TERAX® WASTE CONVERSION ROTORUA LAKES COUNCIL: CASE STUDY

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WHAT'S THE PROBLEM?

Located in a sensitive lake catchment, the Rotorua Lakes Council (RLC) has invested heavily in high quality wastewater treatment systems over the past 40 years. Serving a population of approximately 70,000 and many times that number of visitors each year, the wastewater treatment plant (WWTP) achieves very high levels of treatment through a biological nutrient removal process and a land treatment system for final effluent disposal.

Biosolids produced by the Rotorua WWTP had been previously composted or landfilled. With continued challenges associated with these disposal routes and ever increasing annual costs reaching around one million dollars per year, RLC sought a more sustainable option.

As an early adopter of biosolids composting in the 1990s, RLC successfully established a market for the product. Despite stringent quality control procedures, this market eroded over the following decade due to perceived risk associated with biosolids going to farmland.

Landfill provided a secure disposal option following the decline of the composting option. The downsides of this for RLC were operational issues caused by high water content biosolids. Landfill leachates are returned to the WWTP and represent a significant nutrient load requiring treatment. Overall, landfilling was not considered a long term option.

TERAX® COMMERCIAL IMPLEMENTATION

Following extensive pilot testing and techno-economic analysis, RLC selected the TERAX® technology to eliminate biosolids disposal requirements from the WWTP.

TERAX® is an organic waste treatment technology developed by Crown Research Institute, Scion, in partnership with RLC. Based on a novel combination of known processes, it provides a complete biosolids management solution through destruction of organic solids and recovery of useful components.

Commercial-scale implementation of the process in Rotorua will eliminate approximately 10,000 tonnes per year of biosolids currently exported from the site. The associated transport cost reduction more than offsets the costs of operating a TERAX® plant, providing a net operating cost benefit to RLC.

The design of a commercial-scale TERAX® plant at the RLC WWTP is now complete. Sized to process projected volumes in 2051, this plant will almost completely remove RLC's dependency on external disposal routes for biosolids.

Before the commercial-scale plant can be installed within the WWTP, its impacts on existing wastewater treatment processes need to be quantified. This is especially the case in Rotorua where the high quality of treated effluent cannot be compromised. Extensive process modelling of the full scale implementation has helped ensure downstream effects are well understood and overall WWTP performance parameters will continue to be met.

To achieve the strict discharge limits for nitrogen, the Rotorua WWTP uses a biological nutrient removal process where a carbon supplement is required as a food source for de-nitrification bacteria. Ethanol, the carbon source used, represents about one-third of variable operating costs for the site. The dissolved organic carbon from TERAX® is highly biodegradable, providing a carbon substitute for the current ethanol requirements.

More then 60% of the nitrogen and 90% of the phosphorus is recovered, resulting in a reduced load returned to the wastewater treatment plant. Nutrients are recovered in a useful form, ensuring their potential impacts on final effluent quality are mitigated.

Nitrogen is recovered through stripping ammonia, and phosphorous is separated from the solid ash fraction. At about 30% phosphate content, this ash is comparable to rock phosphate used for fertiliser production. Producing up to 50 tonnes of nitrogen and 40 tonnes of phosphorus per year at the Rotorua plant is expected to provide useful quantities to supply niche applications in the fertiliser market.

In Rotorua, the lifecycle cost (capital plus 20-year operating costs) is approximately 20% lower for TERAX® compared to dewatering, transport and landfilling of sludge. This lowered lifecycle cost does not include any income that may be generated from the nitrogen or phosphorus product streams. It is expected that the financial benefit will be even greater with economies of scale in larger plants, and in locations with high transport and disposal costs.

CONTACTS

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