Are food, beverage and primary processors literally pouring profit down the drain?

CST Wastewater Solutions
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Many food, beverage and primary processors in the Australasian and Asia-Pacific region have traditionally viewed their wastewater primarily as a problem that has to be solved to meet local discharge standards. They view investment in wastewater treatment purely as a cost impost required to meet environmental and health standards.

Some processors have made the problem even worse by using their settling ponds and other treatment facilities as a place into which to deposit process failures entrained in their waste streams. This only adds to the investment and energy costs required (for diffuser and other technologies) to get the wastewater up to legal standards for disposal within local regulations. The result of such practices is not only environmental groundwater and discharge hazards, but also increasing community objections from neighbouring residents who object to the smells, noise and discharges emanating from factories.

Forward-thinking companies are now taking the initiative to search the globe for best-practice methods to achieve as close to possible as zero waste in their plants, often through prevention of biowaste in the first place and often through re-use of potentially contaminating products into useful forms. One of the most dramatic but least publicised results of this search for excellence is the installation of anaerobic digestion plants to not only remove nutrients (BOD, COD) from wastewater and solids waste streams, but also to convert the waste itself into biogas (methane) to replace fossil fuels.

The best of these technologies not only remove up to 99% or more of organic matter from waste streams, but also provide an ongoing and reliable source of base load green energy for profitable use. Unlike windmills and solar power, this biological source of energy can be tapped on demand to fuel boilers and heat processes, or even to fuel generators to sell electricity back into the

local grid - a great advantage in areas of the Asia-Pacific where electricity production can be highly centralised and major losses may be incurred in transmitting energy across long distances. Companies that sell electricity back to the grid may also earn carbon credits in doing so.

As a result of their efficiency, anaerobic digestion facilities have been recognised by the United Nations Development Programme as one of the most useful decentralised sources of energy supply, as they are less capital-intensive than large power plants. They can also benefit local communities by providing local energy supplies and eliminate the need for large and often smelly and environmentally challenging lagoons.

Anaerobic digestion

Anaerobic digestion is a biological process whereby bacteria break down organic material into more basic compounds without requiring oxygen as a component of the process. Modern anaerobic processes can vastly concentrate the process in environmentally harmonious closed reactors, operated under ideal temperature and process control to optimise waste consumption, and, in the process, generate large quantities of methane (CH_4) from the organic materials in the wastewater. The same technology can be applied in covered lagoons, with less control and efficiency than reactors but at a lesser cost and with considerable green energy gains.

“The quantities of methane produced by anaerobic digestion can diminish or even completely replace the use of fossil fuels in the production process,” said Mike Bambridge, the managing director of CST Wastewater Solutions, which is installing in Australia anaerobic digestion plants using the technologies of Global Water Engineering (GWE).

One ton of COD (chemical oxygen demand) digested anaerobically generates 350 Nm^3 of methane, equivalent to approximately 312 L of fuel oil, or generates about 1400 kWh of green electricity. Multiplied over a plant over a year, this output can add up to millions of dollars saved on fossil fuels. Depending on the scale of the anaerobic plant employed, the green energy generated can repay the cost of the anaerobic plant within as little as two years - and go on generating profit virtually in perpetuity.

Industry examples

CST Wastewater Solutions is involved in a number of GWE anaerobic installations, ranging from a fully enclosed reactor (tank) type at the Bluetongue Brewery near Sydney to a closed high-rate anaerobic lagoon (COHRAL) type for Oakey Beef Exports on Queensland's Darling Downs. The latter installation, scheduled for completion next year, will extract green energy biogas from its wastewater streams to replace millions of dollars' worth of natural gas currently consumed at the abattoir.

Both the Bluetongue installation and the Oakey are among GWE anaerobic installations that not only clean wastewater to high standards, but also transform a process problem into a source of profit by producing green energy. Bambridge said the technologies are "applicable to any industry with a biological wastewater stream, including particularly food and beverage industries and agro industries with water and pulp waste streams such starch and sugar pulps, vegetable or potato waste".

In Uthai Thani, Thailand, the Chok Chai Starch tapioca starch plant converts pulp waste to produce green energy. Chok Chai uses GWE RAPTOR anaerobic wastewater technology coupled with an ANAMIX thermophilic digester for the processing of waste cassava pulp. The RAPTOR system processes and converts the leftover fresh pulp, which starts to ferment once stored, to useful green energy. Such rotting organic material can generate considerable odour and release heavily polluted wastewater leaching out of mountainous pulp piles.

Another company to deploy the RAPTOR system is processed potato exporter Remo-Frit. GWE built a complete wastewater treatment plant and a RAPTOR plant for the solid residues of the Remo-Frit potato processing plant in Verrebroek, Belgium. Energy savings produced by biogas production at Remo-Frit are achieved in perpetuity, with fossil fuel equivalent savings totalling US$40 million in the first decade at today's prices.

The Chok Chai Starch RAPTOR with fresh cassava roots (left) and the Remo-Frit plant transforming waste into green energy (right).

Conclusion

According to Bambridge, most industries have been focusing on treating their effluent to meet local discharge standards at the lowest possible investment costs, with wastewater treatment installations only generating additional operating costs.

“However, applying anaerobic wastewater treatment sheds a whole different light on the cost structure of wastewater treatment infrastructure,” he said. “It can now actually become a substantial additional source of income for many factories and processing plants throughout the Asia-Pacific and throughout the world.”