Wastewater recycling increases drinking water in Queensland, Australia

Despite recent floods, Queensland, Australia is an arid region that is subject to long droughts. To help the region better prepare for future droughts and use existing water supplies more effectively, new technology was installed at the new Dalby wastewater treatment plant. The new facility will help stretch potable water supplies in drought periods, according to authors **Ian Cameron** and **Thomas Mannhardt** of Parsons Brinckerhoff.

Ironically, before the catastrophic flooding that affected much of Queensland, Australia in January 2011, the region suffered a nine-year drought that ended in 2010. Responding to that drought and the probability of future droughts, affected communities forged ahead with efforts to find ways to cope with an uncertain future water supply.

One solution is to reserve more water for drinking by recycling, treating, and using effluent from wastewater treatment plants for non-drinking uses such as manufacturing or irrigation. Using treated effluent for non-drinking purposes provides ample high-quality, non-potable water to the applications that need it while reserving more drinking water for the residents of rapidly growing communities.

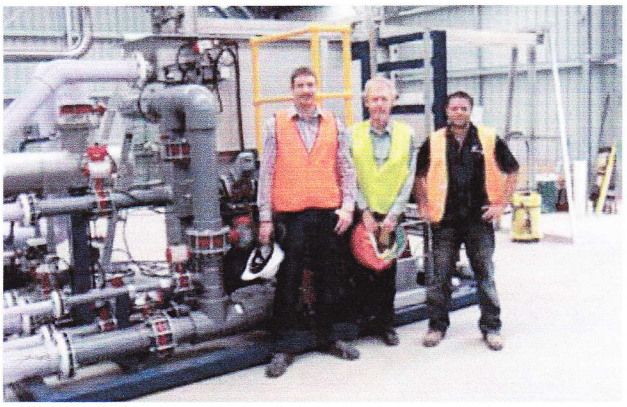
In the town of Dalby, Queensland, the demand for drinking water is about four megaliters (ML) per day, with a local ethanol plant using approximately 1 ML per day, or 25 percent of the daily potable water demand. In 2007, the Western Downs Regional Council (WDRC) and the ethanol plant reached an agreement in which Dalby Biorefinery would convert its operations to use recycled water.

The WDRC then upgraded the Dalby wastewater treatment plant to provide the ethanol plant with 1 ML of Class A+ recycled water daily. The design was able to facilitate the installation of an addition ultrafiltration system to double the output. Construction on the upgrade began in July 2009 and reached practical completion in March 2010. The Dalby Wastewater Recycling Plant was formally opened in June 2010. In October 2010, the project won the Excellence Award for Innovation from the Institute of Public Works Engineering Australia-Queensland.

The US$2.39-million project was delivered on a design and construct basis by Water Infrastructure Group. Parsons Brinckerhoff (PB) provided services that included an options study, preliminary and concept engineering design, and tender/contract document preparation. PB was later appointed as the project superintendent to manage and supervise the contractor's design and construction of the upgrade.

The project used the latest process treatment technologies available. The key features of the design incorporate a process train with submerged ultrafiltration membranes, followed by ultraviolet disinfection and final chlorination to ensure the desired water quality. The principal technology used is ultrafiltration. This technique provides a filtration step for the removal of viruses, pathogens, and bacteria. Additional technologies such as ultraviolet disinfection and sodium hypochlorite dosing are also being used to construct a multi-barrier approach.

The system makes use of existing infrastructure on site by diverting treated outfall water prior to discharge to a balanced storage facility. That ensures that the upstream recycling plant has sufficient supply during daily diurnal flows from the biological process. The new plant also adds tertiary treatment steps to the existing biological wastewater primary and secondary treatment processes.



(Left to right) On the site of the Dalby water recycling plant are: Parsons Brinckerhoff's Thomas Mannhardt, project superintendent; Terry Fagg, utilities treatment manager, Western Downs Regional Council; and Rob Nadin, project manager, Water Infrastructure Group.

As part of the recycling project, a flow diversion box was installed to redirect the clarified water to a storage/equalization basin. From there, a pair of submerged pumps lifts the water to the new wastewater recycling plant where it passes through 200-micron strainers and enters a submerged ultrafiltration system to reduce the level of leftover contaminants. The water then is treated further with ultraviolet disinfection and final chlorination and sent via transfer pumps and a pipeline to the ethanol plant 7.5 kilometers (five miles) away.

By using a process that treats water that would otherwise be discharged to a creek, WDRC was able to reduce the need to draw water from surface catchments or aquifers. Not only is recycled water being used as a potable water substitute for industrial production, discharge of wastewater into the environment has also been reduced.

Using treated wastewater for purposes such as park and golf course watering is not uncommon in Australia, but the use of recycled wastewater for an industrial process represents a significant step forward. Sufficient redundancy was built into the design to allow installation of an additional submerged ultrafiltration skid that could double the plant's output of Class A+ recycled water to 2 ML per day if additional capacity is needed.

With one-fifth of Dalby's potable water supply now available to Dalby residents, the town is much better prepared to deal with future residential and industrial growth and better able to manage extended drought conditions.

Authors' Note

Ian Cameron is the principal water engineer and Thomas Mannhardt is the senior water and process engineer for Parsons Brinckerhoff in Queensland, Australia.