

BAOTI gets ready for



Established in 1999, with Baoti Group Ltd. as its main shareholder, Baoji Titanium Industry Co., Ltd (BAOTI) is the biggest manufacturer of titanium mill products and titanium alloys in China. Stainless Steel World went to Baoji, China, and spoke with Mr Jia Shuanxiao, General Manager of Baoti who told us more about his company and its plans for the future.

By Michael van Wijngaarden and David Sear

Traditionally, the city of Baoji is famous for its bronze industry. During the Shang and Zhou dynasties a few thousand years ago, this was the area where the expertise of bronze smelting developed to its highest level and which formed the cornerstone for the growth of an entire civilization. Today, with the presence of Baoti as China's biggest production and R&D base for titanium and titanium alloys, Baoji is rapidly becoming known as titanium city.

Looking at the world market demand for titanium mill products, consumption is estimated to reach 58,970 tonnes this year. The combined industrial and consumer markets (including the chemical processing, pulp and paper, sporting goods, and energy industries) is

expected to consume 47 percent of that total. Commercial aerospace will account for 31 percent, while military aircraft and ground vehicles will make up the 22 percent remainder.

At present, Baoti is capable of outputting over 3,500 tons of titanium products each year with a comprehensive product range that includes sheets and plates, slabs, bars and billets, wires, tubes and pipes, forgings and castings, clad materials as well as all kinds of titanium equipment. These products are widely used in every kind of industry ranging from aerospace and automotive to sports, medical, chemical and petrochemical industries. In order to service these markets and meet the growing demand for titanium products the compa-

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ny has recently made a number of important investments. These investments will also help to get Baoti ready for the future and realise its expansion plans for markets both in and outside of China.

INVESTMENTS

Mr Jia firstly explained about the company's production facilities: "We have four workshops that cover melting, forging, tube production and the production of sheets and plates. At present the melting workshop has a production capacity of 6000 tons per year. However, an additional production capacity of 2000 tons will soon come online when our new electron beam furnace has been installed and commissioned." This electron beam furnace, we learned, is an addition to the VAR furnaces already fitted, the latest of which, China's largest vacuum arc furnace, was installed as recently as May 2004. The EB furnace will be installed in the second half of 2005. It was bought in Germany and will be housed in a purpose-built hall that was under construction at the time Stainless Steel World visited.

As well as increasing overall production, the new furnace will enable Baoti to offer even larger ingot sizes, up from the current 6 tons to 10 tons. Further, the new electron beam furnace will mean that both round and square ingots can be made. "The standard form of ingot is round but square ingots are the preferred shape in producing flat products as they will reduce cost and increase yield," notes Mr. Jia "On top of that, this new

furnace makes it easier to remove high-density contaminants and enable us to increase the use of scrap metals. These are produced during the production process and re-using them will constitute a significant cost saving."

Significant investments can also be seen in the new forging workshop which houses both a Chinese-made forge and, also since May 2004, a German-made forge press. Equipment in the forging workshop now includes an SXP-13 precision forging press, a ring rolling mill, a 3150 ton hydraulic press and a 2500 ton high-speed hydraulic press that enables Baoti to produce titanium and titanium alloy bars, billets, discs and rings. This investment has also significantly increased the company's ability to produce both forging parts and bars. During a round trip of the facility we learned that quality is controlled by the company's skilled forge masters. They have the possibility to choose between electric, oil or gas furnaces for heating and annealing and take particular care in the production process to ensure optimum grain size and flow.

This brings us to the seamless and welded tube workshop. Mr. Jia explained that the annual production capacity is 1000 tons of seamless pipes and 200 tons of welded pipes and that besides pipes and tubes this shop produces reducers and special section tubes, bars and various clad products in titanium, tantalum, niobium, hafnium, nickel, copper and their alloys. They are mostly used in heat exchangers for the power generation industry. In order to produce such a wide array of products Baoti is equipped with a 3150 ton horizontal press and a 1000 ton vertical piercing machine and various types of tube and pipe cold rolling mills. Mr Jia: "With our vacuum annealing furnace we can produce seamless products up to 15m with an outside diameter of up to 130 mm. Of course within those boundaries we can produce practically any seamless tube."

The facility for welded tubes, which, according to Mr Jia, offers the advantage of higher tolerances and lower cost, was purchased in the United States. Here, strip is turned into welded tubes. In fact, strip is the only titanium product that Baoti does not make itself. Instead strip is purchased from regular sources around the world. The unit has the ability to make welded tubes up to 12m long.

The fourth and final pillar on which the production process of Baoti is built is the flat products workshop. The sheet and plate as well as the clad plate that comes from this mill are produced with a 3300mm hot rolling mill imported from Germany and 1200mm 4 high reversible hot and cold rolling mills which were imported from Japan. They produce plates of up to 7m long and 2.8 m wide ranging from 4.76 to 60mm in thickness. Sheets can be produced up to 3m long, 1m wide and ranging from 0.5 to 4.75 in thickness. After rolling the plates can be annealed, pickled and packed ready to be shipped. Of course, all finished products go through a thorough quality inspection to ensure they meet the desired properties.

QUALITY

The bespoke nature of Baoti is furthermore stressed by the fact that extensive research and development is done in-house and that the production process is supported by an impressive newly completed laboratory which, we were told, is the best equipped titanium industry laboratory in China. Mr Jia: "The equipment is located over three floors, right from sample preparation. Our main equipment includes Leco Gas Determinators, ICP optical emission, creep & rupture test machines, INSTRON material testing system and different kinds of microscopes. With this facility the company can perform all the normal testing procedures in-house, but we can also rely on our outstanding external contacts should additional testing be required."

In order to stay in this leading position and to support the company's expanding production capabilities and product development plans, considerable investments are ongoing in the R&D facilities. Mr Jia told us that this facility has already been approved by such leading companies as Rolls-Royce and Airbus and is well-equipped for both the necessary production testing and inspection procedures as well as conducting fundamen-



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tal research and development of titanium alloys and applications.

According to the company over 6000 new material R&D projects have been undertaken, resulting in hundreds of technological developments. Chinese authorities confirm that the company ranks among the country's top knowledge centres in controlling the quality for melting titanium alloy ingot, preparing the master alloy for ingot melting and making large titanium alloy forgings. Baoti also ranks among the world top companies in producing Ti-6Al-4V. At present, Baoti is working on considerable numbers of new R&D projects or products in a wide array of titanium and titanium alloys and there are plans to develop new markets for the use of titanium alloys in seawater desalination applications, natural gas exploitation and other areas.

Clearly, providing a high-quality product is an important topic to Baoti. This is why all major equipment used for completing melting, forging, rolling and quality inspection processes has been sourced from the world's leading suppliers in countries such as the USA, Germany, Japan and Austria. This enables the company to ensure all products always meet international standards. Mr Jia: "Due to the high standard of our products, we have received both ISO9001:2000 certification for our quality system and ASME authorization for manufacturing titanium pressure vessels. Additionally, our Ti-6Al-4V (TA6V) and CP (T40) titanium sheets have been approved by Airbus, with our Ti-6Al-4V ingots and sheets having received approval from Rolls-Royce. Moreover, we have been appointed as a foreign supplier of CP and Ti-6Al-4V products for McDonnell Douglas. All this has resulted, among other things, that we were able to successfully negotiate long term business contracts with a number of respected international companies which adds to the stability of our company."

'The company is strongly developing its overseas presence.'

Mr Jia explained that given the company's significant research and development facilities Baoti is very active in developing new alloys and applications, not just for titanium but also for other metals such as nickel and zirconium. "We are also keen to further the use of titanium in normal industrial areas such as sports, golf clubs, glasses, frames and architectural applications. Besides that, Baoti continues to promote and improve the use of titanium in existing applications by, for example, performing research and development work to improve corrosion resistance. In view of the high cost of titanium, another important focal point for Baoti is to reduce the overall production cost and thus product price. According to Mr Jia the



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high titanium price has both adverse and positive effects on the market. "High titanium cost leads to high product prices which may stimulate clients to look at alternative materials, leading to a drop in titanium demand. On the other side, existing and new titanium suppliers may be encouraged to benefit from high market prices by increasing or introducing their supply to the market. Overall, the high cost should help to refocus the titanium market."

MARKETS

The current focus of Baoti is mainly on the domestic Chinese market. Most of its business is related to normal industrial applications and its facilities can supply 70 per cent of the internal market for titanium products and even up to 90 per cent of the market for some specific applications in the aerospace industry. However, Mr Jia said, the company is strongly developing its overseas presence. He finishes: "At the moment around twenty per cent of our products are exported to other countries but we are looking to increase this percentage to thirty per cent in the coming years. For 2005 we expect to achieve a mill output of 4500 tons. We have already done a lot of foundation work towards achieving that goal and will continue to work closely with our existing and future customers to acquire further approvals. We will also increase our international presence by attending leading trade-shows and promote

ourselves through international publications like Stainless Steel World magazine. With solid management, skilled technicians, perfect processing techniques and modern manufacturing facilities we have the ability to meet all our clients' demands."

About Baoti

Baoji Titanium Industry Co., Ltd. is the biggest manufacturer in China specialized in mill products of titanium and its alloys. Relying on Baoji Nonferrous Metals Works as its biggest shareholder Baoti possess a strong technology base and a complete product range.

An integrated production system that includes melting, forging, rolling, drawing and fabricating enables Baoti to manufacture various products including ingot, billet, bar, wire, plate, sheet, tubing, forging, casting of all grades of c.p. titanium and most titanium alloys as well as many down-stream products.

No. of Employees:	Above 1000 People
No. of R&D Staff:	Above 100 People
Estimated Annual Sales (USD):	US\$ 50 Million US\$100 Million
Year Established:	1999