

Mitsubishi Materials Corporation a surprise in special alloys

During a recent visit to the Far East, Stainless Steel World received a warm welcome from Mitsubishi Materials Corporation at its High Performance Alloys Products Division plant in Okegawa, just North of Tokyo, Japan. Here, Mr. Noboru Yonezawa, General Manager for the Okegawa plant, Mr. Yokoto Nakamura, General Manager of the plant's Sales and Marketing Department and their colleagues managed to surprise and impress us more than once when they filled us in on what the company has to offer in terms of super alloys, often for highly specialized applications at the top end of the market. As a result, for the first time in its fifteen-year history, Stainless Steel World has put a Japanese company on the cover of the magazine.

By Sjef Roymans and Esther Martensen

Modern, state-of-the-art equipment, such as these V.A.R and E.S.R (insert) furnaces, combined with decades of accumulated knowledge, guarantees that Mitsubishi Materials can meet even the most demanding requests when it comes to super alloys in any field of application in the high end of the market.



ation:



The Okegawa plant is the main production facility of the High Performance Alloys Products Division of Mitsubishi Materials Corporation

“Most people, when you say Mitsubishi, they think of cars but what we do is something completely different,” Mr. Nakamura begins our meeting. “Mitsubishi Materials Corporation offers a broad range of business segments, ranging from metal melting, silicon and advanced materials to cement, energy- and environment-related operations and others.” The Okegawa plant, which Stainless Steel World visited, is the main manufacturing plant of the company’s High Performance Alloy Products Division. Here, Mitsubishi Materials develops specialty alloys to fulfil demanding materials needs for a variety of corrosion, high temperature and wear resistant applications. These materials include high nickel, cobalt and copper alloys as well as titanium and zirconium alloys which are available in flat products, forgings, wire, pipe, tube and fabricated products such as vessels and heat exchangers. Mr. Yonezawa explains: “We do not focus on issues such as seawater corrosion. Instead, our products are made to withstand much more extreme processing conditions in, for example, the chemical processing industries and nuclear power generation.” Other markets in which the company is active include the automotive and aerospace industries, which also frequently require special materials.

**“Most people, when you say Mitsubishi,
they think of cars but what we do is
something completely different.”**

DEVELOPMENT OF NEW SUPER ALLOYS

In addition to supplying special alloys that have already proven their value over the past decades, such as Mitsubishi Alloy (MA) and Mitsubishi Hardfacing Alloy (MHA), Mitsubishi Materials is always investigating the development of



From left to right: Mr. Takeshi Kohda, Manager Overseas Sales Group, Sales and Marketing Department, Mr. Yokoto Nakamura, General Manager, Sales and Marketing Department, Mr. Noboru Yonezawa, General Manager and Mr. Hiroaki Kikuchi, Manager Aerospace Business Department, all of the High Performance Alloys Products Division.

new alloys for new and existing applications. And even though some have argued that the market for special alloys has reached a level of maturity, Mr. Nakamura feels that there is still a need for additional specialized products, especially with conditions in the processing industry becoming increasingly severe. One new alloy that is quickly gaining recognition in the international market is MAT 21®, the patented Ni-19Cr-19Mo-1.8Ta alloy (UNS N06210), Mitsubishi Materials has developed for highly aggressive environments. According to Mr. Yonezawa, one of the qualities of MAT 21 is that it has outstanding resistance to pitting and crevice corrosion and high corrosion resistance of the welding area, because the tantalum addition operates to promote the formation of a passive film and to ensure the stability of passivity. “MAT 21 has a tensile and yield strength equivalent to that of Alloy 22 and C-276. Furthermore, it has 1.5 to 2 times the strength of austenitic stainless steel. Weldability and machineability of MAT 21 are equal to existing Ni-Cr-Mo alloys and welding the material to stainless steel is easy.” Mitsubishi Materials now offers the MAT 21 Alloy for its entire product range, including forgings, welding rod, seamless pipes and tubes, vessels, heat exchangers and piping.

A prime example of a demanding application in which MAT 21 has been applied successfully, is a heat exchanger for an amino acid feed plant reactor with a capacity of 9m³ which the company fabricated for a client in June 1999. Mr. Nakamura: “This reactor was originally made of Alloy 22 but this material caused corrosion problems. The customer then carried out field tests on both MAT 21 and Alloy 22. In

these tests MAT 21 showed superior corrosion resistance compared to Alloy 22. The reactor material was subsequently changed to MAT 21 and other reactors will soon follow suit. We foresee a wide array of applications for MAT 21 in the future, in for example pharmaceutical plants and fine chemicals plants.”

Another new alloy the company has developed in recent years is Ni-45Cr-1Mo, which has been giving the brand name MC Alloy. It is designed especially for highly oxidizing environments. Mr. Yonezawa: “Nickel alloyed with high chromium, such as 50Ni-50Cr, has so far only been supplied as castings or in powder forms because of its poor workability properties. However, MC Alloy can also be supplied as sheet and plate, bar, welded tube and pipe, and wires with good workability irrespective of its high chromium content. MC Alloy is resistant to such oxidizing media as HNO₃, HNO₃-HF and mixed acids. It can be used for the structural material of pickling acid baths and the surrounding equipment, for example plate type heat exchangers in steel plants. MC Alloy has also been recognized as a suitable material for chemical processes using supercritical water (SCW) because of its outstanding resistance to SCW environments with inorganic acids and stress corrosion cracking in high temperature and high-pressure water. MC Alloy shows 100 to 1000 times less dissolved ions in several

“We can satisfy customers’ demands by offering high quality products at a fair price and with quick delivery times.”

Educating materials engineers

Working with special alloys means that the end-user demands a lot of expertise and assistance from the supplier when selecting materials for their projects. Mr. Yonezawa: “Experienced, senior engineers who have been working with special materials in very severe conditions, usually know what to expect but we do find it surprising that younger engineers who recently graduated often do not know much about special alloys. They will have studied many corrosion systems in college but only understand the behavior of standard steel, not of special alloys. If this is the case, we can teach and assist them. We speak their language and are very much in touch with any materials issues they may have. Customers appreciate this part of our service.”

acids with a pH value of about 1 than stainless steels.” Mitsubishi Materials foresees a great future for the material in pharmaceutical plants, which cannot afford any contamination from metal ions, as the replacement for glass linings. In addition to MAT 21 and MC Alloy, Mitsubishi is also carrying out research on a number of other super alloys, geared mostly towards the automotive industry. The company has also been working on a next generation high temperature resistant alloy over the past two years and field tests are currently being carried out on this material. However, the development of these alloys is still at an early stage and therefore the company cannot give out any information at this time.



A turbine case, manufactured for the aerospace industry. The company has been involved in this industry for decades.

CUSTOM-MADE PRODUCTION

But in spite of this wide range of available alloys, occasionally, a customer will need a material for an application that is so specialized that no alloy currently available on the market will do the trick. If this is the case the metallurgists of the Mitsubishi Materials Corporation research and development department can help satisfy even the most demanding materials needs by developing a custom-made alloy for a particular project. One example of this was a material the company developed for a gas turbine. The client needed an alloy that could withstand extremely high temperatures. The R&D department of Mitsubishi Materials took up the challenge and developed a tailor-made alloy.

READY FOR A CHALLENGE

So far, Mitsubishi Materials Corporation's most important markets have been the domestic Japanese market as well as other countries in the region, most notably China and South Korea. Mr. Yonezawa: "We have been operating in these markets, in some cases, for more than 40 years. In the domestic Japanese market especially, everyone is aware of our capabilities and considers us a force to be reckoned with. And even though there are no new plants being built in Japan at the moment, Japanese chemical companies are building plants in other countries, such as China and Korea, so we increasingly focus on these markets as well."

In addition to further expansion into the Asian market, Mitsubishi Materials has plans to increase its presence in the European and US markets as well. For cobalt, the company's market share is considerable in the international market already, especially in Europe, but for nickel alloys export to the West is still limited and the company would like to see this changed in the near future. Mr. Nakamura: "There is a lot of competition in those parts of the world but we are confident that we can satisfy customers' demands by offering high quality products at a fair price and with quick delivery times. Those are the key factors of our success. We have the knowledge and expertise, the right fabricating capabilities and with our new production facility in Indonesia we can be even more competitive."

And indeed Western countries are often pleasantly surprised when they hear what Mitsubishi Materials can do. Mr. Nakamura says he feels that the international market is often simply not aware of the company's existence and its capabilities. "Our goal for the next few years is to change this perception and to introduce the capabilities of our company to an international clientele. For this purpose, we are expanding our network, setting up contacts with engineering companies and, in some cases, distributors. We prefer, however, to talk directly with engineers because of the highly specialized, and often unique, process conditions." He concludes: "With conditions in the processing industries become increasingly severe and corrosive, we invite end-users of super alloys to call upon our 40 years of experience in this field and to test us. We feel that we are ready for this challenge. With our knowledge and wide range of materials and products we can meet their demands in any field of application in the high end of the market." ◀



Mitsubishi Materials recently installed a 7000-ton high-speed forging press at the Okegawa plant.

Mitsubishi Materials Corporation
High Performance Alloys Products Division

Established in 1950, Mitsubishi Materials Corporation is one of the world's largest diversified materials companies. In addition to being a leader in metal smelting and fabricated materials, notably aluminium cans, it is also a major supplier of advanced materials. The company's high-level research and development programs enable it to maintain its dominant position in key markets. Mitsubishi Material comprises 336 subsidiaries in 21 countries employing 21,745 people. The company's head office is based in Tokyo, Japan. Founded in 1944, the Okegawa plant, which Stainless Steel World visited during this trip, is the company's main production facility for the High Performance Alloys Products Division. About 450 employees fabricate different types of super alloys for demanding applications. The product lines include forgings, tubing, castings and flat products for the chemical processing industry, the pharmaceutical industry, power generation, the automotive industry and the aerospace industry. To better service the needs of the latter, the Okegawa plant operates a 6000-ton isothermal forging press and recently installed a 7000-ton high-speed forging press. The company has been accredited with ISO9002, ISO14001 and QS9000 certification. For more information: <http://www.mmc.co.jp/alloy/english/>