

Jiangxi Copper: turning wastewater into profits

Jonathan Wilkinson explains how BioteQ is helping Jiangxi Copper Co improve wastewater treatment at the Dexing mine

“This plant uses sulphide precipitation technology to treat acid mine drainage while recovering copper during treatment”

The attention given to innovation in water-treatment technologies is on the rise. One project that has drawn the interest of governments and industry observers is Jiangxi Copper Co's (JCC) Dexing mine in Jiangxi province, China.

Dexing is the site of a new ion-exchange water-treatment plant that has been developed as a partnership between JCC and Canada-based BioteQ Environmental Technologies.

The ion-exchange plant recovers nickel and cobalt from low-grade solution to produce a saleable Ni/Co product and

clean water that can be recycled for onsite use or discharged safely to the local environment.

BioteQ's relationship with JCC is longstanding. The parties started their co-operation in 2006 with a 50/50 joint venture project to design, build and commission a water-treatment plant for copper removal and recovery using BioteQ's ChemSulphide process.

This plant uses sulphide precipitation technology to treat acid mine drainage while recovering copper during treatment. Not only does the plant successfully treat mining effluent, but it also generates

revenues from the copper recovered in the wastewater.

The project was awarded the 2008 China Mining Environmental Protection Award for its application of innovative water-treatment technologies to protect and preserve the environment.

The Dexing mine was once again in the news when an ion-exchange plant, focused on the removal of nickel and cobalt from mine waters, was completed. In March 2012, it was announced that the plant had been awarded Yu\$3.5 million (approximately US\$555,000) from the Jiangxi Provincial Development and Reform Commission.

The award, handed out in the Green Technology/Environmental category, recognises high-tech innovations that deliver significant environmental, economic and social benefits for the region. The commission is the governing body overseeing economic and social development in Jiangxi province of China.

ION EXCHANGE

The initial ChemSulphide water treatment plant has a design flow of 1,000m³/h and recovers copper from surface water run-off, mixed with drainage from waste dumps and low grade stockpiles.

These stockpiles are processed upstream of the site's high-density sludge (HDS) lime neutralisation plant that is used to remove aluminium prior to discharge into the environment.

During the construction and operation of the copper recovery plant, nickel and cobalt (Ni/Co) were found in the ChemSulphide plant effluent. The concentration levels of nickel and cobalt ranged from 5-8mg/L.

When combined with a high water flow, the recovery of these metals was a potentially attractive opportunity. This recognition prompted JCC and BioteQ to evaluate using selective ion-exchange technology to recover nickel and cobalt from the discharge of the existing copper-recovery treatment plant.

The ion exchange uses resins to load the target metals, and is particularly effective where metal concentrations are low and wastewater flows are high.



The Dexing ChemSulphide water-treatment plant

What is ion exchange?

Ion exchange can be used to selectively recover dissolved metals that are in low concentrations in large flows of wastewater, and is particularly effective where metal concentrations are very low but still exceed discharge limits.

Ion exchange recovers metals in a three-stage process:

- In the first stage, metals are selectively loaded onto a custom resin.
- In the second stage, metals are stripped from the resin and concentrated into a regenerate solution.
- In the final stage, the concentrated metals are precipitated from the solution in a saleable form.

Ion exchange offers a number of advantages, not

least of which is the ability to produce wastewater streams that are compliant with strict water-quality criteria for discharge or re-use.

This ability to extract metals into a saleable form from the wastewater streams also allows operations to maximise resource recovery of dissolved metals in low-grade solutions. Operations can ultimately generate a revenue stream from waste to offset water treatment costs.

At the same time, it reduces or eliminates sludge production and the associated long-term environmental and financial liabilities. In some projects, ion exchange for metal recovery has been effectively combined with sulphide precipitation to deliver cost-efficient recovery of dissolved metals in low-grade solutions.

Once the resins are fully loaded, they are regenerated by stripping the metals from the resin and concentrated in solution. This concentrated metal-bearing regenerant solution is then treated to precipitate the metals from the solution in the form of a saleable metal by-product.

A 2010 pilot at the Dexing site demonstrated that it was technically feasible to use ion exchange to recover nickel and cobalt from the mine water. In the following year, a full-scale plant was designed and constructed to operate downstream of the copper recovery plant and upstream of the HDS plant.

The ion-exchange plant, which receives a flow of approximately 800m³/h from the copper recovery plant, can produce a commercial grade metal concentrate product and is moving into commercial production.

The ion-exchange plant will enable JCC and BioteQ to produce metal concentrate. In addition, a secondary benefit for JCC is that the plant contributes to a reduction in the amount and toxicity of waste sludge produced by lime neutralisation.

The recovery of copper, nickel and cobalt from the ChemSulphide and ion-exchange plants results in the production of significantly less waste sludge that must be disposed of.

RUNNING THE NUMBERS

In commercial production since 2008, the ChemSulphide copper recovery plant treats on average more than 6.3 million m³ of wastewater, while recovering just less than 1.8Mlbs of copper per year.

The ion-exchange plant will move into commercial production in the June quarter of 2012 with measured ramp-up throughout the year. At full operational capacity, the plant is projected to recover approximately 50,000lbs of nickel and 50,000lbs of cobalt per year.

The developments undertaken by BioteQ and JCC at the Dexing mine show that effective water treatment can be highly cost effective. Working with BioteQ, JCC has found innovative ways to turn a cost centre into a profitable enterprise.

The Dexing example illustrates that revenues generated from the recovery of



dissolved metals can, in many instances, significantly offset wastewater treatment costs. Funds generated through the recovery of such metals can be used to offset operating costs, as well as eventually offset costs associated with mine reclamation and closure costs – while at the same time providing stable, productive employment for local communities. ▼

Ion-exchange technologies are also used at Dexing to enhance metal recovery

Jonathan Wilkinson is CEO of BioteQ Environmental Technologies, a Vancouver-based water treatment company that applies innovative technologies and operating expertise to solve challenging water treatment problems. See: www.bioteq.ca.

NEW!

Modular Design Makes 6712DT Heli-Portable For Remote Work

Geoprobe®

Innovative Rigs and Equipment for the Mineral Exploration Industry

www.geoprobe.com

800-436-7762 or

785-825-1842

The NEW Geoprobe® 6712DT separates into three sections for transport, and easily reassembles in less than 15 minutes. Approximate weight: 6,000 lb. All manual controls. Heavy-duty track drive system. Easy access to key service and maintenance components. Refined Direct Push capabilities.

Rear blade assembly for tooling transport and machine stabilization.

It's a great addition to your drilling resources.

