



The new 15 000 m³ balancing dam is one of the most expensive features of the R70-million project.

Engineers Take on Mother Nature at Hartebeest- fontein

How do you upgrade a sewage treatment works while ensuring continuous operation during one of the most severe rainy seasons in years? Just ask the project team at ERWAT's Hartebeestfontein Wastewater Treatment Plant where improvements totaling R70-million are currently being undertaken. Lani Holtzhausen reports.

Located to the east of Kempton Park, on the East Rand, the Hartebeestfontein works was originally established in 1977 comprising three 10 Mℓ/day treatment modules. The plant treats wastewater from the industries in Spartan and Isando as well as households in the Kempton Park area.

Wastewater is processed using a two-stage activated sludge process. Each stage is a complete processing unit comprising aeration, clarification and sludge return. The primary stage is aimed mainly at Chemical Oxygen Demand (COD) removal, while the secondary stage is for nitrification.

In 1986, a side-stream Phostrip (biological phosphate removal) plant was retrofitted. This was followed by the addition of a third inlet works module in 1992 and a single 15 Mℓ/day treatment works, resulting in the works' total present capacity of 45 Mℓ/day. In 1995, a tertiary treatment system was designed and implemented to handle chemical dosing to allow for more effective phosphate removal.

IMPROVING EFFLUENT STANDARDS

The sewage treatment works has historically been subjected to unusually high peak flows, at times affecting the ability of the works to treat incoming sewage optimally. This, in turn, has affected the quality of the final effluent released into the Swartspuit. Since this discharge point is about 20 km upstream of the Rietvlei Dam, a major drinking water supply source for the Tshwane municipal area, it was crucial that something be done about the situation, reports ERWAT project manager Leon Naudé. "The current project will not merely improve the quality of the treated effluent, but allow the works to meet the standards set by the Department of Water Affairs & Forestry for 2010," he told *the Water Wheel*. The capacity of the works remains adequate, however, and will not be increased at this stage.

Design has been undertaken by process consultant Bill Alexander, while the civil and structural aspects have been tasked to consulting

engineering company ARQ. Grinaker-LTA has been appointed as the main contractor, with ERWAT undertaking the mechanical and electrical work.

BALANCING THE LOAD

One of the main features of the project (and also one of the most expensive), has been the construction of a new 15 000 m³ balancing dam to equalise the incoming load. The dam was completed towards the end of last year, and has already been incorporated into the existing sewage treatment works. In addition, the project includes the conversion of the vulnerable sludge age system from short to long, with aeration capacity being added for better biological nutrient treatment.

What makes the project especially challenging is the fact that construction and rehabilitation work is ongoing while the plant is in operation. "We cannot leave the area without a sewage treatment plant so only one or two modules are shut down at a time to allow the treatment process to

continue,” explains Naudé. As soon as infrastructure has been completed, the modules are connected back on to the system. The project team therefore works closely with the operators of the plant.

The geotechnical aspects of the project have caused several headaches for the project team to date. The prevailing dolomitic conditions at Hartebeestfontein have constrained construction at times as site engineers investigate the best way to protect the integrity of the infrastructure. Eli Coetzee of ARQ reports from the site. “Special attention has had to be paid to the foundations of the extensions and design of the drainage system. Infiltration of water into underground structures has to be minimised. This is being accomplished by adding impenetrable layers inside the concrete works, for example, the balancing dam features a multiseam system,” he says.

Drilling samples have shown that past leakages have created underground voids at parts of the site, threatening the integrity of some of the infrastructure. At the time of writing, investigations were continuing to find the best sustainable solution.

Coetzee notes that the patience of the project team has further been tested by recent heavy rains, turning the site into a giant mud pool at times. The rains also filled up emptied tanks, preventing the effective search for leakages and making necessary rehabilitation work difficult. Despite these challenges, though, the project team remains optimistic that construction will be completed before the end of the year.

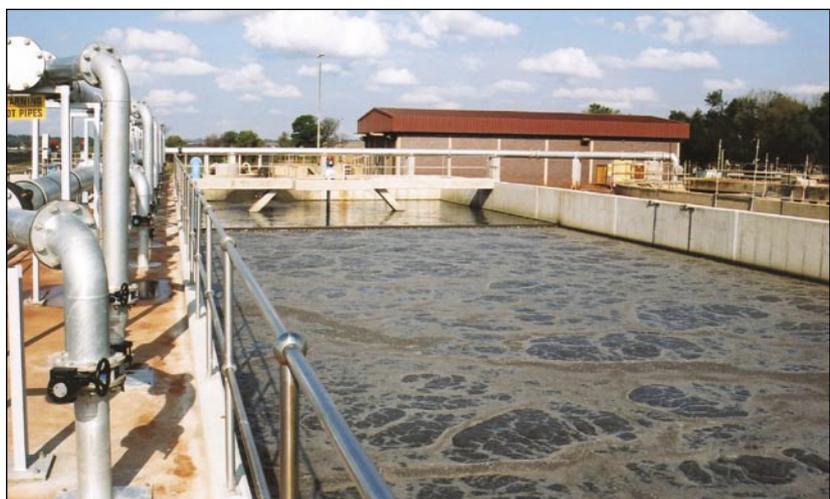
At about 50% complete, improvements in the quality of the released effluent can already be observed. There is no doubt that the project will bring much needed improvement to the performance of the Hartebeestfontein Wastewater Treatment Works.



Construction of one of the new aeration basins underway at the Hartebeestfontein Wastewater Treatment Works.



The old aeration basins of modules one and two which are now being converted into anoxic and anaerobic zones.



The new aeration basin for module four which features a diffused air system.

