



World First: Full-scale BioSure Plant Commissioned

Old Dortmund tanks were revamped to act as the biological sulphate reducing reactors. All the tanks are covered to prevent the escape of hazardous sulphurous gases.

A 10 Mℓ/day full-scale plant to treat toxic mine-water from the Grootvlei gold mine using primary sewage sludge has been commissioned at ERWAT's Ancor Wastewater Treatment Works on the Far East Rand. Lani Holtzhausen reports.

The plant, constructed at a cost of R15-million, is treating sulphate rich acid mine drainage using the Rhodes BioSURE Process, a patented cost-effective biological treatment option developed over nearly a decade with funds from the Water Research Commission. This is reported to be the first full-scale plant of its kind in the world.

Polluted mine-water from underground mine workings is becoming an increasing problem in South Africa as more mines close down resulting in water, both from the surface and underground, filling up the worked

out shafts and becoming polluted with heavy metals and minerals. Grootvlei, one of the last remaining operational gold mines on the Far East Witwatersrand Basin, pumps about 75 Mℓ/day of water from its No 3 shaft to gain access to its gold reserves.

FINDING A SUSTAINABLE SOLUTION

Situated near the ecologically sensitive Blesbokspruit Ramsar site, the mine has actively sought sustainable ways reduce ingress into its workings and to cost-effectively treat the water

it pumps out. After careful evaluation of several technologies, the BioSURE process was selected.

For the last two years, the technology has been tested through a 2 Mℓ/day pilot plant situated at Ancor. Construction started last year on the full-scale modular plant using existing abandoned infrastructure at the wastewater treatment works dating back from the 1950s and 1960s.

In essence, the BioSURE technology is a biological sulphate reduction process where sulphate rich water is placed together with primary sewage

sludge which acts as a carbon donor source in a reactor to create conventionally-treatable biosolid waste.

THE TREATMENT PROCESS

ERWAT project manager Leon Naudé reports that, being a first, the construction process was quite challenging, as the team had no reference and the process had to be fine-tuned while being built. He explains that, first, the pumped mine-water is treated at a high-density separation (HDS) plant to remove iron and condition pH levels. Then it is pumped two kilometres via a newly-constructed 10 Mℓ capacity pipeline to the Ancor works.

The pipeline enters the works from a northerly direction. This mine-water is then mixed together with primary sewage sludge in a mixing tank from where a splitter box directs the material to eight biological sulphate reducing reactors or bioreactors. It is interesting to note that these bioreactors are actually revamped Dortmund tanks. The walls of each tank was heightened for

Mixing and splitter tanks at the new 10 Mℓ/day BioSURE mine-water treatment plant at ERWAT's Ancor Wastewater Treatment Plant.



an increased capacity of about 1,25 Mℓ/day per tank. All tanks, manholes, etc have been sealed to prevent the escape of any hazardous sulphurous gases.

The overflow water, now rich in sulphide is pumped through the main pump station to another mixing box. Here, iron slurry, a byproduct from the initial HDS process is mixed with the material before it is again divided between four

reactor clarifiers for sulphide removal. The overflow water from these reactors now contains reduced sulphate levels and virtually no sulphide.


From here the material is pumped to Ancor's biofilters for removal of remaining Chemical Oxygen Demand (COD) and ammonia following the conventional sewage treatment process for eventual release into the Blesbokspruit. The capital investment



The polymer dosing station.

cost was carried by Grootvlei, and ERWAT is operating the plant on behalf of the mine.

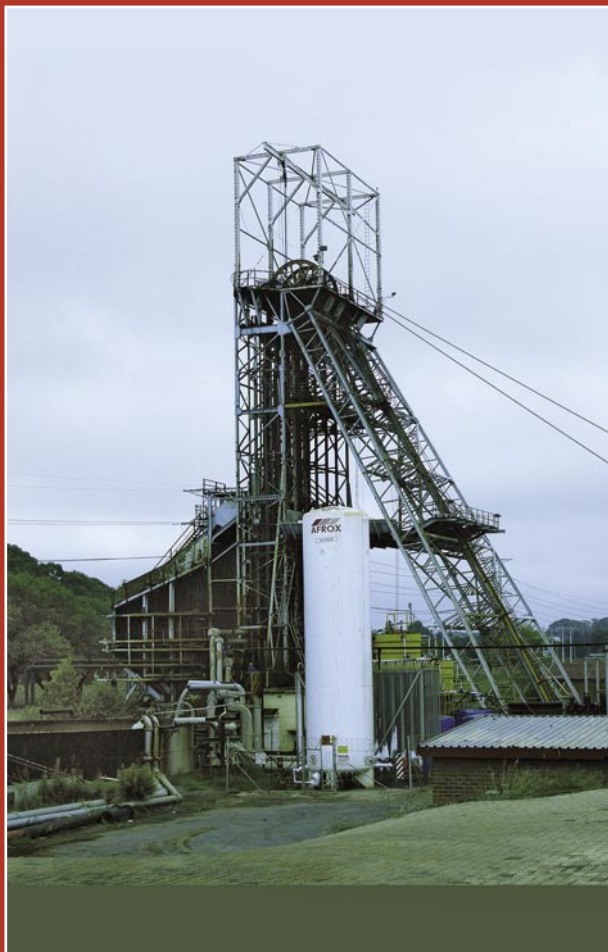
Naudé tells *the Water Wheel* that all mechanical equipment has been installed on an on-duty and standby basis to ensure a smooth continuous process. At the time of writing the plant was gradually being ramped up to full capacity. "We are quite pleased with the outcome of the process," says Naudé. "This might prove the long-term sustainable answer mines have been looking for."

ERWAT, which holds a licence for the BioSURE process, is now looking at similar technology to treat other industrial sulphate-rich industrial effluent, such as tannery effluent. 



The final water pump station.

PROJECTS PROGRESS TO REDUCE INGRESS AT GROOTVLEI



As part from treating its mine-water, Grootvlei has embarked on several projects in an effort to reduce the volume of water pumped from underground.

Construction of the first project to reduce seepage from surface water is nearly complete. This involves the diversion of the Blesbokspruit in the vicinity of the West Pit opencast complex to reduce infiltration from constant upstream industrial discharge. It is anticipated that this project, valued at R9-million, will reduce surface ingress by between three and five million litres a day.

The next focus area will be surface ingress at the No 8, 4 and 1 shaft complex. Underground water quality and flow measurements indicate that industrial discharges upstream of this area are affecting the volume and quantity of underground seepage.

Speaking at a mine-water symposium in Johannesburg earlier this year organised by the Geological Society of South Africa, group environmental manager Irene Lea said that, because of this third parties had to be involved in finding a solution. "We have made proposals to the Department of Water Affairs & Forestry and the Department of Minerals & Energy in this regard. They acknowledge that the process must be facilitated by government, and have subsequently proposes that a sub-committee be formed to which all stakeholders participate."

It is hoped that this committee will be initiated soon so that the process can be taken further.