentage of invoiced sales, %	Market capi- talization, SEK 000s	Dividend yield, %	Number of employees
1862–67							100–200
1868	130		55	42	430	12	
1869	700		130	19	640	1	
1870	900	29	220	24	980	13	290
1871	1 000	11	218	22	1 070	14	310
1872	1 730	73	490	28	1 400	17	380
1873	2 330	35	465	20	1 630	14	440
1874	1 770	-24	304	17	1 700	14	510
1875	2 000	13	208	10	1 670	9	510
1876	1 840	-8	166	9	1 680	9	560
1877	1 440	-22	120	8	1 650	5	520
1878	1 800	25	79	4	1 630	4	490
1879	1 750	-3	98	6	1 660	5	510
1880	2 340	34	192	8	1 760	6	610
1881	2 290	-2	236	10	1 900	6	630
1882	2 500	9	260	10	2 040	6	660
1883	2 590	4	208	8	2 130	5	740
1884	2 140	-17	97	5	2 120	4	670
1885	1 730	-19	112	6	2 140	3	690
1886	1 900	10	112	6	2 180	3	690
1887	2 010	6	76	4	2 180	3	770
1888	2 110	5	111	5	2 230	3	830
1889	3 020	43	248	8	2 410	5	970
1890	3 420	13	81	2	2 380	4	1 080
1891	2 980	-13	199	7	2 490	4	1 120
1892	3 420	15	161	5	2 560	4	1 120
1893	3 190	-7	206	6	2 670	3	1 140
1894	3 530	11	161	5	2 740	3	1 150
1895	4 670	32	376	8	3 010	4	1 290
1896	6 440	38	1 008	16	3 880	4	1 510
1897	6 200	-4	653	11	4 310	4	1 670
1898	4 210	-32	372	9	4 490	4	1 570
1899	5 490	30	366	7	4 680	4	1 750
1900	6 360	16	486	8	4 990	4	1 930
1901	5 010	-21	194	4	4 700	4	1 840
1902	5 500	10	391	7	4 910	6	1 820
1903	6 050	10	612	10	5 000	4	1 990
1904	6 120	1	545	9	5 080	4	2 030

Year	Invoiced sales SEK 000s	Change compared with preceding year %	Result after tax, SEK 000s	Percentage of invoiced sales, %	Market capi- talization, SEK 000s	Dividend yield, %	Number of employees
1905	5 990	-2	376	6	5 160	4	2 050
1906	7 300	22	604	8	5 550	4	2 280
1907	8 270	13	657	8	6 200	3	2 280
1908	7 770	-6	568	7	6 560	3	2 270
1909	5 440	-30	160	3	6 510	3	1 930
1910	9 630	77	635	7	6 930	3	1 960
1911	9 210	-4	798	9	8 310	7	1 990
1912	10 510	14	1 190	11	9 910	4	2 040
1913	12 290	17	1 960	16	9 900	5	2 240
1914	10 960	-11	1 370	13	9 600	5	2 260
1915	15 680	43	2 680	17	13 700	4	2 470
1916	22 540	44	3 610	16	26 400	3	2 500
1917	33 040	47	5 200	16	28 800	4	2 420
1918	39 360	19	2 900	7	28 800	5	2 550
1919	29 990	-24	2 040	7	19 200	8	2 560
1920	31 170	4	1 130	4	16 800	6	2 640
1921	10 720	-66	-550	-5	12 000	6	2 290
1922	12 980	21	310	2	12 000	6	2 160
1923	10 770	-17	560	5	11 500	5	1 630
1924	17 620	64	860	5	9 100	8	2 660
1925	20 190	15	1 060	5	11 000	8	2 940
1926	19 820	-2	1 010	5	13 000	6	3 020
1927	22 100	12	1 400	6	13 400	7	3 110
1928	26 810	21	1 740	6	18 200	5	3 510
1929	30 500	14	2 150	7	19 900	5	4 000
1930	23 250	-24	1 350	6	21 300	5	4 000
1931	19 780	-15	830	4	17 600	5	3 690
1932	20 830	5	990	5	16 600	6	3 480
1933	25 040	20	1 040	4	21 300	5	3 500
1934	31 900	27	3 110	10	24 800	5	3 920
1935	32 200	1	2 400	7	28 800	4	4 170
1936	36 000	12	2 580	7	33 600	4	4 500
1937	46 600	29	3 430	7	42 000	4	4 700
1938	39 900	-14	2 890	7	41 000	4	4 800
1939	46 500	17	2 650	6	36 400	4	5 300
1940	51 500	11	3 680	7	36 000	4	5 500
1941	59 400	15	2 580	4	46 500	4	5 900
1942	66 500	12	2 170	3	55 000	4	6 300
1943	70 900	7	2 990	4	49 000	4	6 300
1944	55 600	-22	2 090	4	53 800	4	5 800
1945	68 600	23	3 170	5	53 000	4	6 070
1946	81 700	19	3 390	4	69 000	4	5 870

Year	Invoiced sales, SEK 000s	Change compared with preceding year, %	Result after tax, SEK 000s	Percentage of invoiced sales, %	Market capitalization, SEK 000s	Dividend yield, %	Number of employees
1947	94 800	16	3 150	3	63 000	4	6 170
1948	106 000	12	3 010	3	56 400	5	6 450
1949	115 700	9	3 710	3	64 100	4	6 500
1950	129 000	11	5 210	4	73 500	4	6 600
1951	170 700	32	6 220	4	93 200	4	6 740
1952	187 000	10	5 540	3	73 800	5	6 890
1953	170 600	-9	5 980	4	75 200	5	6 720
1954	165 400	-3	5 340	3	101 400	5	6 670
1955	200 000	21	6 470	3	89 400	5	6 800
1956	231 000	16	7 070	3	100 200	5	6 880
1957	245 000	6	7 167	3	96 000	5	6 860
1958	236 000	-4	5 630	2	130 400	5	6 200
1959	276 000	17	6 830	2	242 400	3	6 820
1960	355 000	29	9 120	3	249 000	3	7 910
1961	423 000	19	12 400	3	304 200	3	8 980
1962	424 000	0	10 700	3	267 700	3	9 010

SANDVIK GROUP—the most recent 50 years 1962–2011

Note 2

Year	Invoiced sales, SEK M	Change compared with preceding year, %	Result after financial items, SEK M	Percentage of invoiced sales, %	Market capitalization, SEK M	Dividend yield, %	Number of employees
1962	536	4	19	4	268	3,3	11 500
1963	550	3	16	3	247	3,6	11 800
1964	681	24	42	6	293	3,0	12 300
1965	791	16	75	9	311	3,5	13 600
1966	906	15	56	6	356	3,0	15 100
1967	962	6	45	5	372	3,6	14 900
1968	1 070	11	74	7	403	3,8	15 100
1969	1 340	25	133	10	660	2,3	16 600
1970	1 600	19	212	13	688	3,0	18 200
1971	1 690	6	147	9	903	2,3	18 800
1972	1 740	3	71	4	932	2,2	19 100
1973	2 390	37	200	8	774	3,5	22 600
1974	3 380	41	456	13	801	3,9	26 600
1975	3 670	9	501	14	1 240	2,9	26 900
1976	3 910	7	356	9	1 640	2,4	27 900
1977	4 520	16	469	10	1 460	3,1	27 400
1978	5 410	20	460	9	2 030	2,5	28 300
1979	6 640	23	604	9	1 950	3,3	30 100
1980	8 150	23	749	9	1 840	4,5	32 000

Year	Invoiced sales, SEK M	Change compared with preceding year, %	Result after financial items, SEK M	Percentage of invoiced sales, %	Market capitalization, SEK M	Dividend yield, %	Number of employees
1981	8 870	9	530	6	2 070	4,6	31 700
1982	9 310	5	68	1	1 670	5,7	28 600
1983	10 100	8	-776	-8	2 970	2,6	25 700
1984	11 300	12	940	8	3 070	3,1	24 000
1985	12 600	12	1 610	13	6 340	2,1	23 900
1986	12 700	1	1 680	13	7 720	2,4	24 000
1987	13 200	4	1 910	14	7 370	3,0	24 400
1988	16 400	24	2 850	17	16 000	2,0	26 200
1989	18 800	15	3 070	16	16 000	2,5	26 900
1990	18 300	-3	2 840	16	12 400	3,8	26 400
1991	17 600	-4	1 780	10	18 700	2,6	25 300
1992	17 200	-2	1 490	9	22 500	2,3	25 600
1993	21 800	27	1 760	8	32 300	1,9	27 600
1994	25 300	16	3 810	15	33 100	3,2	27 600
1995	29 700	17	5 620	19	32 300	5,2	29 900
1996	28 300	-5	4 450	16	51 200	3,5	30 400
1997	34 100	20	4 210	12	58 500	3,1	38 400
1998	42 400	24	3 940	9	36 500	5,0	37 500
1999	39 300	-7	5 470	14	69 300	3,0	33 900
2000	43 800	11	5 800	13	58 700	4,0	34 700
2001	48 900	12	5 610	11	58 200	4,2	34 800
2002	48 700	-0	5 060	10	50 400	5,1	37 400
2003	48 800	0	4 190	9	64 200	4,2	36 900
2004	54 600	12	6 880	13	70 600	4,1	38 400
2005	63 400	16	8 820	14	87 800	3,6	39 600
2006	72 300	14	11 110	15	118 600	3,3	41 700
2007	86 300	19	13 000	15	131 700	3,6	47 100
2008	92 700	7	10 580	11	58 100	6,4	50 000
2009	71 900	-22	-3 470	-5	102 000	1,2	44 400
2010	82 700	15	9 410	11	155 500	2,3	47 100
2011	92 300						49 500

Note 3

Note 1: Sandvik developed strongly as a group in the 1950s. However, consolidated accounts were not prepared before the early 1960s. Only one measurement of profit was available in the external accounting records: Net profit for the Parent Company, meaning the result after tax. Information relating to invoiced sales, profit and number of employees up until 1962 pertains only to the Parent Company, which covered nearly all operations in Sweden and nearly all production. Invoiced sales specifies sales to the global market less deductions for provisions to own sales companies and agents. (In 1862–67,

the Sandviken operations were included in Högbo Stål och Jernwerks AB and only very little information regarding personnel is available for this period.)

Note 2: Consolidated accounts were introduced in the early 1960s. Reliable information about the Group is available from 1962 onward. If the 1962 values in the two tables are compared, we can see that invoiced sales for the Parent Company amounted to SEK 424 M, while the corresponding figure for the Group was SEK 536 M. The Parent Company's result after tax was

SEK 10.7 M while the Group's result after financial items, that is, before appropriations and tax, totaled SEK 19 M. The number of employees in the Parent Company was 9,100, with the figure being 11,500 for the Group.

Note 3: Invoiced sales and employees based on the situation at 30 September 2011; invoiced sales added together for the most recent four quarters.

Compiled by Anders Vrethem and Magnus Larsson, Sandvik.

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