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# Nippon Yakin Kogyo

## Eighty years of stainless steel

Japanese stainless steel manufacturer Nippon Yakin Kogyo was established in 1925. In 1935 the company first manufactured 18-8 stainless steel and has been one of the leading stainless steel manufacturers ever since. We visited the company's headquarters in Kawasaki and talked with President Mr Yoichi Saji.

By Michael van Wijngaarden

In the past few years the Nippon Yakin Kogyo Group, or NYK, has gone through an extensive re-organisation programme. This programme was aimed at achieving sustainable development in the face of worldwide competition, which is set to become more intense in the future. For this purpose NYK consolidated its affiliated companies such as the Oheyama plant, which produces raw material.

### TOTAL PRODUCTION

Now that the re-organisation programme is reaching its end NYK is capable of producing its stainless steel products through a total production system. This system covers every step of the process, from the smelting of ferro-nickel ore to the manufacturing and processing of finished stainless steel products. Through the Yakin Oheyama plant the company produces granulated ferro-nickel. Ore ships transport nickel ore from countries such as the French territory of New Caledonia and Indonesia. The Yakin Oheyama plant smelts the raw ore through what is known as the "Oheyama method" using an immense rotary kiln to produce ferro-nickel, the base raw material for stainless steel. Mr Saji: "This production process guarantees the stable supply of raw material for the production of nickel containing alloys. Our steel making plant in Kawasaki uses all of the ferro-

nickel produced in Oheyama. The Kawasaki plant is responsible for developing and manufacturing the group's products and houses a wide array of facilities including a melt shop, a hot rolling shop, a cold rolling mill shop, a plate shop, and a large diameter pipe shop." One piece of equipment the company is especially proud of is the NCH hot rolling mill, recognized as one of the top mills in the world. It is capable of producing 2.5m wide quarto plates through its rougher mill as well as 1m wide, 2.0mm thick coils and five-foot wide coils through its finishing mill.

A second crucial aim of the re-organisation programme was to transform the company's product portfolio from standard grade stainless steels into the production of high performance alloys and high value added materials. To achieve this NYK invested heavily in modernising its hot rolling mill mentioned earlier. Mr Saji: "After starting the reform programme in 1996 we invested 35 billion Yen (250 million Euro) for the construction of the mill and 27 billion Yen (195 million Euro) for the support equipment. The high-alloy materials now account for 35 per cent of total sales, as opposed to only a few per cent before the re-organisation. NYK has the ambition to expand this number even further, to 50 per cent or higher in the next three years, by investing another 17 billion Yen (123 million Euro).

The production increase that we have achieved enables us to supply high-grade materials at a competitive price and to reasonable delivery times."

#### MANUFACTURING TECHNOLOGY

To foster an increase in the production of high-grade materials, Mr Saji further explained, NYK needed to develop a new production technology that also meets the customers' quality demands. This brings us to the company's five core manufacturing technologies.

produce massive quantities of high quality purity steels. We can also supply the material for high-definition grade brown tube shadow masks by using the mass production continuous casting process. Our company is the number one manufacturer in this market. I am proud to say that we received the "John Chipman Award" from the Iron & Steel Society (ISS, currently AIST, Association for Iron & Steel Technology). It is an award for our morphology controlling technology of non-metallic inclusions. The award recognises excellence and originality in the application of scientific principles in the production and processing of iron and steel and it was the first time in 50 years for a general specialty steel company to acquire this prize."

The second core manufacturing technology that Mr Saji mentioned is the continuous casting process for high nickel alloys. In order to realise a high productivity, all products are manufactured through a continuous casting process similar to that of conventional stainless steel. For a high-alloy continuous casting process it was necessary to develop the original powder for mould lubrication. Applying this technology for the production of alloys containing active elements such as titanium, aluminium and niobium has made it possible to produce about 60 types of high alloys through a continuous casting process. Mr Saji: "We have a distinctive temperature and composition control furnace before the next step in the production process, the two vertical continuous casting machines. These facilities enable us to precisely control the addition of those active elements and set the optimum temperature for the continuous casting of slabs."

Thermo-mechanical treatment is the third core manufacturing technology of NYK. The hot rolling process takes place in a multifunctional Steckel type mill which is adapted to hot roll many kinds of high alloys. Together with the progress that has been made in the steel making process over the years, the combined heat treatment technology and mechanical working process enable NYK to closely control the production process and achieve very distinctive material properties. The reason for this is that the technology offers many possibilities in the homogenisation and strengthening of the alloys. An important side effect of the hot rolling equipment is that it heavily cuts back energy consumption so that NYK has already achieved the targeted reduction from the Kyoto Protocol.

# Co., Ltd

## manufacturing

The first one is a refining process that guarantees high-purity alloys. According to Mr Saji, NYK has developed the original technology to control the inclusions morphology. By using the maximum of 80 tons per heat in the AOD or VOD process NYK is able to realise an alloy quality, with regard to inclusion control, that is comparable to alloys manufactured by a conventional vacuum induction furnace or VAR. Mass production of high-grade alloys is now possible by defusing the inclusions,

### 'NYK is capable of producing its products through a total production process.'

precisely controlling the composition of non-metallic inclusions and lowering the melting point of the inclusions by combining the consecutive hot rolling and cold rolling process technologies. Mr Saji: "We have already successfully applied this technology for the production of stainless steel and high-performance alloys, enabling us to

#### Facts & figures

The estimated total sales volume is about 330 thousand tons per year, which amounts to 121 billion yen (158 billion-yen consolidated). The estimated ordinary income is 15 billion-yen (17 billion yen consolidated). In 2004 NYK has achieved an all-time high sales and profit figure. NYK has accomplished its target of 10% or over for return on sales. It will not pursue an expansion in the production volume, but will focus on the value added high-grade products to compete in the worldwide markets. The 900 employees of Nippon Yakin Kogyo Co., LTD. and 2000 employees of consolidated companies aim to co-operate with society and its customers as a high profit company that makes sustainable growth possible. NYK will target at over 7% of ROA and 30% of ROE in order to maintain operating as a stable business entity.

The fourth core manufacturing technology is the development of corrosion resistant materials and of surface treatment technologies. Mr Saji: "The corrosion resistance of alloys and steels is strongly influenced by the surface quality of the base material and of the welded parts. Our R&D department has always achieved significant results in the development of corrosion resistant technologies. Also, quite exceptionally, the R&D department developed a surface treatment technology that guarantees high corrosion resistance. We have supplied the material for a number of very large soy sauce tanks, for example, that are made of super austenitic stainless steel. The surface treatment improved corrosion resistance to assure food safety."

### 'We can offer distinctive after sales services to the customers.'

The fifth core manufacturing technology is welding of high nickel alloys. These alloys are applied as a structural material, which poses more challenges than standard grade materials in case of welding the same alloys or different material grades. Mr Saji: "We started to develop new welding techniques taking welding materials such as welding rod as the starting point. This

enables us to develop new welding technologies every time we face a new problem. Furthermore we have an affiliated company that manufactures welding machines, and we supply high-grade welding technologies to the customers. As president of the company I believe in this way we can offer distinctive after sales services to the customers."

#### CUSTOMER RELATIONS

Talking about sales, Mr Saji explained that NYK has been quite successful in marketing the 60 high-performance alloys on the basis of a step-by-step marketing approach. By interviewing technical divisions, planning divisions and getting in close contact with the higher echelons of its customers NYK has negotiated custom-made supply programs covering quality levels, price and delivery times. As part of the after-sales service NYK also discuss expected future material problems in relation to the customers' production schedule. The result of this has been the development of a number of valuable inspection techniques, such as one for the soy sauce tanks mentioned earlier. With the combined production and supply planning as well as the after sales services NYK is building up long-term customer relations.

#### SUSTAINABLE

Building up long-term relationships is not the only goal of the company though. Mr Saji feels NYK also has a tremendous responsibility regarding the company's environmental impact and its role in society.

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He explained that his company puts importance in helping to build a sustainable society and developing in co-existence with society by being conscious about recycling and fighting the global greenhouse effect. "The shift towards producing high performance alloys has been a major step in safeguarding the environment. Even though the initial cost of these alloys is generally higher the number of applications is growing because of the material's life cycle cost benefits. These high-class materials offer long life and low maintenance to our customers and at the end of their application lifetime they can be fully recycled. We believe that the accomplishment of our structural reform will be widely accepted by the general public in view of the environmental benefits."

Mr Saji: "The structural reform obviously affects NYK's capital investment but that the future of the company depends on facing the problem and fighting it by continue to develop technological innovations. These innovations relate to on-site energy saving technology, for instance by investing in extensive equipment renovations, and conversion to clean energy. We have already achieved the targeted reduction level in the first Kyoto Protocol but we are determined to go further and keep the level of our life-cycle inventory at the highest in the world. In the future we will therefore improve our product range by also upgrading the standard 304 and 316 grades. This will provide our

customers with superior, high-quality products." Summarising, Mr Saji said that in the face of world-wide competition NYK will continue to grow by effectively using its five core manufacturing competencies and its traditionally superior managing technologies. "We feel we can be competitive by concentrating on our distinct business and using our strengths. What sets us particularly apart is that we manufacture our products from ferro-nickel, which is the dominant material source for producing nickel based stainless steel and nickel based high-alloys. This year we will celebrate the 80th anniversary of the foundation of our company and we are proud of being able to go ahead with new developments under the new company structure." ■

**Production facilities:**

Yakin Oheyama plant: ferro-nickel smelting, 13,000 tons of nickel per year

**Yakin Kawasaki:**

integrated plant for stainless steels and nickel alloys

**Products:**

Plate, sheet and strip