



Case Study: Minerals processing solutions

Organisation: OceanaGold Ltd, New Zealand

Site: Macraes, New Zealand

Year: 2007

Application: Gold Flotation

Challenge:

- Turnkey design and installation
- Debottleneck flotation configuration from two trains to single train
- Extremely limited footprint
- Increase flotation capacity from 5.8mtpa to 6mtpa
- Improve recovery of gold bearing sulphide
- Limited time frame

Solution: 3 x TankCell® -300, FrothMaster™ 2 froth imaging system and ACT Control System

Key benefits:

- Gold sulphide recovery improved by 3%
- Throughput of 6mtpa achieved
- Better mechanical and metallurgical stability
- Lower maintenance, compared to two train circuit
- TankCell® design commenced Jan 07, turnkey project commissioned Nov 07
- Easier operability

World's largest operational mechanical flotation cells, TankCell® -300s, debottleneck and increase recovery at OceanaGold's Macraes Gold Mine in New Zealand.

The successful commissioning by Outotec of three TankCell® -300 flotation cells at OceanaGold's Macraes operation in New Zealand represents a groundbreaking worldwide development for flotation technology. TankCell® -300, with an active capacity of over 300m³, is the largest operational mechanical flotation cell in the world and the Macraes site, commissioned in November 2007, is the first such installation globally.

Outotec
More out of ore

OceanaGold Corporation is a significant Pacific Rim gold producer, with a portfolio of operating, development and exploration assets. These assets – located in the South Island of New Zealand and in the Philippines – include New Zealand's largest gold producing operation, Macraes, which has produced more than two million ounces of gold since current mining operations began in 1990.

Total Macraes production is expected to average 200,000 - 220,000 ounces per annum with total production from the New Zealand operations (including Reef ton) averaging 250,000 - 300,000 ounces of gold per annum. OceanaGold's Macraes mine is New Zealand's largest gold mine with a current throughput of 6mtpa. The Macraes Operation requires large-scale mining with highly efficient technology to achieve optimum economic results. In addition, the Macraes ore body is low grade and refractory in nature requiring pressure oxidation for processing. Gold grades from the combined open pit / underground operation average 1.4 - 1.8 grams per tonne.

OceanaGold is listed on the Toronto, Australian and New Zealand Stock Exchanges under the stock code "OGC".

Old flotation circuit at Macraes

The old flotation circuit at Macraes consisted of two single trains, supported further by Flash Flotation™ in the grinding circuit. Outotec's Flash Flotation™ SkimAir® cells prevent liberated particles from overgrinding and result in more stable feed to the flotation circuit. In this instance at Macraes, the 2 x SK500 recovered 60-65% of the gold sulphide minerals. The cyclone overflow was then fed into rougher column cells, with the tail from the columns flowing into Outotec mechanical scavengers.

Concentrate from the rougher and scavengers was passed through a cleaner and recleaner circuit, with the final concentrate being treated in a pressure oxidation circuit.

This old circuit had four key challenges:

1. Restricted throughput due to a lack of flotation capacity
2. Difficult to operate, feed was split through two flotation trains
3. Recovery not optimal, which was linked to poor performance of the column cells
4. Expensive to operate and maintain

Debottlenecking and the new circuit

The flotation circuit capacity was to be expanded, whilst at the same time returning to a single flotation train operation. Previous testwork had shown that a 2.5% increase in sulphides recovery could be expected if the rougher flotation columns were replaced with TankCells®.

Thus a plan was undertaken in which the two flotation trains would be combined through the installation of a new rougher flotation stage, consisting of 3 x TankCell® -300 cells, each with a volume of 300m³. The first two cells are equipped with traditional OK MultiMix mechanisms, whereas the third cell would have the new FloatForce® mechanism. All cells would have FlowBoosters mounted on the shaft to optimise mixing efficiency and metallurgical performance.

The TankCell® -300 tails gravitate 37m to the existing two TankCell® -150 scavengers. The existing rougher columns were to be decommissioned whilst the train's scavenger cells (6 x OK38) were to become the first cleaner cells. The resulting circuit would have a 6mtpa capacity through a single flotation train.

The project also sought to incorporate the latest in control technology for the new TankCells®. Each TankCell® was fitted with the FrothMaster™ 2 froth imaging system and an overall expert control platform (ACT Control System) was supplied for management of air addition, froth speed and level in the new cells.

Turnkey implementation

The new circuit configuration was finalised in March 2007. TankCell® -300, being the first of its size, was subjected to rigorous CFD Modelling and water testing in Perth before a further 2 x TankCell® -300 were constructed in New Zealand. In May 2007 Outotec began work on site to prepare for installation of the TankCell® -300 cells. Works included civil and earthworks, significant upgrades to the electrical system on site and a detailed plan for integrating the cells into the existing circuit, including design of all pumping, piping additional flotation air blowers and the rerouting of existing slurry piping. Upon arrival at site, the new flotation cells were installed into the circuit and, after mechanical commissioning, were integrated into the circuit in November 2007 during a 48-hour shutdown. Within two hours of the plant restarting after shutdown, full operation of the flotation circuit was achieved.

Result

The introduction of the new TankCell® -300 rougher cells achieved all of the project aims. The circuit is now operating on a single train basis, with operator comments confirming significant improvement in ease of operation. Throughput at the targeted 6mtpa has been demonstrated.



The 3 x TankCell® -300 at Macraes. The world's largest operational flotation cells, with over 300m³ active capacity.

This new circuit at Macraes was projected to improve gold bearing sulphide recovery by 2.5%, and economical evaluation based on that yielded a payback time of about 16 months. According to average metallurgical results, the bulk flotation recovery has improved by 3%, hence contributing to an even shorter payback time. This result will be further evaluated through a complete plant survey program in the near future. The cost of operating the flotation circuit has decreased with the decommissioning of the old rougher columns.

TankCell® -300 = Metallurgical stability

The TankCell® -300 cells are demonstrating excellent mechanical and metallurgical performance. The ACT Control System provides for a consistent and stable froth surface (despite the very low sulphide feed grades) that provides excellent metallurgical results. Mass pull in these cells is controlled, automatically adjusting the air feed rate or the froth depth. The strategy that yields highest recovery uses air feed rate as the primary variable and froth depth as secondary. Concentrate grades have increased in the rougher circuit, whilst simultaneously achieving higher recovery through the careful application of froth control.

Hydrodynamic and gas dispersion measurements showed similar superficial gas velocity measurements at various locations within each cell. The superficial gas velocities in the TankCell® -300s are within the range of previously measured Outotec flotation cells greater than 100m³. Bubble sizes ranged between 1.0 and 1.2mm in the TankCell® -300s and are within the range of previously measured large Outotec flotation cells.

The successful commissioning of the additional auxiliary reversible agitator (FlowBooster) has shown that there is significant potential to reduce power without any loss in metallurgical performance, with potential to increase coarse particle flotation.

The 3 x TankCell® -300 were installed on an exceptionally small existing plant footprint. In this case, gravity flow of tails makes the operation particularly efficient.

The future

Further analysis on the performance of the new TankCell® -300 cells is planned, including full size-by-size metallurgical surveys and ongoing analysis of operating costs. All of this information will be used for further development of both new TankCell® designs and optimisations on existing TankCells®.

Outotec is a worldwide technology leader providing innovative and environmentally sound solutions for a wide variety of customers in minerals and metals processing as well as related process industries. Outotec Oyj is listed on the NASDAQ OMX Helsinki.

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