

The Class A+ recycled water treatment process

Recycled water is an increasingly important and sustainable water resource required in our drought prone country, Australia. Allconnex Water is developing and implementing safe, robust and sustainable recycled water treatment technologies.

Residents living in the Pimpama Coomera region on the northern end of the Gold Coast are reaping the benefits of Allconnex Water's planning through the Pimpama Coomera Waterfuture (PCWF) Master Plan.

The PCWF Master Plan is providing the region with one of the largest, innovative water projects in Queensland. Class A+ recycled water is being supplied to dual reticulated homes and businesses in the rapidly growing Pimpama Coomera region. This is through a separate water network, easily identified

by purple water mains, meters, pipes, taps and hoses. This network provides residents with the ability to use Class A+ recycled water for flushing toilets, watering gardens and washing cars whenever they choose.

The recycled water treatment plant located at Pimpama produces Class A+ recycled water, which is Queensland's highest quality recycled water not intended for drinking purposes.



The treatment process in detail

1 Pre-treatment

Pre-treatment incorporates two physical separation and one chemical dosing treatment units.

Band screens capture large solids from the raw wastewater, and a vortex grit chamber removes grit. Captured screenings and grit are disposed of as landfill. Large solids and grit must be removed from the raw wastewater to prevent damage to downstream equipment and contamination of the final products.

Lime can be added to the wastewater to adjust the pH and increase the alkalinity. Conditioning the wastewater in this way provides the ideal environment for biological treatment.

2a Biological treatment

Biological treatment harnesses bacteria to remove nitrogen, phosphorus and carbon from the wastewater with the aid of chemical dosing (methanol, aluminium sulphate). The following zones of the bioreactor provide the range of conditions necessary for a variety of bacteria to grow and work to remove the contaminants:

- anaerobic (no oxygen and no nitrate – conditions required to facilitate phosphorus removal)
- anoxic (no oxygen – ideal conditions to complete nitrogen removal) and;
- aerobic (controlled amounts of oxygen – ideal conditions for carbon removal and to commence nitrogen removal)

A balance tank within the bioreactor minimises fluctuations in the flow of wastewater from the pre-treatment area to maintain a constant load on the bacteria.

2b Clarification

Clarifiers separate solids (sludge) and floating material (scum, fat, oil) from the wastewater. Sludge settles to the bottom of the clarifier where it is scraped up and returned to the bioreactor.

Floating material is collected and recycled through the plant. Clarified water (launders) flows over the weir at the edge of the clarifier.

3 Media filtration

Clarified water is filtered through beds of coal to further reduce the:

- nutrient concentration to levels compliant with discharge limits
- colour for aesthetic purposes
- suspended solids to increase the efficiency of downstream treatment processes

Dosing chemicals (sodium hypochlorite, sodium hydroxide, aluminium sulphate) prior to filtration enhances this process.

At the conclusion of this process step the water meets Class B recycled water standards. This is the end of the wastewater treatment process.

4 Chlorine contact tanks

Contact time with sodium hypochlorite (chlorine) is required to kill bacteria and pathogens in the clarified water.

Excess Class B recycled water is transferred to the storage lagoons. This water is recycled through the plant when sufficient capacity is available.

5 Ultra-filtration

This is the first stage of the Class A+ recycled water treatment process. The ultra-filtration membranes are synthetic fibres with pores a fraction of a micrometre in diameter. As the recycled water passes through the ultra-filtration units these membranes reject particles and microbiological pathogens larger than the pore size.

6 Ultra-violet disinfection

Ultra-filtered water flows past a number of high intensity ultra violet reactors. UV light further purifies the water by destroying microbiological pathogens of all sizes.

7 Chlorination

Sodium hypochlorite is mixed with the water as it is pumped offsite in order to maintain the required level of chlorine throughout the network. This prevents microbiological pathogens from recontaminating the product.

The water is now treated to Class A+ recycled water standard. Class A+ recycled water is supplied to specially plumbed dual reticulated homes and businesses in the Pimpama Coomera area for toilet flushing and external non-drinking use.

Biosolids handling

The quantity of bacteria within the bioreactor increases due to reproduction but needs to be maintained at a level that is optimal for efficient treatment. This is achieved by removing a certain portion of the wastewater (containing bacteria) from the bioreactor.

This wastewater is de-watered using belt filter presses to produce biosolids which are beneficially reused as agricultural fertiliser.

Odour control

The impact of odour emissions is minimised with an odour control system. This draws air from the pre-treatment area, balance tank, anaerobic zones of the bioreactor and biosolids storage area. The air is treated with a bio-trickling filter, followed by activated carbon scrubbers. This is then vented to the atmosphere through a stack.

