Turn a Cost Center into a Profit Center

Breweries can successfully utilize the biogas from their wastewater treatment plant as an energy source in their operations, saving money as well as minimizing waste, according to environmental solutions company Talbot & Talbot.

The company says that the biogas produced from the treatment of wastewater can contribute 10 to 15 percent of a brewery's steam requirements, reducing the need to buy increasingly expensive alternative fuels while substituting it with green energy.

"Using biogas as a fuel for raising steam in a brewery can definitely be viable, resulting in the treatment plant changing from a cost center into a profit center," said Talbot & Talbot Director Frank Urbaniak-Hedley. "The value of this energy depends on the cost of the current fuel it replaces, whether coal, gas or electricity," whose company's technologies are represented in Australia by CST Wastewater Solutions.

Urbaniak-Hedley presented his experiences and expertise at the IBD Convention (Industrial Brewer and Distilling) in Uganda recently, and said that the technologies developed by Talbot & Talbot had been successfully applied to breweries over the size of 500,000 hectoliters/annum in Africa and abroad. The technologies are broadly applicable to food and beverage operations, as well as various manufacturing and processing plants.

Talbot & Talbot, based in Pietermaritzburg, KwaZulu-Natal, provides turnkey wastewater treatment solutions for industries worldwide and has substantial experience in utilizing biogas as an energy source.

According to Urbaniak-Hedley, most breweries with a production capacity greater than 500,000 hectoliters per year typically employ wastewater treatment processes prior to the discharge of their effluent, whether to municipal utilities or to the natural environment.

This treatment usually involves anaerobic digestion, possibly followed by aerobic treatment, although the specific requirements vary depending on the final receiving environment.

Anaerobic Treatment

Anaerobic biological treatment is generally chosen for the first stage because of the higher chemical oxygen demand (COD) loads associated with brewery effluent, and the lower sludge production and energy consumption required by the anaerobic process.

The volume of gas produced through anaerobic digestion of the soluble organic matter is directly proportional to the mass of the organic matter. The generally accepted ratio is 0.35 Nm^3 of methane per kilogram of COD equivalent treated. Methane makes up about 65 percent of the biogas by volume, and is generated together with carbon dioxide (35 percent) and trace amounts of other gases, including hydrogen sulphide and ammonia. The heating value of the biogas is 25.7 Mega Joules per cubic meter (MJ/m^3), compared to methane at 37.7 MJ/m^3, natural gas at 35 to 43 MJ/m^3 and LPG at 50 to 55 MJ/m^3.

Urbaniak-Hedley explains: “The biogas can be burned in a dual-fuel boiler or in a stand-alone dedicated boiler installation. The resulting steam is piped directly into the main steam supply header”.

“The boiler is fully automated, starting up and producing steam when gas is available. The combination is optimized to produce the maximum heating value from the gas.”

The biogas boiler normally works in conjunction with a flare stack that burns off excess gas should the steam boiler not be available for any reason. The gas produced is always below the brewery's steam demand, so the gas is generally used as it is produced, rather than being stored.

Economic Value

As a rule of thumb, 100 Nm^3 of biogas would discharge one ton of saturated steam into the main steam header. The actual amount depends on the gas quality, header pressure, boiler efficiency and feed water temperature, among other factors.

According to Urbaniak-Hedley "A typical brewery with production of 1 mHl per annum might produce waste of up to 4.5 tons of COD equivalent per day, with a potential of 2000 m^3 per day of gas or 20 tons of steam.

"The replacement value of this energy depends upon the cost and type of the current fuel used at the brewery, whether coal, gas or electricity. Due to this, the wastewater treatment plant potentially changes from being a cost-driven center to a profit-driven one."

Possible issues in using brewery biogas, which Talbot & Talbot has the expertise and experience to handle, include:

- **The health and output of the digester**. Once the focus and purpose of the digester changes from wastewater treatment to energy production, greater effort has to be applied to maximize the gas output by maintaining a healthy digester.

- **Digester pressure**. This has to be carefully controlled by the boiler load valve to maintain a steady gas pressure and water flow within the digester.

- **Coordinating the operating information**. The gas supply system and the boiler have different control mechanisms, which makes information transfer limited. This can make troubleshooting by operators problematic.

- **Construction materials**. These have to be carefully selected since carbon steel, brass, bronze and copper are corroded by the sulphide in the gas.

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