Sumitomo Metal Industries distinguishing itself through rapid progress

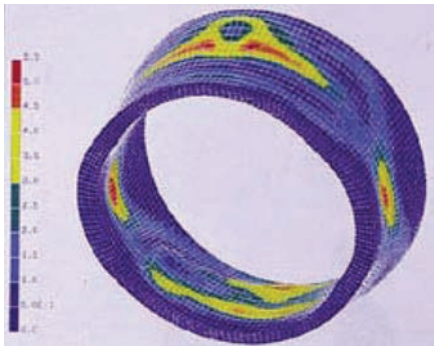
It is some time since Stainless Steel World's last visit to Sumitomo Metals Industries (SMI) in May 2009, so we were very interested to know what developments have been taking place in the company since then. The answer is quite a lot. We met with Mr. Shigemitsu Kimura (Section Manager, Specification and Quality Control Section, Steel Tube Works), Mr. Junichi Higuchi (Technical Manager, Specification & Quality Control Section), Mr. Hiroshi Matsuo (Technical Manager, Specification & Quality Control Section), and Mr. Hiroyuki Hatanaka (Manager, Specialty Tubular Products Sales Department), who were pleased to update us on SMI's main areas of focus and the latest advances the company has made in these fields.

By Kiyo Ichikawa and Gillian Kersley

Research and development at SMI

Creep test facilities in corporate R&D laboratory

Mr. Kimura was keen to tell us what SMI are doing to further their Research and Development strategy. "To show you how seriously we take R&D," he says "the SMI corporate R&D laboratories employ a great number of leading professional industry researchers and contain various state-of-the-art testing facilities to cover all aspects of steel-making processes, product applications, as well as fundamental research. Additionally we are now building a new R&D centre that will be completed in May 2012. It is a large-scale nine storey renewal project: five storey above ground and four below. It also includes a laboratory. It has been designed to have an open-plan environment to allow engineers and researchers to depart from their traditional, hierarchical relationship in favor of an open, interactive one in which new ideas can be exchanged and material development enhanced". According to Mr. Kimura the new facility will house around 650 employees and will be highly environmentally friendly, with a low-energy consumption.



Finite element analysis example

The new main building of SMI corporate R&D laboratory

Mr. Kimura continues: "Part of our research and development strategy is to collaborate with, and support, academic organizations not only in Japan but also in the USA and Europe in such areas as the reduction to radiation exposure in nuclear power plants. At the same time we are developing a suitable next generation product. Reducing worker exposure to radiation is something that we at SMI are particularly dedicated to." The ISOE (Information System of Occupational Exposure), a joint committee of IAEA and OECD, awarded SMI's development of tube film coating technology a prize in April 2010, for preventing metal elution and thus reducing radiation exposure. "It's the first time that a materials manufacturer has been awarded an engineering prize." he proudly states.

The oil industry and SMI

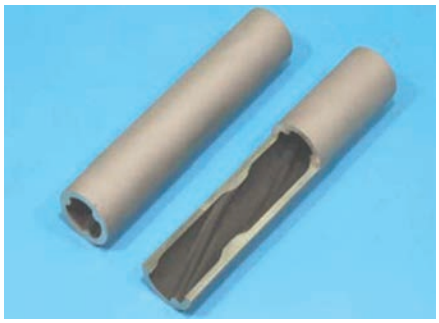
In answer to the question what SMI are doing to keep their customers happy in this specific market, Mr. Higuchi replies: "In this field, we supply a variety of materials from common austenitic stainless steel (such as TP304, TP316) to high grade nickel-based alloys. Furthermore we are developing our own materials and specific-shaped products for certain applications."

"Being SMI, we are always on the lookout to further improve our products using the technological knowledge and feedback we acquire on a daily basis from our clients. A common concern of clients is that they need grades that can withstand the intensely corrosive environments found in synthetic gas plants, for example methanol, ammonia and hydrogen, and gas-to-liquids production plants. Metal dusting, a type of corrosion resulting from catastrophic carburization or graphitization of steels and alloys occurring in a carbonaceous atmosphere, is a prominent cause of corrosion damage for high-temperature materials. This catastrophic wastage due to metal dusting is a more severe problem than carburization because it seriously decreases the service life of the materials used as a high-temperature component. One of the most common techniques to prevent metal dusting is to form a protective oxide scale on the alloy surfaces. However, once any defects occur in the oxide scale, carbon dissociated from the carbon monoxide molecule diffuses into the metal matrix through the defects. We conducted laboratory metal dusting tests and field tests in a commercial synthesis gas plant for a new nickel-based alloy containing copper, Sumitomo 696 (UNS N06696, ASME Code Case 2652). The hybrid-suppression technique of this alloy has been proven to be effective through laboratory and field tests, and we consider it to be the best nickel-containing grade in the 600 alloy series for a synthesis-gas environment. Furthermore, SMI is developing an economical, slightly lower grade material – an anti-metal-dusting steel-based alloy, for use in this sector," Mr. Higuchi tells us.

Another new nickel-based alloy, Sumitomo 845 (UNS N06845), has been developed for other corrosive conditions. This material has exceptional corrosion resistance in both reducing acid (HCl, H_2SO_4) and oxidizing acid (HNO_3).In these severe conditions nickel-based alloys such as N10276, N06022 are usually used. Sumitomo 845 has equivalent corrosion resistance with these alloys and is more cost-effective. In addition, this alloy has excellent resistance not only for general corrosion, but also for localized corrosion and has good mechanical properties and weldability as well. Sumitomo also consult with customers about the difficulties they experience with metals and troubleshoot them by advising customers how to select the most suitable materials. "By doing this", he adds, "we can not only expand our services and help to customers but at the same time amass useful statistical information to develop other future alloys for both the domestic and overseas market."

347AP furnace tubes in hydro-cracker

Regarding their 347AP grade (UNS N034751, ASME Code Case 2196-1), Mr. Higuchi explains that this is a material that has been used in Japan since the 1990s and is particularly suitable for Hydrotreaters and Hydrocrackers in refineries. Global requirements for sulfur content in fuel oils have become more stringent, whilst the quality of crude oil will decline in the coming years, as resources are depleted. To solve these issues, upgrading Hydrotreater and Hydrocracker will become commonplace. Mr. Higuchi adds: "We would like to supply 347AP on a worldwide basis using our accumulated service data from the domestic market. In order to facilitate this, we have increased the availability and international standardization of 347AP." Mr. Higuchi agrees that 304 and 316 will remain important but stresses that SMI's development and sales of highly corrosion-resistant materials will separate it from other companies, raise its brand image, and demonstrate its technological potential.



Advanced three finned tubes

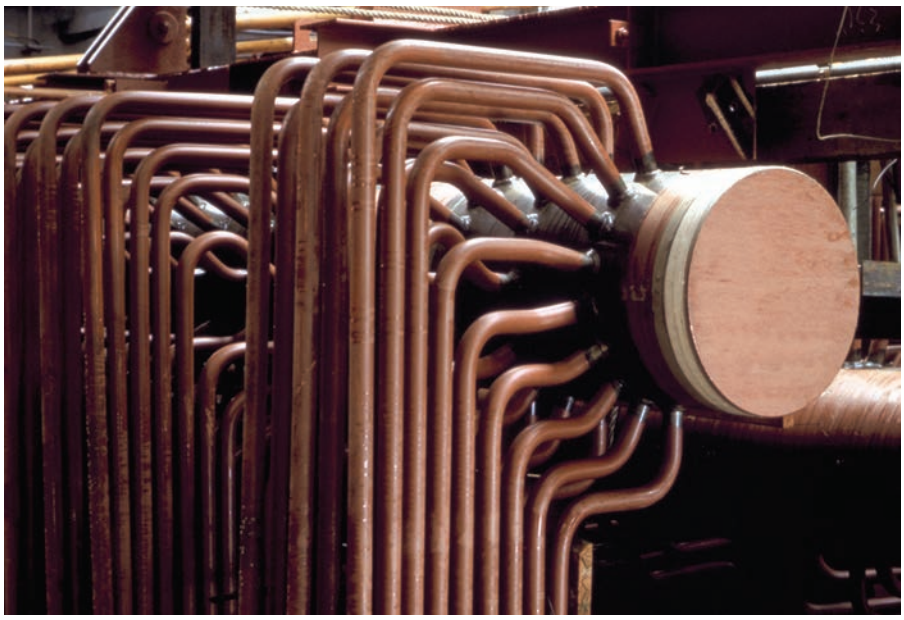
"Another unique development is cracking tubes for ethylene plants. For this application, high heat transfer efficiency is very important to realize high productivity, and SMI has been supplied over 8000 tons of Internal finned tubes (8, 10, 12fins), which have a wider surface area than common shaped tubes. Additionally, SMI has currently developed a newly shaped finned tube that improves the flow situation without increasing the pressure loss. To ensure well-balanced properties, cutting-edge flow analysis was conducted in our R&D laboratory. Advanced three finned tubes show better heat transfer efficiency due to their rational fin design, which contributes to a smooth rotational flow inside the tubes. We also can utilize our human resources to aid such a unique development." he concludes.

Large diameter thick wall pipe of HR6W (457mm in diameter with 60mm thickness)

Power generation and SMI

So what has been happening further in the two years since Stainless Steel World last interviewed the company? "In the first place, the energy industry remains a number one priority for SMI," says Mr. Matsuo, "and we have been forging ahead to distinguish ourselves from our competitors with regard to material developments for power generation. We have always put back the knowledge gained from our R&D division into the power generation industries. Moreover, we are the first company to have successfully developed materials (SUPER304H® and HR3C™) for 'Ultra-Supercritical' (USC) boilers with steam temperatures of 600 degrees Celsius and pressure of 25MPa. We have produced seventy-five thousand tons of tubes for these units, which have not only been produced for the internal Japanese market, but also have been exported to China, Europe and the rest of the world due to their higher efficiency and lower CO2 emission."

Mr. Matsuo explains further: "Advanced-USC (A-USC) is a very challenging field in which to achieve higher efficiencies and lower CO2 emissions. Advanced nickel-based super alloys are strongly needed for A-USC power plants operated at steam temperatures above 700 °C. The nickel-based alloy developed HR6W (Vd-TÜV559/9, UNS N06674), which is strengthened by Fe2W-type Laves phase and M23C6, is one of the candidate materials for thick wall-pipe applications. The stability of long-term creep strength and superior creep rupture ductility have been proven by creep rupture tests of up to 60,000h at 650–800°C. Various sizes of HR6W thick-wall pipes have been successfully manufactured thanks to good formability. It has also been



Fabricated header pipe and super-heater in boiler

confirmed that HR6W has a better stress relaxation cracking resistance by means of extra-slow-strain-rate tensile tests at elevated temperatures. Hr6W has been evaluated in the A-USC projects of Europe and Japan as a candidate material for tubes and pipes.

So, what about the use of these developed stainless steels in other applications? Mr. Matsuo explains: "HRSG (Heat recovery steam generators of combined cycle gas turbine power plants) must be an interesting candidate, because the temperatures of newly developing HRSG will be higher, therefore superior grade material will be required. Furthermore, renewable energy is also an intriguing field for us, and Sumitomo are involved in biomasses such as Circulation Fluidized Bed (CFB) and Bubbling Fluidized Bed (BFB) boilers. A variety of biomasses are used as fuel for these boilers, but the risk of fireside corrosion can be more severe. Corrosion resistance of materials is much more of a crucial issue compared with USC boilers. Nevertheless, we will be able to utilize the knowledge of our corrosion specialists as solution providers in this area." Mr. Matsuo added that Concentrated Solar Power (CSP) is also a notable field for material development, and went on to say that for application purposes, the materials used require not only strength and corrosion resistance as in other boiler or steam generator applications, but other characteristics might become important. SMI believe that this will be a very important market for the future that they would like to be a part of. They will therefore accommodate requests and demands from customers in this field as they occur.

In their previous interview, SMI had talked about how the stainless steel grades they had developed for coal thermal power generators had become widely accepted as a standard material for making USC boilers. Today, to satisfy changing needs and demands, the company continues to make use of their accumulated knowledge and experience to develop new standard materials for power generators as part of their expansion strategy. "There are many fields where our experience can be put to good use and we are working to become the benchmark in these areas". Mr. Matsuo continued: "In the nuclear power industries, the materials used in the power plants require exemplary quality control. To comply with such conditions, SMI have developed a special manufacturing process and have modified their products within the conditions stipulated by material standards using the knowledge and experience built up over many years. The resulting materials are the conglomeration of the know-how that has been accumulated within our company."

The product currently undergoing a surge of interest is the production of steam generator tubes for nuclear power plants. From May 2009 onwards, SMI has achieved a 30% increase in production over 2010. Plans are now afoot to invest around 14 billion Yen to further increase the size of the production line. Originally scheduled for completion in 2013, the Fukushima accident might put obstacles in the path but this is, nevertheless, still going ahead so far.

Expanding SMI's network

Finally, we asked Mr. Hatanaka about SMI's overseas offices. "So far we have expanded mostly in Europe and the US", he states. "However, since the domestic market has become increasingly saturated, we have decided to expand more overseas. Asia is a booming market where the population is increasing and the demand for energy resources is rapidly rising. In this respect we have just expanded to Singapore for an outlet in the oil refinery and boiler industries, and our engineers will accede to the office there in August 2011. Interconnection is another issue. When a large company decides on a strategy decision, say in Houston, the impact can be felt as far away as Asia. We are currently setting up a strong communication network between all our representatives in our regional offices to track these global trends so that we can identify and accommodate customers' needs more expediently. We stalwartly believe that there are many areas where Japan's experience and performance can be put into good practicality in the global arena and, at the same time, we would like to increase SMI's energy-related business footprint around the world."

Mr. Hatanaka goes on to say that whilst he feels that India and China are important locations to focus on and expand into, it is still essential to ensure that good communications are maintained with markets in Europe and the US since the latter countries are where the main engineering users are usually located. He is adamant, moreover, that Europe and the US will continue to remain important markets for SMI products. "This is the fundamental reason why SMI believe it is so vital to put global networks and communication channels in place", he concludes.

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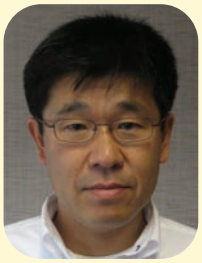

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