



SAVONIA UNIVERSITY OF APPLIED SCIENCES ENVIRONMENTAL TECHNOLOGY RESEARCH AND TEACHING

Mobile Biogas Plant

Savonia's mobile biogas plant was completed during the autumn 2009. It is a facility designed for research, teaching and development use. Its functions are similar to biogas plants that are designed for energy production and use wet digestion. The biogas plant is built in a container, so it can be easily transported to the location where biogas testing is performed.

The mobile biogas plant comprises two similar cylindrical biogas digesters that can be operated in different temperatures and optionally in parallel or in series. The plant can be fed with both liquid and solid materials. Feeding can be manually or automatically controlled.

The functions of the biogas facility are controlled and monitored through a touch-sensitive display unit located in the container. The unit can be used to control, e.g. , the temperature of the digesters and the feeding times of materials. All the measuring information is saved in the control unit, and it can be transferred onto a memory stick as an Excel file. Furthermore, the facility can send status information to a set of predetermined phone numbers as SMS. If necessary, the test function can also monitor the dry matter and the organic contents as well as the pH of the feeds.

Technical Information:

- LabVIEW based automation.
- Two 3 m³ reactors equipped with agitators.
- A hydronic heating system (heat reservoir equipped with a gas burner and electric resistors).
- A submersible pump for feeding liquids.
- A cracking mill and a screw feeder for solids.
- Measurement of temperature, methane content and gas production.
- Flanged joint connections for further measurements.
- Sampling connections into the reactors.
- A gas reservoir on top of the facility (1 m³).
- A gas burner 2 kW.



The plant has two 3m³ digesters.



SAVONIA UNIVERSITY OF APPLIED SCIENCES ENVIRONMENTAL TECHNOLOGY RESEARCH AND TEACHING

Biogas Research at Laboratory Scale

The research and teaching unit of environmental technology at the Savonia University of Applied Sciences carries out biogas testing with batch test equipment as well as with continuous biogas reactors at the laboratory located at Kuopio Technopolis.

The biogas testing aims to determine the biogas production potential of different materials or mixtures. Both of the previously mentioned test types use wet digesting, and they include analysing the quantity and the composition of the collected biogas. The biogas composition is determined with a gas analyser, and the results reveal the methane, carbon dioxide, oxygen, hydrogen sulphide and ammonia contents in the gas.

In addition, both test types include analysing dry matter and organic contents as well as measuring the pH. It is also possible to determine the BOD and the COD.

Biogas batch tests

The biogas batch tests are performed in five-litre laboratory glass bottles. The bottle caps have an inlet through which the generated gas can be collected into gas bags equipped with valves. The glass bottles are placed in an incubator; it is possible to opt either for a mesophilic or a thermophilic temperature. In fact, one to six samples can be tested at once. Both

the gas volume and its content are being measured regularly. It is also worth noticing that the inoculum is examined separately, and its influence is therefore excluded from the final results.

Continuous biogas reactors

The laboratory has four continuous biogas reactors whose effective volume is 12,6 litres each. The equipment is heated with a water circulation, and it has an automatic agitator. It is possible to feed materials into the digesters as well as to remove materials from them. Consequently, they simulate the functioning of a real biogas plant. The gas is collected and examined in the same way as in the batch tests. Biogas reactors monitoring can be done by titrimetric measurements analyzing volatile fatty acids (VFA) and alkalinity (TIC).



A continuous biogas reactor.