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CENTUM Selected for Zambian Copper Smelter Upgrade Project

Location: Mufulira, Zambia
Order Date: January 2005
Completion: September 2006
Industry: Mining



Executive Summary

Mopani Copper's Mufulira smelter in Zambia originally processed over 400,000 tons per annum (tpa) of copper concentrates, most of which was sourced from its own mines. Some feed was obtained from surrounding operations in Zambia and the Democratic Republic of the Congo. The primary smelting furnace was a 36-MVA submerged arc, six-in-line electric furnace that had been installed in 1971 and rebuilt in 1991. This furnace, was approaching the end of its operating life and was due for replacement.

In addition, Mopani Copper was obliged to bring the gas emissions of its Mufulira smelter into compliance with Zambian environmental regulations. This necessitated the installation of an acid plant to process off-gas from the primary smelting furnace.

With surplus capacity in the Mufulira smelter and the need to replace the electric furnace, Mopani Copper's management decided to install a new Xstrata Technology ISASMELT™ primary smelting furnace. Additionally, a purpose-built electric settling furnace, acid plant, oxygen plant for meeting the oxygen supply requirements of the ISASMELT™ furnace, and associated infrastructure were installed.

Initially the upgraded smelter was configured to process up to 650,000 tpa of copper concentrates. However, the design of the ISASMELT™ furnace and electric settling furnace allowed for an increase to 850,000 tpa by increasing the level of oxygen enrichment in the ISASMELT™ process. In the redesigned process, gas from the ISASMELT™ furnace that has been cooled and cleaned of particulate matter is ducted to the acid plant for use in sulphuric acid production.

The Challenges and the Solutions

The project was an excellent example of a well executed brownfield site project involving a wide number of engineering companies and vendors from different countries working together in a remote part of the world. Despite the logistical challenges of constructing a new smelter in a land-locked country in the middle of Africa, this was the fastest of all ISASMELT™ projects completed to date. It took only 28 months from signing of the engineering and license agreement to achieve the first feed on in the furnace in September 2006.

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In addition to completing engineering design of the ISASMELT™ plant and supplying key equipment such as the waste heat boiler, Xstrata designed and supplied a plant wide process control system for the project based on a Yokogawa CENTUM CS 3000 system that had been built in Australia by Yokogawa Australia, tested and accepted by Xstrata Technology, and then exported to Zambia. The control system allows the acid plant, oxygen plant, and ISASMELT™ plant to be controlled from a central control room.

Mopani staff trained at Xstrata's Mount Isa copper smelter for over three months prior to plant startup, while Xstrata personnel with many years of operating experience on various smelters assisted with pre-operational training and hot commissioning of the Mufulira plant. Key process personnel remained on site for an extended period to assist with ramping up the plant and provide comprehensive training for Mopani operations staff. The Mount Isa plant also uses a Yokogawa control system, so the operation, engineering, and maintenance training went smoothly and was very effective.

Customer Satisfaction

The user wanted to implement their control strategy in a DCS they could trust and one that could be maintained by the local Zambian workforce. Xstrata has used Yokogawa extensively in the past and trusted the reliability of the CS 3000 system. Xstrata also recognized the inherent intuitiveness of the CS 3000 system and believed Yokogawa the best fit for the workers on site.

This project gained further recognition in 2006 when it was selected for a Zenith Award by Process and Control Engineering, an Australian industry publication.

About Xstrata Technology and ISASMELT™

Xstrata Technology, a wholly owned subsidiary of Xstrata plc, develops, markets, and supports technologies for the global mining, mineral processing, and metals extraction industries. These technologies, originally developed for use in own operations, are marketed for use by third parties. ISASMELT™ is a top blown bath smelting technology. It uses submerged lance injection to provide highly efficient mixing and reaction of feed materials in a molten slag bath. The use of advanced process control systems results in the furnace operation being largely automated. It can be easily retro-fitted into existing smelters to either augment or replace existing technology or used in new "green field" smelter applications.

<System Details>

Control System: **CENTUM CS 3000, Plant Resource Manager (PRM)**

6 dual screen human interface stations (HIS), 1 PRM, 1 OPC station, 5 field control stations (FCS)