

KNIGHT PIÉSOLD

Unpacking TSF challenges and solutions

Water management is and will remain one of the primary challenges on any mine. As legislation grows increasingly stringent and corporate standards constantly improve, it is becoming more and more difficult and costly to adequately manage water within tailings storage facility (TSF) circuits.

ANDRIES STRAUSS, sector manager: mining for Level 2 BBBEE environment consulting specialist **Knight Piésold**, discusses some of these challenges and demonstrates some of its expert solutions offerings through a number of recent projects.

“Following major TSF failures in recent years, a lot more emphasis is being placed on understanding the risks posed by large TSFs. In most cases, the primary driver of these failures is linked to mismanagement of water, or not adequately providing for extreme rainfall events. Carrying out detailed dam breach assessments for these facilities are becoming far more common as a result,” Strauss explains.

Unfortunately, in most cases, dam breach assessments are inherently uncertain due to the vast number of assumptions. Current software deals well with Newtonian fluids (water) but not as yet the heavily solids laden water (non-Newtonian fluids) that flow during a TSF breach.

Knight Piésold has developed an in-house procedure based on state-of-the-art knowledge and understanding of this phenomenon.

“Understanding the water balance of the TSF and the greater mine is critical to making operational and business decisions affecting water management. Knight Piésold has developed countless water balance models for projects all over the world, ranging from simple spreadsheet based models to advanced probabilistic models using GoldSim or similar software,” Copeland points out.

An extensive track record

Knight Piésold earlier this year carried out the detailed design of a new cyclone deposition facility in the Northern Cape and is currently supervising the construction. This facility has a very negative water balance and should therefore never be storing large volumes of water. The external run-off generated during the design storm event required some innovative designs to ensure

protection of the facility and ensure clean and dirty water remain separated.

“We also have on-going design, construction supervision and monitoring involvement at a large spigot deposition facility in Madagascar which has a highly positive water balance. Here, the embankments were designed as water retaining dams to allow for storage of the large volumes of water for extended periods.”

In July Knight Piésold completed the feasibility phase design of the first formally designed TSF in Rwanda, which may go to detailed design later this year, followed by construction. In contrast to the flat terrain of the Northern Cape, this site is situated in a steep valley requiring a very different approach to the external run-off management. Groundwater is also very shallow, requiring extensive drainage to protect this resource from contamination.

Knight Piésold also pioneered the use of a siphon decant system on a TSF in Limpopo in the early 90s. A similar design was commissioned earlier this year on a mega facility in the North-West Province. The siphon decant system allows for decanting water off the facility with minimal energy requirements and without the traditional outlet pipe exiting through or under the perimeter wall “which is frowned upon by certain clients/countries”.

Beyond TSFs

The company is also currently involved in a number of medium to large scale hydro power projects in the Democratic Republic of Congo (DRC), at different stages of design and construction. These are being developed for mining companies where access to grid power is not reliably available and they otherwise have to rely on diesel generated power at high cost. These projects will outlive the mine and be



Images showcase Knight Piésold's siphon decant system on a TSF

turned over to the local communities after mine closure, providing on-going power.

Knight Piésold also has an extensive track record in the design and execution of waste water treatment works. These have mainly been in the local government sector, but can easily be scaled down to suit the needs of a mining operation where the re-use of 'grey' water is common practice on many mines. **MRA**