

Phoenix Gold Mine

Cyanide detoxification system

Red Lake, Ontario, 2014



Above: a liquid SO₂ storage tank with the control building above, and the portable insulated gas handling building built at BI Pure Water's facility in Surrey, BC

Process Manufacturing (Canada) Inc. and BI Pure Water (Canada) Inc. have designed and manufactured an energy-efficient cyanide destruct system for the Rubicon Phoenix Gold Mine in Red Lake, Ontario. The project includes a gas handling building, liquid SO₂ control building, a liquid SO₂ storage tank and a cyanide destruction tank. Process Manufacturing is under contract with Gekko Systems PTY of Australia.

Oxygen is now commonly employed to treat process tailings from gold plants. The oxygen process has greater flexibility and lower energy requirements because it has greater utilization than other processes.

After recovery of the gold in the ore, the tailings are treated in a single-stage cyanide destruction process to reduce the concentration of residual cyanide and precipitate heavy metals in the final effluent tailings stream. This process must meet the target limits set by the Ministry of Environment and/or the ICMI Code compliance which can be as low as 1 mg/L CN total or less than 50 mg/L weak acid dissociable (WAD) cyanide for the discharge of final tails into a tailings storage facility.

Sulphur dioxide (SO₂) and oxygen are used in the first stage of the cyanide destruction process to destroy WAD cyanide. Metals are precipitated as hydroxides with the addition of lime at a controlled pH range. The strong iron cyanide complexes are then precipitated with copper to form a copper-iron-cyanide precipitate.

The 4 m wide x 17.3 m long x 3.5 m high gas-handling building is built on a steel frame. The walls use urethane foam panels (SIP) of R20 and the roof is R30. The structure was fabricated by BI Pure Water to Process Manufacturing's design.

The major equipment in this building includes three PCI DOCS 500 oxygen generators, located in one of the rooms. A Kaeser KAD90 desiccant drier system and two Kaeser air compressors are located in the other room.

CASE STUDY

A liquid SO₂ control building is installed on top of the SO₂ storage tank on site. Also built on site is a large 300 cubic meter steel cyanide destruction tank. As well as the liquid SO₂ reagent system, a lime reagent system and copper reagent system were included in the project.



Some of the controls and instruments included in the process are an online cyanide WAD analyzer, slurry flow meter and density meter, an emergency shutoff valve for the reagents, pressure reducing valve, pressure gauges/transmitters, flow meters, auto flow controller and an SO₂ detector.

This process is fully automated, requiring very little supervision by mine operations. The control room operators are able to monitor the flow rates and composition of the feed by computer screen, as well as the quality of the effluent. The effluent is measured automatically every 30 minutes, allowing for timely automatic adjustments to the reagent addition to the reactor tank. This ensures the process is in compliance with regulatory requirements before discharge to the final impoundment area.

The above systems and structures were assembled and tested at the BI Pure Water facility in Surrey, BC and shipped complete to the Red Lake mine.



Top: Three PCI Oxygen Generators are installed in the containerized steel frame gas handling building. Above left: Desiccant drier system and right, two Kaeser air compressors



Protecting the environment is of the highest importance and BI Pure Water works with its partners to provide the latest technology to accomplish this goal.

Guided by the triple bottom line of social, economic and environmental sustainability, the design team can move beyond the norm to

improve the systems over time. By understanding the components of successful treatment innovation, the relationship with the operator can be facilitated and the result is a more productive system.

BI Pure Water and Process Manufacturing specialize in reviewing water/fluid analysis results and prescribing the most cost-effective solution. We pilot, design, manufacture, install, start-up and commission package treatment plants. The operators are then trained and the plants can be serviced on a regular basis. Our package treatment plants are cost-effective.

