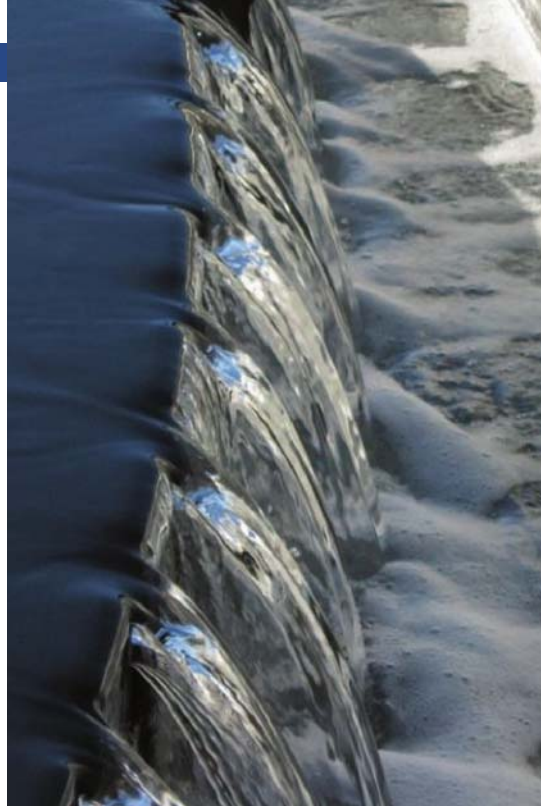
CLEANING UP THEIR ACT!

As the mining industry adapts to changing markets, economic and environmental sustainability is taking on new meaning. One interesting by-product of today's recession is the acceleration of technology adoption in order to improve operational efficiency, reduce life cycle costs and protect the environment. One area that is gaining considerable attention in mining quarters is wastewater treatment. Acid wastewater contaminated with dissolved metals can create a lasting environmental liability and long-term remediation requirements that significantly impact the life cycle costs of mining operations. However, new technologies that reduce these life cycle costs are being successfully applied in wastewater treatment by removing metal contaminants, and producing no residual waste sludge. Instead, high-grade metal by-products are produced that can be sold to offset the cost of water treatment, converting a waste stream from a cost centre to a revenue generator while eliminating long-term environmental liabilities. Following are just two examples of how new innovations in wastewater treatment have delivered proven and sustainable results.



A series of photos clearly shows that through modern technology and processes, deadly situations (left) can be transformed back to the way Mother Nature intended them to be (right).

Jiangxi Copper's Dexing mine in Jiangxi Province, China, recently won the country's 2008 Mining Environment Protection Award for applying new technology that treats metal contaminated water in a manner that is environmentally and economically sustainable. The impetus for the transition to new water treatment solutions was the 2008 Olympics. As part of a government-wide initiative to improve the country's environmental performance, Jiangxi Copper led the effort on the part of the mining sector by targeting six of its sites for new wastewater treatment plants, starting with Dexing.

The largest of the company's copper mines, the Dexing site produces 120,000 tonnes of copper concentrate per year from flotation concentrate. It also operates a heap leach using SX-EW to produce copper cathode from low grade stockpile. Acid mine drainage from the waste dumps and stockpiles contains copper.

In 2005, Jiangxi Copper entered a joint venture agreement with BioteQ Environmental Technologies Inc. of Vancouver (www.bioteq.ca) to implement its proprietary ChemSulphide® process. Under the terms of the agreement, BioteQ is responsible for building and operating the water treatment plants and shares 50 per cent of the capital and operating costs. This highly effective business model reduces capital and implementation risk, while allowing operations to leverage the benefits of a proven technology solution and in-depth operating expertise.

The process works by using sulphide precipitation to selectively remove and recover individual metals from contaminated water. Sulphide is mixed with the water to be treated under controlled conditions to selectively precipitate metals as a high grade metal sulphide. The precipitated metals and treated water are then pumped to a clarifier tank where the clean water is separated from the metal solids and either discharged to the local environment or recycled. At that point, the metal solids are filtered to remove excess water, producing a high grade metal sulphide product that is suitable for refining.

Jiangxi Copper commissioned the new 25 million yuan (CDN$ 3.6 million) water treatment plant in the spring of 2008. The capacity of this new plant is 1,000 cubic metres of water per hour, recovering up to 3.6 million pounds of high grade copper annually. The reclaimed copper is sent to the Jiangxi Copper refinery, and sold to generate revenue that pays for the cost of water treatment. This model reduces the life cycle costs for the mine operation, and improves the environmental footprint of the site.

Plant performance has exceeded expectations. Within the first year of operation, the plant processed 5.7 billion litres of water and removed close to 1.3 million pounds of copper from the environment, delivering process availability of more than 98% and profitable operations for the joint venture partners.

This sulphide technology is certainly not exclusive to addressing the needs of active mine sites. It has also been successfully applied in wastewater treatment for abandoned mining operations as a means to mitigate the long-term effects of acid mine drainage.

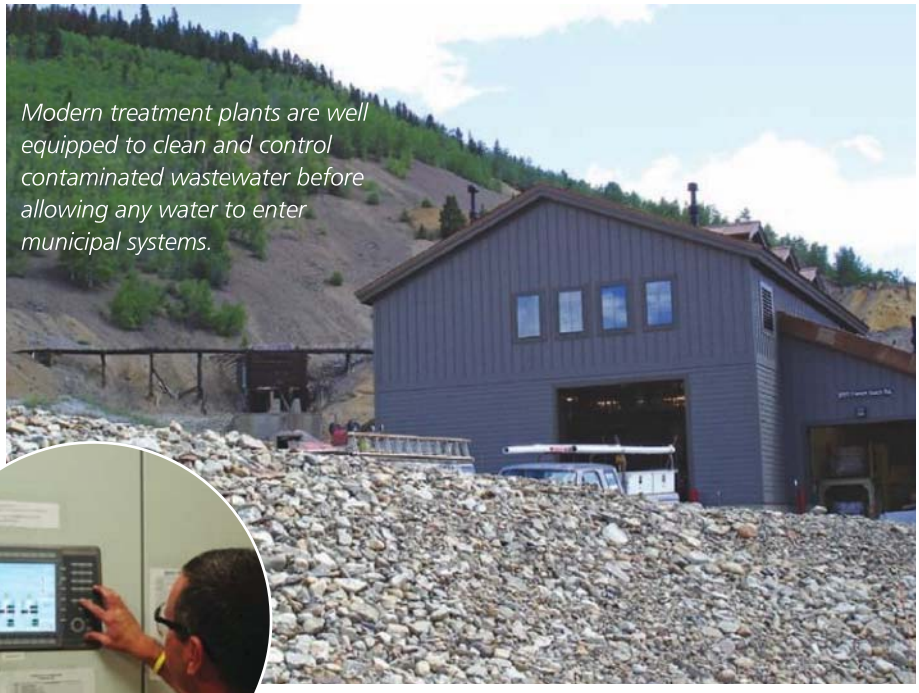
There is no question that monitoring and maintaining the wastewater reservoirs at these sites has always been a significant financial and environment liability for the industry. Some operations have worked in partnership with municipal authorities to address the wastewater dilemma and restore significant portions of what was once unusable land for community use.

At the Wellington Oro Mine site near Breckenridge, Colorado, for example, ChemSulphide® technology was used as part of a joint initiative focused on the community's open-space protection effort. This successful zinc-silver mine closed in 1972 after nearly 90 years of operation. Since that date, water contaminated with high levels of zinc and cadmium has been draining from more than 12 miles of abandoned tunnels, adits, and the associated mine infrastructure, impacting important fish populations in the French Creek tributary of the Blue River.

Seventeen years later, the site was identified for potential Superfund listing by the US Environmental Protection Agency (US EPA). At that point, a community team was formed to ensure the protection of alpine habitat and open space. A key component of that plan involved addressing the area's water quality issues.

In 2005, the Town of Breckenridge and Summit County purchased the 1,800 acre site as part of its open space plan, and an international call for proposals was issued to find a suitable water treatment technology to remove dissolved metals emanating from the former mine site. BioteQ's water treatment process was selected because it produces treated water that meets strict water quality criteria for metal content while generating no waste sludge that requires special disposal. Instead, it produces a saleable zinc-cadmium sulphide that can be sold to offset treatment costs and recycled into useful products.

The 3,200 sq. ft. water treatment plant was commissioned in 2008 and has the capacity to process up to 150 US gallons per minute, or up to 80 million US gallons of water per year (equivalent to 120 Olympic-sized swimming pools). In this particular applica-

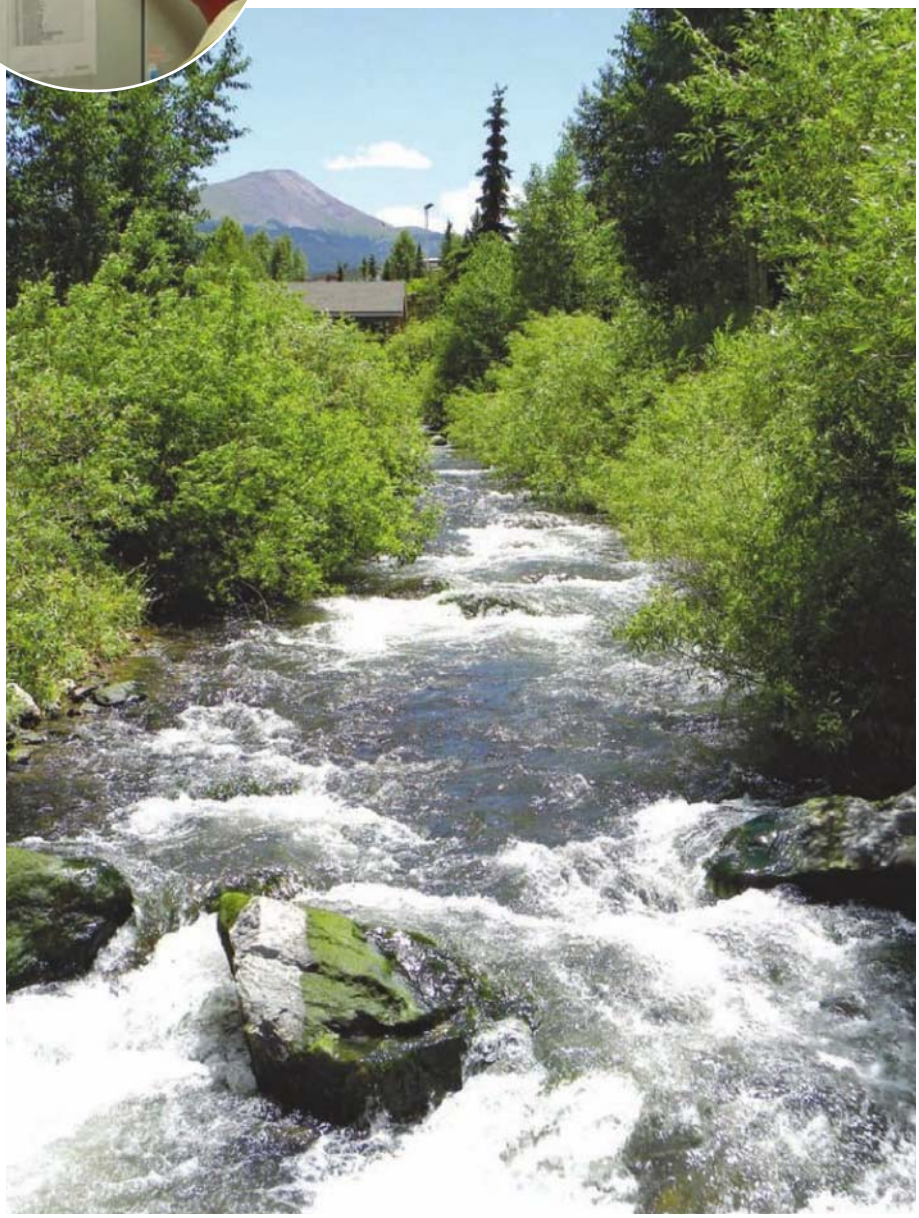


Modern treatment plants are well equipped to clean and control contaminated wastewater before allowing any water to enter municipal systems.

tion, the system removes cadmium, zinc, and other minor contaminants from metal-contaminated mine drainage. The water that is returned to the French Gulch basin has less than 225 parts per billion of zinc and 4 parts per billion of cadmium, meeting strict criteria set by Colorado Water Quality Standards.

On average, the treatment plant – which is managed by the town's water division – removes 4,000 pounds of metals a month. It also meets international ISO 14001 standards for environmental compliance.

This is a compelling example of how mining operations, environmental agencies and municipalities can work together to address the issue of acid mine drainage at abandoned sites.

By applying new techniques to an age-old problem, communities cannot only "clean up their act," they can even generate revenue streams from the recovery of saleable metals, while ensuring the sustainability of their water resources for future generations.

As the mining industry moves forward, the need to adopt new technologies to keep pace with legislative and market changes will become more pressing than ever. As it stands today, there are considerable opportunities to improve environmental sustainability and wastewater recovery, streamline operations, and reduce life cycle costs and risk. Whether addressing the needs of a fully operational site as a means to preserve fresh water supplies, or mitigating the damage of an operation that has long since shut down, it is the application of innovative technology that will play a key role in the industry's future. **NMT**