CORN PRODUCTS FIRST BIOGAS PLANT in collaboration with GLOBAL WATER ENGINEERING

CORN PRODUCTS International Inc., headquartered in the Chicago suburb of Westchester, Illinois, is one of the world's largest corn refining and ingredient companies, with a proud history spanning of over 100 years. It was one of the first companies to be listed on Wall Street and was recently acquired by Bunge Ltd., a US agro industry giant.
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 the recent high energy prices, in May 2006 CORN PRODUCTS International Inc. commissioned GLOBAL WATER ENGINEERING (GWE), a global leader in wastewater treatment and green energy solutions, to design and build for its production facility in Thailand, what is expected to be Corn Products' first in a long line of anaerobic waste water treatment plants with biogas utilization.

GWE was chosen because of its distinguished >20 years unmatched track record in efficient design, installation and commissioning of wastewater treatment plants, combining aerobic and anaerobic treatment technology in more than 300 plants worldwide, with expert biogas handling expertise to produce green heat and/or electricity.

The facility chosen for this milestone project, was the 600t starch per day factory for Corn Products Amardass (Thailand) Co. Ltd, situated in Sikkhiu, in the Nakhon Ratchasima province of North East Thailand. The factory produces modified starch using the tapioca (cassava) root as a feed stock.

Construction for this Turnkey project started in earnest in the late summer of 2006 and the first biogas was fittingly flared off at the plant on the 4th of July 2007, USA's Independence Day.

Following a successful biological start-up of the anaerobic reactors and subsequent Guarantee Test Run performed by GWE in collaboration with Corn Products staff, GWE's guarantee of 90% COD removal efficiency was achieved and comfortably exceeded, resulting in average Biogas production of 527 Nm^3/1,000 kg of COD load, at an average CH_4 content in the biogas of 63%.

All the biogas produced is utilized as fuel replacement in the 2 factory boilers that generate steam required for starch drying, utilizing GWE's state of the art, self-modulating dual fuel boiler conversion system. Since start of steady operations to date, this has resulted in a more than 50% reduction of fuel used of ca. 12 l/ton (liters of Heavy Fuel Oil per ton of tapioca roots processed). To bring this into economic perspective, in the period 1st January - 31st July 2008, Corn Products Amardass (Thailand)

Co., Ltd have saved a staggering 76 million THB, or ca. 330,000 USD/month in Fuel Oil. This is the power potential of GWE technology!

From an environmental standpoint, this project also qualifies for carbon emission reductions under the CDM (Clean Development Mechanism), a UN initiative from the Kyoto Protocol. Certified Emission Reductions (CERs as they are commonly known) are awarded to the project as GWE's anaerobic reactors trap and utilize the CH_4 which would have otherwise gone into the atmosphere, through the standard open lagooning treatment previously implemented by the facility. As the trapped methane is burnt into the factory boilers it converts to CO_2 which, while still a greenhouse gas, is recognized to be 22 x less harmful than CH_4 to the planet. So for every ton of methane destroyed, 21 tons of CO_2 emission reductions are awarded.

A WIN-WIN situation for customer, technology provider and our planet!

For these reasons it is easy to see why CORN PRODUCTS Inc. are currently planning to apply anaerobic digestion technology to the rest of their facilities worldwide.

For more information please visit www.cornproducts.com & www.globalwe.com.

ADDITIONAL INFORMATION

GWE's turnkey Biogas Project for CORN PRODUCTS International Inc. has successfully been implemented and steady operations have been ongoing since September 2007. The total organic waste of the production plant which comes from the native and modified starch operations using tapioca as feed stock is being processed in the Wastewater Treatment and Biogas Plant and all biogas generated is reused as fuel in 2 steam boilers.

The Plant is composed mainly of pre-treatment units, 3 high-rate ANUBIX-B™ reactors (GWE's 6th generation design of the long standing UASB - Upflow Anaerobic Sludge Blanket) equipped with a 2-step neutralization process, and a biogas handling and reuse system. This plant is the biggest so far in GWE's record for native and modified starch producing factories on a global basis. It is designed, based on maximum expected factory production, for a staggering organic load of 150,000 kg COD/day with a max. hydraulic load of 6,000 m^3/day of waste water at an average COD concentration of 25,000 mg/l.

Plant start-up was completed in August 25, 2007 with lower than expected factory wastewater output since then, culminating in a maximum organic loading of just over 100,000 kg COD/d, more or less two-thirds of the design COD capacity of the reactors. COD removal efficiency has been as high as 95% on the average. This efficiency delivered by GWE technology is unmatched in the industry.

Since steady operations, all the biogas is utilized as fuel in 2 existing steam boilers with 4 burners, and in any combination, each of these burners may selectively be fired in either 3 modes: 100% biogas firing, dual firing i.e., biogas – fuel oil, and fuel oil only. The daily modes of burner firing depend largely on the amount of biogas produced (which is also dependent on the amount of organic waste produced from the factory) and the fuel firing system has been automated for operational flexibility and to give biogas preference. Any biogas in excess is being burned at the centralized safety flare situated on the biogas reactors.

PROCESS DESCRIPTION

The wastewater comes from the factory by gravity sewer. The influent first flows through sand/grit traps for removal of settleable solids, mainly earth (sand, mud from the roots washing) and some floating materials and scum. From the sand traps the wastewater passes through screen extractors, in order to remove coarse particles (roots pulp, peels), which is very important as they can cause anaerobic bacterial sludge in the methane reactors to float and escape.

After the screen the wastewater flows into an equalization lagoon where biological hydrolysis/acidification processes take place, resulting in the formation of organic acids, which causes a serious pH drop (down to 4 – 4.5).

From the equalization basin the pre-acidified wastewater is pumped up into a degasifying tank and from there to the methane reactors. The acidic wastewater has to be neutralized with caustic soda. This neutralization is particularly important in the start-up phase and initial months of operation. Afterwards it is mainly stand-by. The pH in the feed line is measured and is controlled to be above a pre-set value (neutral to slightly acid, depending on the progress of plant start-up) by addition of NaOH in-line followed by an in-line mixer.

The wastewater is then pumped into the methane reactors through an influent distribution system at the bottom of the reactor.

Out of the GWE range of methane reactors the ANUBIX-B^{TM} reactor was selected, which is of the UASB (Upflow Anaerobic Sludge Blanket) type, with a special "3 phase separator" device at the top of the reactor which results in a separation of the mixed liquor into clarified wastewater, biogas and sludge.

Part of the methane reactor effluent is recycled to keep a constant flow velocity in the reactor's influent distribution system.

Excess sludge can eventually, from time to time, be withdrawn from the bottom of the reactor if necessary.

The effluent of the anaerobic treatment is further treated in some of the existing lagoons, receiving only ca. 2- 5% of the original load.