

Durban Water Recycling Project

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South Africa-Durban

Project Background or Rationale

Water supply sources within South Africa are becoming ever more limited, while the need for alternative solutions is becoming increasingly more important with reuse becoming more attractive over traditional solutions.

The city of Durban in the Ethekeweni municipality, located on the east coast of South Africa, was faced with the challenge of sewage capacity constraints and the high cost of constructing a new outflow or marine outfall pipeline. They put together plans to increase capacity by building a duplicate sewer line, but found that the costs of wastewater disposal would be too high. The other option available was effluent recycling for reuse. However, even this option posed a financial and technical management challenge. The solution that emerged is an example of a Public Private Partnership (PPP) that harnesses the synergies of the partners to achieve an outcome that is unprecedented in the water industry in South Africa. The projects demonstrate innovative approaches to the sustainable development of water resources, minimization of water consumption and environmental pollution, and the achievement of technically challenging water and wastewater treatment goals. The result was the construction of a secondary waste water treatment plant and a water recycling plant, aimed at treating and supplying treated effluent to a level which was acceptable to an industrial recipient (Mondi Paper Mills) funded and managed through a partnership with the private sector Veola Water Services (VWS). This demonstrated that by pooling resources and expertise in a PPP, and by focusing on long-term sustainability goals, all participants can benefit, including the environment.

The Durban Water Recycling Project demonstrates that innovative approaches to water resource management, environmental management, wastewater treatment technology and institutional arrangements can yield exceptional results.

Capacity and Type of Reuse Application

The resulting solution was a plant consisting of an upgrade of the existing activated sludge process from 12.9 mgd to 19.9 mgd (50 megaliters/d to 77 megaliters/d), the construction of a new 12.3 mgd (47.5 megaliters/d) tertiary plant (**Figure 1**), refurbishment of the high level storage tank and the installation of the reclaimed water reticulation system. This solution produced treated effluent (12.1 mgd or 47 megaliters/d) for reuse in industrial application. Mondi uses the reclaimed water for the production of fine paper and is extremely sensitive to processed water quality and its impact on paper brightness.



Figure 1
Construction of the Durban Wastewater Recycling Plant (Photo credit: Ethekeweni Metro Water Services)

Water Quality Standards and Treatment Technology

The technology produces reuse water of a quality which has to comply with 32 contractually specified parameters based on regulatory requirements. The activated sludge process is a conventional design and serves to remove 95 percent of the incoming COD and 98 percent of the incoming ammonia loads. Typically, activated sludge plant effluent COD and ammonia concentrations are 15 mg/L and 0.2 mg/L respectively. The first step in the tertiary treatment process is lamella settling. Poly Aluminum Chloride (PAC) is placed in the water leaving behind the lamella settlers and is employed for the removal of iron. The final

reclaimed water achieves iron levels of 0.04 mg/L, which is five times lower than the South African standards for class 1 potable water (SABS 241:1999). The dual media filtration step is the last solids removal barrier in the process. Iron precipitate is removed in the dual media filter. The final step is ozonation used to break up the remaining non-biodegradable organic compounds, including color causing compounds. Mondi Paper's reclaimed water specification includes 23 parameters that are measured in the South African potable standard (SABS 241:1999) of these parameters; Mondi's specification meets or exceeds the potable standard for 77 percent of the parameters for class 1 potable water. In practice, VWS operationally meets or exceeds the Class 1 potable standard for 96 percent of the parameters. The Class 1 potable water standard gives the water quality levels that are known to be acceptable for lifetime human consumption.

Project Funding, Management Practices, and Benefits

The preliminary and primary wastewater treatment process is comprised of screening, degritting and primary settling operations; performed by Ethekweni Metro Water Services (EMWS). Meanwhile, the effluent from the primary settling tank is fed to the activated sludge plant operated by VWS. The funding of the capital for upgrade and new technologies, as well as the risks of meeting the water quality is undertaken by VWS under a 20 year production, operation and transfer concession. The incentive rested on the fact that the industry partner was prepared to accept a treated effluent water quality at a tariff, which was attractive and with offered high supply assurance. For the private sector it was a financially viable proposition, and for the municipality there were significant benefits to be achieved.

For EWS, the project has delayed capital investment for the increased marine outfall pipeline capacity; it also has delayed capital investment for future bulk potable water supply infrastructure. There was no capital investment and risks associated with the recycling plant; and a long term revenue stream from a levy raised on the production of recycled water was created thereby reducing cost of water services to Durban's citizens.

For Mondi the benefits were a 50 percent reduction on normal industrial water tariffs, representing a

significant cost saving in Mondi's paper production. The project provided a higher assurance of water supply for the functioning of Mondi and greater security in terms of additional water requirements.

Successes and Lessons Learned

The success of the project demonstrated a true partnership between the public and private sectors and the success of the partnership lies in the mobilization of the inherent strengths of both sectors. Some of these key outcomes are as follows:

At operational capacity 12.3 mgd/47.5 megaliters/d) the reclamation plant will meet 7 percent of the city's current potable water demand and will reduce the city's treated wastewater output by 10 percent. EWS currently treats 121.3 mgd (470 megaliters/d) of wastewater. Of this volume, approximately 200 51.6 mgd (megaliters/d) is discharged into the sea as screened and degrittied wastewater. The reclamation project reduces the city's total treated wastewater discharge by 10 percent and reduces the partially treated load on the marine environment by up to 24 percent. Further, the volume of potable water saved on a daily basis afforded the opportunity to extend supply to up to 220,000 households in the greater Durban area.

Individually the water treatment steps employed in the Durban Water Recycling process are relatively standard in terms of water industry technologies. Together, however, the treatment steps create a highly specialized process, tailored specifically to meet the quality requirements of the main client, Mondi Paper Mills. The treatment of raw wastewater from both domestic and industrial sources to a potable standard, within the financial pressures of the business environment, is a significant technical achievement.

This 20-year concession project was the first PPP of its kind in South Africa. Within the South African context, the project broke new ground in its approach to manage and implement water projects and may be regarded as model for future PPPs in South Africa, and possibly elsewhere. The acceptance of PPPs and the involvement of the private sector in business opportunities for the provision of water services in South Africa are enhanced by the success of the Durban Water Recycling Project.

This project has also changed the way industry in South Africa views wastewater. Sewage is no longer

regarded simply as a waste product, but a beneficial resource spurring many new initiatives which have unlocked innovation and technology.

References and Sources

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