

## Green power through anaerobic wastewater treatment

*Amid surging energy prices and talks about measures to counter global warming, green energy generation from wastewater treatment does not always get as much attention as the more traditional renewables such as solar and wind. Nonetheless, wastewater offers huge potential as a source of renewable energy. Karel Van Velthoven at Global Water Engineering (GWE) encourages businesses with organic content in their wastewater and waste streams to investigate the anaerobic potential for their specific industrial facility.*

Any factory with a biological waste stream or wastewater with high chemical oxygen demand (COD) can easily use this resource to generate energy. Notably, the concept of using wastewater to create green energy is much more widely applicable than often realized.

So far, most industries have mainly been focusing on treating their effluent to meet local discharge standards. By doing so, wastewater treatment installations have only generated additional costs and have never been seen as revenue generators.

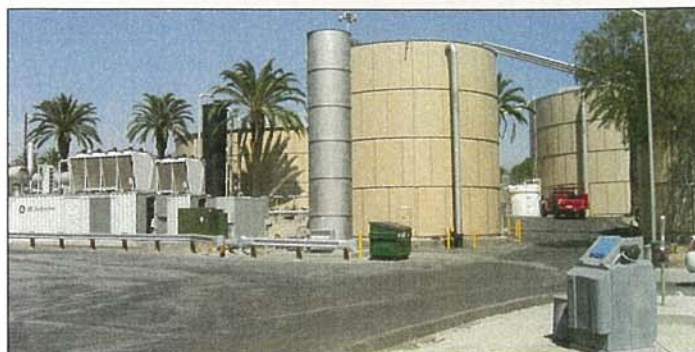
Applying anaerobic wastewater treatment sheds a whole different light on the cost structure of wastewater treatment infrastructure; it can generate a substantial additional source of income for a factory. In realizing this new value by anaerobically treating organic effluent and waste material, a whole series of benefits come into play.

Of course the first benefit is cleaned effluent, efficiently taking out an important waste stream that many companies have to accomplish to comply with enforced regulations.

On average the removal efficiency of GWE's anaerobic wastewater treatment installations is as high as 90 to 95%, bringing the organic load down to regulatory discharge standards for most types of wastewater. For the most heavily loaded wastewaters, extra post-treatment steps can further purify the effluent, meeting even the most stringent discharge regulations for water reuse.

Secondly, the greatest advantage of anaerobic wastewater treatment is the controlled, continuous production of valuable biogas that occurs during the wastewater treatment, which other types of treatment such as aerobic do not provide. The closed anaerobic reactors generate large quantities of methane (CH<sub>4</sub>) from the organic materials in the wastewater that can diminish or even completely replace the use of fossil fuels in the production process. To bring some perspective to the value, one ton of COD digested anaerobically can result into a 350 Nm<sup>3</sup> of methane equivalent to 0.15 MW of power.

For specific industry applications with high organic loads, enough biogas can be generated to fully cover a



**At Miller, Irwindale, USA, an anaerobic wastewater treatment plant (ANUBIX™-B) with biogas reuse in electrical power generators produces 29,480 kg/day COD, which translated into 8,300 kg/day fuel oil equivalent. Photo by GWE**

factory's energy needs and still have a biogas surplus to feed it into power generators and sell electricity to the national grid. A project recently completed for a 300-tonnes/day-starch factory in Thailand illustrates this funding. The energy yield from the anaerobic digestion of the starch factory's wastewater is double than what is required for the mill's production, making the factory 100% self-sufficient for its energy needs. The surplus electricity is sold back to the grid, generating additional revenues.

In addition, the GWE closed anaerobic process systems prevent large quantities of methane from being emitted into the atmosphere. Methane is 21 times more harmful than carbon dioxide, so anaerobic wastewater solutions can also qualify for Emission Reduction Certificates for projects in countries listed under the United Nations Kyoto Clean Development Mechanism (CDM) and Joint Implementation (JI) programs.

A major environmental advantage to this strategy is the significant

## Astonishing energy cost savings at US starch factory in Thailand

An anaerobic wastewater treatment plant with biogas use designed for Corn Products International's 600-tonnes/day tapioca (cassava) starch factory in northeast Thailand is bringing about "astonishing" cost savings in energy, according to Simon Denye, managing director of Corn Products International South East Asia.

The company is one of the world's largest corn refining and ingredient companies with a history spanning of over 100 years. The company is a leading supplier of starches, sweeteners, and other ingredients to customers in more than 60 industries, including the food, beverage, pharmaceutical, animal feed, corrugating, paper, and textile sectors. It is the world's largest producer of dextrose and a leading regional manufacturer of starches, syrups, and glucose with 27 production facilities worldwide.

In line with its policy of environmental responsibility and driven by high energy prices, the company selected this factory in Thailand for a green milestone project in 2006. It selected Global Water Engineering (GWE) to design and build Corn Products' first-ever anaerobic wastewater treatment plant with biogas use. The installation is the biggest so far in GWE's record for native and modified starch producing factories. It was designed for a staggering organic load of 150,000 kg COD/day.

The plant consists mainly of pre-treatment units, three high-rate ANUBIX-B™ reactors (GWE's 6th generation design of the long standing - Upflow Anaerobic Sludge Blanket) equipped with a two-step neutralization process and a biogas handling and reuse system. The biogas is used as fuel in four steam boilers that can be fired in three modes:

100% biogas firing, dual firing i.e., biogas - fuel oil, or fuel oil only, which is a unique technical advantage of GWE technology.

An audit recently performed by Corn Products International at this factory revealed several million US dollars saving on fossil fuel from operating the GWE anaerobic wastewater treatment installation. The savings were much higher than planned and were accomplished by being able to replace costly fossil fuel with biogas, generated from the GWE ANUBIX-B™ reactors.

Payback time of GWE installations in general is under two years, but the installation will even have a payback time of as little as one year in the case of Corn Products. Denye explained: "Although projected by GWE, and proven at many other GWE customers' plants, we had never envisaged such astonishing cost savings for our factory. But as

energy prices have gone up significantly and seeing the very high efficiency of the GWE technology, we managed these great savings."

Chief Executive Officer Jean Pierre Ombregt of Global Water Engineering added: "The savings our installation realized at Corn Products Amardass clearly prove that our technology is a serious proposition, not only for wastewater treatment, but also in the alternative energy market."

Anaerobic wastewater treatment and organic solid waste treatment, both with biogas generation, are definitely one of the most sustainable sources of renewable energy to consider for many industries around the world. These installations offer a viable mixture of economical and ecological advantages, offering a greener footprint and maximized energy-efficiency for many industries' production facilities.



reduction of factories' carbon footprint. Not only by supplying renewable energy and thus reducing or even eliminating the use of fossil fuels, anaerobic wastewater treatment with biogas recovery also replaces more traditional, CH<sub>4</sub>-polluting, open lagoons and power consuming and sludge producing traditional aerobic wastewater treatment plants.

### Factory applications

Anaerobic wastewater treatment with biogas recovery is possible for a wide range of industries. The COD loading rate constitutes the main criteria for energy-generating projects to become viable. The higher the organic load of the wastewater, the more biogas and thus renewable energy can be generated from it. Fuel cost also plays a significant role. Higher energy prices are driving the trend towards anaerobic technology as an effective way to safeguard immediate and future power supply for many industries.

Typical industries suitable for anaerobic wastewater treatment are: beer and beverages (beer, soft drinks, tea, coffee- and milk-based drinks, fruit juices); food processing & canning (fruits, vegetables, meat, fish,



An anaerobic wastewater treatment plant (ANUBIX™-B) in a Frito Lay plant in Sabritas, Mexico produces 4,000 kg/day COD or 1,100 kg/day fuel oil equivalent. Photo by GWE

seafood); snacks, confectionary, dairy; agro and agro-processing industries (beet sugar, starch, palm oil); fermentation industry (alcohol, yeast, monosodium glutamate etc.); biofuels (ethanol, biodiesel); pulp & paper; and petrochemical (PTA, PET, glycol and polyester factories).

In selecting a suitable technology provider for wastewater treatment with biogas utilization, it is crucial to partner up with a reliable, experienced team with a solid track record in this field.

The technical and economic feasibility of a biogas project must be analyzed thoroughly from the design to implementation stage and beyond, into operations and maintenance of the plants. In addition, the correct reactor configuration for each application is essential. Each industry has specific wastewater characteristics, requiring thorough analysis and subsequent careful selection of the most suitable reactor design for these characteristics.

Too often companies have become

disillusioned after trying to implement anaerobic wastewater treatment with biogas reuse in the past. Although anaerobic technologies have improved significantly in recent years, the world is still littered with too many examples of how it is not supposed to be done. A significant part of GWE revenue comes from customers who had bad experiences with anaerobic treatment in the past. Unfortunately it sheds a negative image on the technology, although it has so much to offer for a broad range of industries.

### Author's Note

Karel Van Velthoven is the marketing manager at Global Water Engineering (GWE). GWE has specialized in developing anaerobic wastewater treatment plants with renewable energy generation for more than 30 years. The company has built up a range of seven anaerobic reactor types, each specifically designed for dedicated organic loads and specific wastewater types.

A globally operating company, its roots are in Belgium with the majority of its management European. GWE maintains its headquarters in Hong Kong and has offices in Belgium, Germany, India, Thailand, The Philippines, and the USA.

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