

Biogas plant turns a problem into profit and benefit

Miskolc, Hungary

Population: 161,265

Area: 236.68 km²

Density: 681/km²

Total waste: 43,846 t

Household waste: 40,175 t

Commercial waste: 3,671 t

Recyclable: 7,057 t

Non-recyclable: 30,718 t

Organic waste: 2,400 t

Miskolc is the fourth most populated city in Hungary and is known as the administrative, economic, scientific, educational, cultural and touristic centre of the Northern-Hungary region. The city is the seat of Borsod-Abaúj-Zemplén County located in the direct neighbourhood of three countries: Slovakia, Ukraine and Romania.

The mechanical treatment facility of the wastewater treatment plant was built in 1978 with 140,000 m³/d capacity. From 1989 to 1994, a biological treatment facility was built with 70,000 m³/d capacity. During 2014 and 2015, the plant was upgraded and refurbished enabling the removal of nitrogen and phosphorus. Currently, the daily amount of the wastewater is normally between 35,000 – 45,000 m³.

Performance of the sewage sludge drying facility did not meet the expectations. The produced dewatered biological excess sludge and raw sludge were transported to a biogas plant in far for a long time. In parallel to the refurbishment, a city-owned biogas plant was established in 2015 enabling the in-site treatment of the sludge.

Miskolc Biogas Plant

The Miskolc Biogas Plant was built on the sewage-treatment plant site in Miskolc between 2011 to 2014. The total investment cost was €7.8 million co-funded up to 91.5% by the EU and the Hungarian Government. The storage capacity of the two fermenters is 8,000 m³ with the maximum power output of 875 kW_{el}. The plant produces biogas from excess-sludge and primary-sludge as well as electricity from biogas directly used within the wastewater treatment plant. The waste heat is used for heating the fermenters. The plant is operated by Biogas Miskolc Ltd., a company indirectly owned by the Municipality of Miskolc.

Currently, the average biogas production of 5,500 m³/day which derives from sewage sludge only covers 80% - 92% of the electricity demand of the plant.

Digesters: 2 x 4,000 m³

Instaled power: 875 kW_{el}

Raw biogas: 5,500 m³/day

Organic fertiliser: 45,000 t/y

Electricity production: 6.5 GWh/y

Heat generation: 6.4 GWh/y

Employees: 8

Anaerobic digestion

The plant includes the initial waste pre-treatment phase followed by anaerobic digestion and a subsequent dehydration of the digested waste. It is a mesophilic one in two digesters at 36°C-37°C temperature.

The feedstock from three different sources comes into the homogenization tank in the pre-treatment phase: biodegradable waste, dehydrated sludge from the load station and a mixture of biological excess sludge and raw sludge as the output from the wastewater treatment and thickening process by a direct pipeline (5%-6% of the mixture). If necessary, pasteurization is achievable prior to homogenization. The biogas is produced in the digesters with the retention time of 18-23 days. The purified biogas is supplied to a locally deployed gas motor unit that produces not only electricity but also waste heat used for heating up the homogenization tank. The digested sludge is dewatered and currently used for reclamation. FeCl₃ tincture is used for desulphurization.

Biowaste to the rescue - adding biowaste for increased production

A development project aimed at increasing the biogas production from 5,500 m³/day to 8,000 m³/day started at the end of 2015 and is planned to continue in 2016 through enhanced processing of biodegradable wastes (expired foods, food scrap, waste from milk industry, etc.). In 2016, the public transportation system will be upgraded by the acquisition of 75 new CNG buses which will be entering service in March 2016 replacing 40% of the total public bus fleet. A new CNG filling station is also being implemented, however the city's aim is to produce biomethane from biogas to be used as fuel for the CNG buses. The estimated yearly amount of gas required for the CNG fleet is around 2.05 million kg. Theoretically, 37.5% of the required gas could be covered by the biogas plant, but this may rise up to 65% after intensification.

