Large volumes of municipal and industrial wastewater are generated every year worldwide. Most of this wastewater is biologically treated to remove dissolved carbon, solids, toxicity, pathogens and other contaminants, with the resulting treated effluent discharged to surface water bodies. These treatment processes also result in the production of large quantities of wastewater related organic solids, from both primary and secondary treatment, termed biosolids.

Existing treatment/disposal options include landfilling, land application, windrow composting, vermicomposting and combustion. In the long-term, with ever-increasing demand for energy, increasingly high cost of conventional energy production, and continued development of highly efficient new technologies, energy recovery is likely to be a key driver in the management of organic waste solids. A sustainable and acceptable option for the long-term management of organic solids must be one that:

1. minimises or eliminates waste residues;
2. eliminates any potential toxicity issues;
3. generates value; and
4. preferably can be implemented on-site to minimise transportation costs.

Scion’s Waste 2 Gold platform provides a sustainable solution to the disposal of solid organic waste. It is based on a deconstruction process that uses heat, pressure and air to convert organic wastes into:

1. readily degradable organic feedstocks, which can be used for industrial biotechnology applications, such as biodegradable plastics or bioenergy/electricity production; and
2. a by-product containing nutrients and metal salts suitable for further value recovery (e.g. fertilisers).

Scion’s approach differs from others in this field in that it is aimed at controlling the deconstruction process to yield useful intermediaries and substrates for downstream bioconversion, rather than complete breakdown to CO$_2$ and water. Scion is developing both innovate deconstruction and biotechnology platforms targeting this outcome.
CASE STUDY

Rotorua District Council (RDC) and Scion are preparing to build a pilot plant that will process biosolid wastes from Rotorua’s municipal wastewater treatment plant (WWTP) into value added products. If successful, the technology will benefit the council, the community and the environment in the following ways:

- Acetic acid production: commercial ethanol is currently used to improve the sewage treatment system's ability to remove nitrogen. The acetic acid produced through Scion's process could replace this ethanol, with potential savings of $367,000 per year.
- Energy generation: the process is essentially a "wet combustion" and will generate excess heat for use in the deconstruction plant and elsewhere at the site. In addition, methane will be generated at several stages in the system for electricity production.
- Environmental improvements: significant greenhouse gas reductions (>70%) will be achieved through deconstruction. In addition, high nutrient content leachates will no longer enter lake-bound waterways around the landfill.
- The deconstruction stage leads to a 30-fold decrease in biosolids volumes - meaning a potential saving of $730,000 per year in transportation, landfill fees and waste levies.

THE OPPORTUNITY

This regional initiative can be applied in other centres as there is increasing pressure on local councils to seek new disposal options for WWTP wastes. Biosolids currently account for up to 15% of all landfilled wastes in New Zealand. Research shows that the same technology could be used for managing organic wastes from food and industrial processors.

Scion is currently seeking to create a broader, national-level research consortium with research partners, domestic and industrial waste producers, and technology providers. We welcome opportunities for new partners, both nationally and internationally, to foster the development and implementation of this innovative technology platform that delivers true triple-bottom line benefits.

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