

WASTEWATER TREATMENT CASE STUDY

Darling Downs Power Station, Queensland, Australia

Located 40km West of Dalby in Queensland's Darling Downs, Origin Energy's new gas-fired power station will produce 630MW of power and when complete will directly employ 25 – 30 staff. Commissioned in the first quarter of 2010, Darling Downs is the largest combined cycle power station in Australia.

The power station on the whole has been built with the environment in mind; utilising state of the art technology the site produces 2.5 million tonnes less of Greenhouse gases than coal-powered technologies, equivalent to removing some 600,000 cars from our roads.

Continuing this trend of 'green-engineering', a key requirement of the overall project was a wastewater treatment system for the staff amenities complex that offered similar 'world-beating' performance, so when tenders were called for the supply and engineering supervision of the sewage scheme, Orenco's AdvanTex® technology came out on top against several traditional activated-sludge-based processes.



The Darling Downs Power Station Sewage Treatment Plant

With 25 – 30 staff onsite during commercial operation, the wastewater treatment system for the DDPS project is designed to treat average flows of 3,000 litres per day, with peaks at almost twice that. Constructed as two AdvanTex® AX20-FAP systems in series, coupled with residual chlorination, the system will produce treated effluent at a standard higher than Class B for irrigation of surrounding areas and trucking off-site for other needs in the region.



Two of Orenco's AX20FAPs, approved in Queensland for residential use, operate in parallel to treat all domestic wastewater onsite



To allow for use of the recycled water when it is needed rather than when it is produced, the system includes a 2-week above-ground storage tank

Table 1. Treatment System Design Performance

Design Criteria	Solution	Comment
A domestic packaged STP for 30 people at 100 litres/person/day	Provision for two of Orenco's AX20FAP systems, built and ready to go	The pre-assembled nature of the AddvanTex AX20FAP meant that CH2M Hill's onsite Skills team could easily install the system with only limited oversight from Innoflow at key project phases
Biologically based treatment system with extended aeration or similar	Provide a system offering better outcomes than traditional extended aeration at much lower operating costs	Innoflow's alternative offer in the tender process gave the engineers a solution they had not considered, and one that exceeded their expectations and requirements
A complete equipment package solution including all components	As well as the two FAP systems, provide an easy-to-install lift station and effluent storage system	Offering a solution constructed of fibreglass, PVC and polyethylene enabled a flexible installation, working around other infrastructure already onsite
Compliance with Class B Effluent Guidelines in Queensland and with AS1546	Provide a proven solution in terms of both treatment performance and regulatory testing and accreditation	Orenco's FAP systems are among the first to be tested to revised AS/NZS1546:2008, with testing completed as the DDPS contract was being finalised.



2 FAPs operated in series provides the system with built-in redundancy; half the plant can be shut down easily for servicing or fault-finding as needed

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Two FAP systems provide primary and secondary treatment at the site

Table 2. Treatment System Performance

Parameter	Required Value*	Design Assumption
BOD ₅	<20 mg/ltr	<5 mg/ltr
Suspended Solids	<30 mg/ltr	<5 mg/ltr
E. Coli	<100 cfu/100ml	<10 cfu/100ml
Residual Chlorine	1 mg/ltr	1 mg/ltr, controlled via a redox controller

****These are the requirements to meet Queensland requirements for Class B effluent***



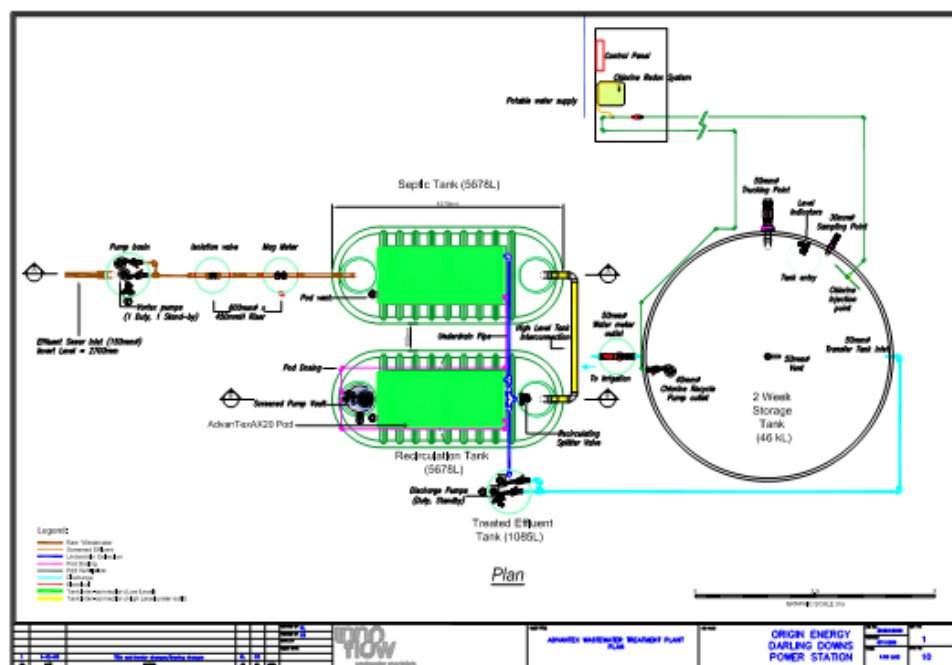
The chemical shed at the treatment plant houses the chlorine drum dosing pump, recirculation loop and main treatment plant controls

To achieve consistent high quality, and ensure the stored water is always ready for irrigation, the system incorporates recirculation and chlorine dosing to maintain a 1 mg/l residual

All of the chlorination equipment and all system controls are easily housed within a small shed adjacent to the main treatment plant

Table 3. System Overview

System Component	Specification	Comment
Design Flow	3,000 litres per day	Consistent flow expected during every day of operation
Primary Treatment System	8,550 litres	2.85 days of primary treatment is provided passively, requiring no operator input
Recirculation Tank Size	3,000 litres	Highly engineered Resin-transfer fibreglass is utilised for the primary and recirculation tanks
Recirculation Pump	2 x Multi-stage pumps	Each pumps serves an individual AdvanTex system, providing inherent redundancy in the system
Packed Bed Reactor Area	4.4m ²	Each AX20 occupies a space of 1.25 x 2.2 m
Effluent Storage	45,600 litres	More than 2 weeks storage is provided offering flexibility in usage for the water produced
System controls	Chlorine controller, main system PLC	All elements are controlled in one central location, with key performance data connecting to the site's overall Distributed Control System via MODBUS



Plan view of the Darling Downs STP. The lift station (not shown) sits some 100 metres away, serving the main amenities building.