

Algal treatment of digestate for more substrate

Ljubljana, Slovenia



Population: 352,349

Area: 903.8 km²

Density: 390/km²

Total waste: 138,317 t

Household waste: 126,536 t

Commercial waste: 11,718 t

Recyclable: 54,089 t

Non-recyclable: 47,506 t

Organic waste: 24,941 t

Within the local administration it is the Department for Economic Affairs and Transport that develops waste management plans and monitor the implementation of these plans, while the collection and treatment are carried out by Snaga public company.

Ljubljana has developed a very successful and exemplary collection system that allows a high share of material recovery. Eco-islands are installed for separate collection of packaging, as well as residual waste and are used by both citizens living in the close vicinity and the general public. Downtown Ljubljana has a network of underground containers that are on disposal to households with a valid card that is used to determine the monthly fee the households pay. In order to promote waste avoidance, households who dispose residual waste less than 6 times a month are exempt from a fee. Ljubljana encourages separate collection of biowaste by allowing households to dispose biowaste for free, up to 4 times per month. Every following disposal is charged. Individual housing areas are, however provided with a separate bin for biowaste.

KOTO biogas plant

19 June 1947 saw the establishment of the company KOTEKS from a former Slovenian Agency for the trade of hides and textiles with pigskin leather as the main production. Over the years the company went through several changes and expanded its operation and products line. Since 2000, after the company transformed into KOTO Ltd., it started acting as the concessionaire for performing the commercial public service of the management of slaughterhouse waste and infectious material of animal origin. Then in 2008, biogas production became a part of the company's activities and renewable electricity production began. The latest coming from the company is the launch of construction of the demonstration centre for growing algae.

Digesters: 3 x 500 m³

Capacity: 13,000 t/y

Treated: 13,000 t/y (90% biowaste, 10% waste from food industry and animal by products)

Raw biogas: 1,800,000 m³/y

Digestate 26,400 t/y

Employees: 148

Anaerobic digestion

The feedstock is provided by several suppliers, such as private companies (canteens, catering companies etc.) as well as markets who deliver food waste; flotation sludge from slaughterhouses and significant quantities of biowaste from municipalities, including Ljubljana itself. Biological process of biogas production takes place in heated gas-tight reactors. Produced biogas, which contain up to 73 % of methane, is used on CHP unit for electricity and heat generation.

The produced biogas is burned what results in 4 GWh of electricity produced annually along with 2.8 GWh of thermal energy. 10% of the electricity is sold to the grid, while the rest is used on the spot and accounts to 50% of the facility's total need for electricity. The heat is used within the facility itself, namely for steam production needed of other processes and for the heating of the offices in cold periods.

The KOTO Company generates additional income by producing biogas apart from the existing gate fees, as according to Slovenian support schemes for the company is entitled to feed-in tariffs of 120.9 €/MWh and premium tariffs for the share of electricity used in the company which amounts to 83.3 €/MWh

Algal treatment of the digestate

The KOTO biogas plant with its new experimental facility for algal treatment of the digestate is one of the pioneers of such technology in Europe. This facility, built and launched in July 2014 in scope of project AlageBio-gas, treats the generated digestate from anaerobic digestion, currently on 100 m² in a 30 m³ pond. By doing so, the quality of digestate's liquid fraction (liquor) is improved and algal biomass is produced, which can be used as an energetic substrate or processed in biorefinery. Furthermore, this technology recycles CO₂ emissions, effectively uses excess heat and reduces odour of digestate.