

The sweet odour deal

Mackay Regional Council's \$153m wastewater recycling initiative will sweeten irrigation for the local sugar cane industry. Gary Finke discusses the odour controls.

The Mackay Water Recycling Project is a major initiative of Mackay Regional Council, recycling 90 per cent of the Whitsunday town's wastewater to protect the Great Barrier Reef from 250 tonnes of nutrients every year.

This \$153 million initiative will also protect and rehabilitate overcommitted groundwater resources at risk of seawater intrusion due to the extraction of 8,500 ML a year to irrigate the district's sugar cane crop. Instead, a substantial area of cane will be irrigated from the effluent water redirected from the creek and estuary outfall, simultaneously achieving a more productive sugar industry in the region.

It will be the largest regional recycling scheme of its type in Australia, with 40km of pipeline, upgrades to key pump stations and expansion of two existing wastewater treatment plants (see Fact File).

Critical to the success of this project is the effective management of odour emissions from each of the major wastewater treatment and pump station facilities, two of which are surrounded by urban and industrial development.

Long residence times in sewer pipelines

and rising mains will see significant potential for sulphide generation and the consequent emission of hydrogen sulphide and other odorous sulphur, plus nitrogen-based organic and inorganic compounds.

During the planning stage, an extensive sampling program was undertaken with liquid sampling comprising such parameters as dissolved and total sulphides, sulphates, pH and temperature, together with gaseous sampling comprising hydrogen sulphide, mercaptans, dimethyl sulphide and volatile organic compounds.

A polished result

Biotrickling filters are a cost effective and environmentally sustainable treatment method compared to most other forms of treatment. For this reason, and due to the high gaseous hydrogen sulphide concentrations detected in the network, biotrickling filters were adopted as the primary first stage of the proposed treatment facility for each site and the two key pumps stations.

Subsequent treatment is performed by activated carbon polishing filters to achieve the very stringent outlet requirements.

FACT FILE

Inside the Mackay Water Recycling Project

The Mount Bassett Wastewater Treatment Plant (WWTP) will be decommissioned and turned into an important intermediate pump station on the way to the existing Bakers Creek WWTP site, which involves 11.5km of 900mm pipe and upgrade of key pump stations. Among the upgrades is the Sydney Street pump station in order to reverse the flow direction and cater for future flow volumes.

The Bakers Creek plant is to be developed into the Mackay South Water Recycling Facility, with the capacity to treat wastewater from 97,000 EP (equivalent persons) and produce Class A recycled water.

A 6.5km 700mm diameter recycled water distribution pipeline will link to a new 2,200 ML storage lagoon plus 27 new balance ponds (on-farm dams). The recycled water will then be distributed through 22km of pipelines to cane farms.

North of the city, the Bucasia WWTP is to be augmented (and known as the Mackay North Water Recycling Facility) to treat 20,000 EP, with a new outfall pipeline bypassing sensitive wetland areas.

Biotrickling filters operate by the absorption of pollutants into an aqueous phase that is recirculated either continuously or intermittently over a packing material. The absorbed pollutants are oxidised by microorganisms which are living on the packing.

Where intermittent recirculation is employed, adsorption on to the biomass or the surfaces of certain media can also play a significant role in the removal of pollutants.

With biotrickling filters, the control of pH is achieved easily, meaning reaction processes that result in the formation of acids, or ammonia and nitrates through the oxidation of organic nitrogen compounds, do not create the same problems as with other biological treatment methods such as compost or soil bed biofilters.

Upstream humidification of the airstream is not required and, in most cases, neither is pre-filtration as particulates and minor grease deposits are readily removed during periodic wastage of recirculation fluid and topping up with fresh or reclaimed water.

Problems compounded

Numerous full-scale biotrickling filters have been successfully applied to the treatment of odours from wastewater treatment plants and sewerage systems globally.

In addition, the technology has been used in chemical processing industries (for removal of styrene and resin vapours), textile industries (carbon disulphide and



The odour control facility at the Mackay South recycling works.

hydrogen sulphide), oil seed extraction (hydrogen sulphide, hexane and pentane), breweries and the tobacco industry.

In fact, many other compounds have been successfully treated by biotrickling filters using selected bacteria, among them aliphatic, aromatic, oxygenated and chlorinated hydrocarbons, long chain sulphur and nitrogen-based compounds. The requirement to treat these types of compounds is an ongoing problem for many industries and further application of biotrickling filters is therefore expected in the near future.

For the Mackay Water Recycling Project, odour control systems at both recycling

facilities and the Sydney Street pump station have been completed and are in the process of bacterial acclimatisation, after which performance testing will be undertaken. The odour control facility at Mt Bassett pump station is due for completion in January 2009.

Preliminary odour measurements have shown very high inlet concentrations at some of the facilities in line with the design levels. Successful operation of each facility will see the elimination of potentially significant nuisance odour for the benefit of the community.

Gary Finke is MD of Aromatrix.

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