



By Martin Neil

Overcoming Saltwater Corrosion

Australian mining company eliminates corrosion with plastic pipe and improves pump cooling with automatic control systems

***B**HP Billiton, an Australian-British mining company, operates in 25 countries around the world. The company mines iron, coal, oil, bauxite, copper, uranium, diamonds and nickel, and it is the world's third largest nickel supplier. In 2007, the company opened a new \$2-billion open-faced mine in Ravensthorpe, Australia, to mine nickel and cobalt.*

The Ravensthorpe Nickel Project (RNP) involves the mining and treatment of nickel laterite ore using a hydrometallurgical process through the enhanced pressure acid leach process. The chemical process requires vast quantities of water, which is pumped via pipeline from the Indian Ocean approximately 26 miles away. Some of the seawater is used in its raw state to cool the bearings in all 152 pumps around the plant, while some is desalinated on site for the metallurgical process. Steam and acid are used to prepare the ore for the refining process. Problems faced at the new plant included saltwater corrosion of the steel pipe and an unreliable and costly servicing of the pump cooling process.

Eliminating Corrosion

GF Piping Systems was called in as a possible source to supply a solution to the plant's saltwater corrosion problem. GF recommended polyvinylidene fluoride (PVDF) and polyethylene (PE) piping systems as the solutions for eliminating the saltwater corrosion. These thermoplastics are highly resistant to salt solutions as well as acids and other highly corrosive chemicals. GF then worked closely with the engineers and associate companies to convert the existing steel piping systems to the new plastic piping systems, and the corrosion problem was eliminated.

Measurement & Control

Following RNP's acceptance of the plastic piping solution, GF was also considered to develop a new automatic control system. Control systems monitor and control the seawater being used to cool the bearings for the 152 pumps that move acid and nickel slurries throughout the mining plant. In the mining industry, a rotameter and a manual valve is the method typically used for monitoring pump cooling systems. This method leads to a high error rate and increased service requirements. It can also result in complete pump failure and system shutdown, which can cause additional production and material costs.

To improve the pump cooling process, GF installed 152 Signet 2551 Magmeter electromagnetic insertion flow sensors. The Magmeters accurately measure the flow rate of incoming seawater used to cool the pump bearings. With no moving parts, these sensors require little or no maintenance. The Signet 2551 Magmeter outputs a 4- to 20-mA signal to the Smar Controller, which

in turn converts the 4- to 20-mA to a digital-ready signal that feeds into the Foundation Fieldbus network.

Another important component to the measurement and control solution was valve control. GF installed 152 Type 132 electric actuated linear ball valves with a PE 25 Positioner for full automatic position control. The set point is adjusted here, and a linear ball in the valve ensures smooth flow characteristics. These valves maintain a constant flow rate of incoming seawater. The linear ball assists with improved flow control characteristics, and its compact size fits easily into the control box.

Wiring consists of two wires for 24-VDC power and two wires from the Foundation Fieldbus input/output module. Also installed was the GF Type 546 d16 PVDF ball valve for quick flushing of strainer and the GF Type 360 PVDF ball check valve with PP ball.

Total Plastic Package

The total plastic package offered a much-improved application solution over the duplex stainless steel system previously being used. The new measurement and control package provided higher system efficiency, reduced service and shut-down costs and higher reliability for the overall process.

The new system has been installed for more than 18 months, and operational reports are extremely positive. "The magmeters, in conjunction with the valves, have provided improved control results, and the onsite support we received from GF has been outstanding," said Val Klintchev, senior piping engineer from Hatch Eng., the construction management company for the project. "Overall, the system proved that piping system components can be connected, installed and operated using Fieldbus serial communication digital protocols."

Similar results can be obtained using the system for applications in power, chemical processing and water treatment. **WWD**

Martin Neil is former sales service and support director for GF Piping Systems' Georg Fischer Signet, LLC, facility. For more information, contact Anant Babbtiwale, product manager for Georg Fischer Signet, LLC. Babbtiwale can be reached at 626.571.2770 or by e-mail at anant.babbtiwale@georgfischer.com.

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ARTICLE SUMMARY

Challenge: An Australian nickel mining project using a hydrometallurgical process faced two major challenges: saltwater corrosion of steel piping and ineffective servicing of the pump cooling process.

Solution: The company plant replaced its steel piping systems with corrosion-resistant PVDF and PE pipe. Other new installations included measurement and control technology, including electromagnetic insertion flow sensors and valve controls.

Conclusion: The new solutions package has provided the mining group with improved efficiency, reduced costs and higher reliability.

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