WATER TREATMENT PLANT AT OCEANAGOLD'S DIDIPIO GOLD-COPPER MINE, PHILIPPINES

The mine required a robust, flexible design to accommodate the unique environment ... the water treatment plant is a major milestone in the mine's evolution, representing an important environmental initiative.

OceanaGold Corporation holds a diverse portfolio of assets in New Zealand, operating three mines on the South Island, including one of the largest gold operations in the country. The company acquired the Didipio Project in the Philippines through a merger with Climax Mining.

Background

Located on the island of Luzon, approximately 270km north-east of the Philippine capital of Manila, the Didipio Mine is a high grade gold-copper development forecast to produce 100k0z gold and 14kt copper on average over its projected 16-year mine life. Didipio Mine was commissioned in 2012, with commercial production commencing April 2013.

In Q3 2013, OceanaGold identified an opportunity for a new water treatment plant to treat the existing tailings

CHALLENGES

- Solids concentration from TSF outflow to be less than 70ppm
- Robust design to cope with fluctuating water quantity and quality
- Remote location, small footprint

SOLUTION

- Extensive testwork programme to verify target levels can be met or exceeded
- Complete water treatment plant - 34m clarifier, associated pipework, detailed engineering (process, civil, mechanical, structural, electrical)

RESULTS

- Overflow solids concentration under 30ppm and as low as 3ppm during commissioning
- Robust, flexibile water treatment plant design

storage facility outflow in order to reduce total suspended solids. The plant would also take into consideration future removal of metals precipitated from solution.

Outotec and OceanaGold have a strong track record of collaboration together, with Outotec supplying all the main processing equipment for the Didipio Mine, including comminution circuit, flotation, filters, thickeners, and automation. Outotec also installed the world-first flotation cell, TankCell 300, at OceanaGold's Macraes mine in New Zealand, which at the time was the largest flotation cell ever built.

Process design

Outotec was engaged to carry out pre-feasibility engineering studies for the water treatment plant, as well as subsequent pre-study work. An extensive testwork programme was also undertaken on site to design the process using Outotec's dynamic bench scale high rate thickener. The programme was critical to proving the process performance could meet stringent targets across an extensive design envelope, with the water treatment plant feed fluctuations being seasonally driven.

Scope

Outotec supplied a complete water treatment solution for Didipio Mine, comprising equipment; plant supply; and detailed engineering. The detailed engineering included process, civil, mechanical, structural and electrical design of the water treatment plant.

Fabrication was performed both locally and from other regionally competitive low cost countries to ensure the lowest project capital requirements.
Outotec provided installation advice for a high quality plant construction managed by the local Didipio Mine project team.

Challenges

The Didipio Mine is situated in a remote, mountainous location, where there are significant seasonal variations in rainfall. After high rainfall, there is a marked increase in rain run-off matter from wash-down sediments, impacting on tailings slurry and ore levels in solids. The geographical constraints also necessitated a small installation footprint, adding to the complexity.

The mine required a robust and flexible design to accommodate the unique environment, incorporating a water treatment plant that accommodates fluctuating water quality and that is easily stopped and resumed as required, dependent on dam volumes.

Additionally, the remote location meant that there is no regular water supply to service water treatment requirements.

Testwork programme

The Didipio Mine water treatment plant is required to reduce the environmental impact of outflow waters from the existing Tailings Storage Facility (TSF). For the majority of the year outflow solids levels are significantly below operating licence levels, with solids level only increasing due to seasonal or one off rainfall events. With these conditions in mind, the testwork programme on site was designed to ensure the already low outflow levels

The water treatment plant at Didipio Mine.

Overflow of Outotec clarifier.

were further reduced and that during periods of high rainfall (high flow/high solids), target outflow solids levels could be met or exceeded.

An extensive testwork programme was undertaken across a broad range of process scenarios to ensure target levels could be met or exceeded and form the part of water treatment plant performance warranties. The test work data also provided critical input to the plant process design.

The water treatment solution

The Didipio Mine water treatment plant treats outflows from the mine's TSF. It is an important environmental initiative to treat total suspended solids so that the water used by Didipio Mine is returned clean and of high quality to the ecosystem.

At the heart of the water treatment plant is the 34m clarifier and associated steel pipework designed and fabricated by Outotec. The plant operates at 50% capacity and can stop operation as required, dependent on water levels in the tailings dam.

To address the water supply issue, clarified water was used to service the treatment plant requirements.

Commissioning

Upon commissioning, the water treatment plant was immediately fully operational. Commissioning was undertaken by an integrated team comprised of Outotec and OceanaGold representatives and adopted a process of introducing concentrated solids from the tailings storage facility to the plant externally in order to seed the solids bed in the clarifier. This approach also simulated the process performance of the plant with a stable level of solids present.

Through five days of commissioning, testing showed overflow solids concentration to be under 30ppm, and as low as 3ppm – far exceeding design specifications of 70ppm, and with potential operational savings in reagent use. Outotec has also been able to confirm successful process commissioning under a 'worst case' scenario with concentrated solids being fed into the system. Through this collaborative approach, the water treatment plant at Didipio Mine not only meets but well exceeds regulatory requirements. The plant had been granted a class D permit in effluent water quality standard (criteria of 50 to 150ppm) but OceanaGold was committed to delivering a plant which exceeded this criteria, taking its water quality to the next level.

Clarifier bridge.

Reintroducing water into the adjoining river.

Conclusion

This water treatment plant represents a major milestone in Didipio Mine's evolution, offering an important environmental solution to treat total suspended solids to safely reintroduce into the adjoining river. The treatment solution reflects targeted values for both Outotec and OceanaGold for sustainable accountability in mineral operations.

The cooperative relationship between Outotec and OceanaGold throughout the project has been an important factor in its success. Thanks to an honest and collaborative partnership, emergent challenges during the course of the project were able to be expediently resolved, resulting in a plant solution that achieves its targeted goals. This success provides an excellent platform for future collaborative projects between Outotec and OceanaGold.