CASE STUDY: A NEW BENCHMARK FOR SUSTAINABLE COPPER PRODUCTION IN CHINA

Outotec’s complete Flash Smelting and Flash Converting solution and process design expertise ensures excellent quality, availability, and environmental performance for Jinchuan Group Co. Ltd.

Jinchuan Group Co. Ltd, one of the largest mining groups in China, chose Outotec’s Flash Smelting and Flash Converting process, anode casting shop, and tankhouse equipment for its new copper smelter in China’s Guangxi Zhuang Autonomous Region. The delivery included operating licenses for both Outotec Flash Smelting and Kennecott-Outotec Flash Converting technologies. Smooth cooperation between Outotec representatives and local service personnel from the beginning of the design phase enabled quick installation and start-up, while the state-of-the-art smelting technology ensures clean, cost-effective, and safe production.

Transforming smelting operations for a leading Chinese mining group

Jinchuan Group Co. Ltd. is a subsidiary of Jinchuan Non-Ferrous Metals Group Co. (JNMG) and one of China’s largest mining groups. The company specializes in mining, concentrating, metallurgy, chemical engineering, and deep processing. In 2011, the company agreed a deal with Outotec to set up a new smelting plant in Fangchenggang in the Guangxi Zhuang Autonomous Region. The convenient location close to the South China Sea makes both the import of copper concentrates and the export of end products cost-effective. During ramp-up the plant was staffed by 100 experienced personnel transferred from another site in China.

When it came to selecting the most appropriate solution for smelting, the decision was an easy one according to Mr. Guo Wanshu, Vice General Manager of Jinchuan-Guangxi Non-ferrous Metal Co, Ltd: “Outotec’s double flash process outperforms those of competitors’ and matches our expectations perfectly.” In addition to the smelting technology, Outotec also delivered basic and detailed engineering for the facilities.

“Outotec’s double flash process matches our expectations perfectly.”
The equipment package included:

- Five loss-in-weight feeders
- Concentrate burner and matte burner
- Four air slides
- Tapholes for flash smelting furnace (FSF) and flash converting furnace (FCF)
- Integrated cooling elements (ICE) for FCF
- Complete Outotec Sentinel system for FCF and critical areas of FSF
- Outotec Process Advisor process control model for the FSF and FCF
- TWIN M18 anode casting equipment
- Permanent cathodes and robotic full-deposit cathode stripping machines for refinery tankhouse

Integrated solution maximizes customer value

Outotec participated in all aspects of the smelter design and project management from the beginning of the plant layout design process. “The customer gets the best value when plants are considered as complete processes instead of islands of single equipment,” explains Kari Pienimäki, Director of Flash Smelting at Outotec. “For example, the distance from the furnace to the slag cooling area and slag concentrator was made as short as possible to minimize the need for transportation and to improve safety.”

Outotec’s furnace feed system and burner designs ensure high concentrate and matte feed, resulting in better overall capacity and longer campaign life. The campaign life is extended by controlling the furnace’s hearth temperature in order to reduce the impact of blister impregnation and infiltration.

Outotec solutions play a critical role in ensuring an optimal process, excellent equipment availability, and a high quality end product. Outotec Process Advisor is an online dynamic process control model with a user interface that allows operators to analyze the process behavior, monitor temperatures and slag chemistry in real time. Outotec also provided training on the automation system and maintenance of the furnaces. Outotec Sentinel is an online furnace integrity monitoring system for cooling elements. “It’s a new, patented intelligent measuring system that enhances furnace integrity and reduces wear by enabling analysis of data from the cooling waters. It protects the furnace by alerting operators to issues such as drops in water flow, heat-load peaks, and deviation in return temperatures. It also shows when there are abnormal process conditions such as buildup, and estimates the condition of the furnace refractory lining,” Pienimäki explains.

In terms of the end product, Outotec’s proven anode casting technology ensures high physical quality of the output from the smelter. The anode casting shop achieved quality and performance requirements within a month.

Ensuring clean, safe, and efficient tankhouse operations

The refinery’s new tankhouse was started up at the end of 2013 and is rated for an annual production of 400,000 tons of high-grade cathode copper. The key elements for smooth copper cathode production are efficient plating of copper on the cathode blanks and reliable stripping machines. Over 70,000 Outotec permanent cathodes and two robotic full-deposit stripping machines, both state-of-the-art technologies, ensure this. Jinchuan Group Co. Ltd
required gentle, automated handling of the cathode blanks, with the aim of maintaining cathode quality, ensuring cleanliness and convenience in the stripping area, and increasing efficiency and safety.

"Outotec’s fully stainless steel, permanent cathodes were chosen because of their high quality materials, high mechanical strength, corrosion-resistant structure, good electrical performance, and long life time," says Eero Tuuppa, Director - Tankhouse Equipment, Outotec. "The design of the automated stripping machines is perfectly suited to the selected cathode blanks."

The installation and start-up of the cathode stripping machines was a joint effort between the Outotec technology experts and the local service organization. The fast implementation and short start-up – one of the shortest ever for a project of this nature in China – were highly valued by Jinchuan Group Co. Ltd. "The team spirit, motivation, and work ethic have been great. Everyone has been working together for a common goal," highlights Outotec’s Kari Pienimäki.

Responsible care for the environment
Outotec flash smelting technology is the cleanest smelting method available. The combined FSF/FCF process is based on sealed furnaces, which allows for better control of gas flows and process conditions with greater flexibility. Using concentrated reaction heat reduces reliance on external fuel sources, is highly energy-efficient, and allows a total of more than 99.9% of sulfur capture thanks to the constant flow of high-strength SO$_2$ process gas from the furnaces.

The low sulfur dioxide emissions not only mean a safer and more hygienic working environment for employees, but also enable compliance with ever-stricter environmental legislation. Outotec’s flash smelting process is rated as the Best Available Technique (BAT) by the European Union. It has been nominated as the ‘Metallurgical innovation of the 20th century’ and awarded ASM Historical Landmark status due to its excellent environmental performance.

“We have been very happy with the cooperation with Outotec in this project. Combining Chinese and foreign technologies is always challenging, but with good and open communication and cooperation these challenges can be, and have been, overcome to the benefit of all,” concludes Mr. Guo Wanshu, Vice General Manager of JNMG.

The team spirit has been great. Everyone has been working together for a common goal.”

FOR FURTHER INFORMATION PLEASE CONTACT: STEPHEN.HUGHES@OUTOTEC.COM