



WATERCARE MINING

## Case Study: Underground & Surface Fines Recovery for Improved Mud Management & PGM Recovery

### Optimising water re-use and reclamation within the underground mining operation is a key objective of the mine's water management model

The fundamental principle of water management in underground mines is to plan, design, operate and close the underground mining operations in a manner that:

- reduces the ingress of fissure water into the mine
- minimises the volume of water used in mining operations
- maximises water re-use
- minimises the water quality deterioration within the mine
- minimises the impacts of mining operations on the natural water resources

In order to bring this fundamental principle into effect, optimising water re-use and reclamation within the underground mining operation is a key objective of the mine's water management model, and is defined in the mine project's design phase.

FIGURE 1: SAMPLES (FROM LEFT TO RIGHT) OF THE HIGH-RATE CLARIFIER FEED SLURRY, OVERFLOW FROM THE HIGH-RATE CLARIFIER, WATER FROM THE FILTER PRESS AND WATER FROM THE CLEAR WATER TANK



Underground hard rock mines (e.g. gold and platinum mines) in South Africa are typically deep mines, with water used underground primarily as mine service water (including dust suppression) and for mine cooling. A key component of the water reticulation system is the use of underground settlers, which are used to remove suspended solids that originate from blasting, cleaning of stopes and backfill operations. The mud which is removed by settling is typically enriched with precious metals, and is therefore a valuable product that needs to be delivered to the beneficiation plant. However, as the moisture content of the settled mud is too high to transfer directly from the settler to the beneficiation plant, it

is usually stored in underground and surface-level mud storage dams, where further settling and mud dewatering occurs. The settled mud is only then moved to the beneficiation plant – a manual labour-intensive, risky and expensive exercise. An alternative mud management solution was therefore required.

FIGURE 2: AN OVERVIEW OF THE COMPACT HIGH-RATE CLARIFIER



Watercare Mining developed an innovative fines recovery system to treat the mud underflow from the underground settlers to a quality that is acceptable for processing in the beneficiation plant. Watercare Mining's Fines Recovery System reduces the quantity of mud that enters the mud settling dams, thereby reducing the frequency of dam cleaning and mud removal. The decreased suspended solids in the clear water overflow also improves the clear water pump life. At the same time, the system increases the consistency of quality and quantity of the mud entering the beneficiation plant, thereby improving precious metal processing efficiency.



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The components of Watercare Mining's Fines Recovery System include:

- A patented, modular High-rate Clarifier (Figure 2) to concentrate the underground settler mud underflow from an average SG of 1,08 kg/L to an average SG of 1.2 kg/L. The High-rate Clarifier overflow water has a suspended solids content of 10-40 mg/L and is returned to the mine service water reticulation system or the surface settling dams (Figure 1).
- A Filter Press, to dewater the High-rate Clarifier underflow mud slurry to a moisture content below 30% (w/w). The filtrate (Figure 1) may be recirculated back to the High-rate Clarifier feed if the suspended solids content is above the specification of 50 mg/L, or returned to the mine service water system.
- An Automatic Flocculant Preparation & Dosing Plant, to support the mud clarifying and dewatering processes.
- A PLC control panel to integrate all the unit processes seamlessly.

FIGURE 3: EXTRUDED MUD FROM THE FILTER PRESS ONTO THE CONVEYOR THAT MOVES THE MUD TO THE BENEFICIATION PLANT



A PGM project in South Africa commissioned Watercare Mining's Fine's Recovery System and reduced the suspended solid loading to the two surface mud dams from an estimated 20 000 kg/day to 8 kg/day. The removal of mud from the dams was historically a continuous process. As soon as the cleaned dam was available for use, the second dam had to be cleaned. At the time of system commissioning, the mine

budgeted approximately R2,4 million/annum for surface mud dam cleaning. It is estimated that with the reduced suspended solids in the service water, the dams will take longer than a year to choke to the point that they will need to be cleaned.

The improved water quality entering the surface settling dams has resulted in improved clear water overflow into the Erickson Dams, feeding water of a better quality back underground to the mine's service water reticulation system. The Erickson Dam chemical treatment costs have decreased due to reduced chemical demand, resulting from the improved water quality. The Fines Recovery System has enabled the mine to comply with the mine's water management model and support the principles of water re-use and reclamation optimisation, and minimising the deterioration of the water quality within the mine.

Watercare Mining's Integrated Fines Recovery System is customised to the requirements of each mine site. The system holistically manages the conversion of underground settler underflow mud to a dry state, efficiently and cost effectively. The return for the mine has been realised in the savings related to dam cleaning (up to R2,4 million/annum), improved clear water pump life, reduced chemical treatment costs, improved PGM yields from the recovered fines, and improved water conservation through re-use and reclamation of the service water. Improved dam capacity management has helped the mine to be more compliant with the health and safety regulations relevant to pollution control dams.