

This is one of 12 case studies presented in the report "Biogas from manure, and waste products – Swedish case studies"
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The biogas plant at Alviksgården

Facts/unique: The first large-scale farm-based biogas plant in Sweden. Self-sufficient in heating and electricity.



Figure 1 Photograph of the biogas plant in Alvik

Alviksgården is a livestock farm located in the north of Sweden, near Luleå, with 16,000 pigs. The farm has 15 employees and its own slaughterhouse. Most of the feed is grown on the farm. The farm previously paid a company to take care of the slaughterhouse waste, but this was expensive. Therefore, the owner of Alviksgården, Mikael Hugoson, decided in the late 1990's to build a biogas plant to treat both the pig manure and the waste from the slaughterhouse. The plant started operations in 2000.

Alviksgården is a self-sufficient farm. The 200 hectares surrounding the farm buildings produce feed for the pigs. The pigs are slaughtered on site and both the manure and the slaughterhouse waste are treated at the farm's biogas plant. The biogas supplies the farm buildings with heat and electricity. An electricity surplus is generated, the sale of which gives extra income to the company. The investment made in the biogas plant will be re-paid within 10 years. Alviksgården is an excellent example of how farm-scale biogas plants can be profitable and also benefit the environment.

The biogas plant and substrate

The plant consists of two reactors with a total volume of 2,300 m³. They digest 50 tons of pig manure and c. 50 tons of slaughterhouse waste each day, some of which comes from the farm, and the rest from slaughterhouses in Skellefteå and Ullånger. The manure is pumped directly from the pig sheds into the reactors, while the slaughterhouse waste is first ground in a mill before it is mixed with the manure in the reactor. The reactor is a one-step, continuously-mixed, thermophilic (50°C) process.



Figure 2 Process diagram of the biogas plant in Alvik

Distribution of the biogas

The plant produces c. 9,600 MWh of biogas per year. The gas is purified by removing sulphur and water vapour. The warm water is stored in a 60 m³ accumulator tank which supplies the entire farm with hot water. Electricity is generated from the remaining energy in the biogas using a 16 cylinder 35 litre gas engine which produces 4,300 MWh every year. The electricity is sold to Luleå Energi (Luleå Energy), but c. 60% is 'bought back' and used on the farm.



Figure 3 A 16 cylinder 35 litre gas engine used to produce electricity in Alvik

Bio-manure

In total, c. 18,000 tons of bio-manure is produced each year, which has a dry weight content of 3-4%. This is stored in several tanks before being applied on nearby land using a liquid manure spreader. Alviksgården grows cereals on 200 hectares.

Financing

The biogas plant cost c. 20 million SEK to build. It was mostly self-financed, but 30% of the cost was covered by grants. The investment is expected to be paid off within 10 years. The difference in price between the electricity bought and sold from the farm is 0.25 SEK per kWh, which is equivalent to the cost of the electricity certificate. The profit is even larger due to the fact that there are no longer any costs for transporting and landfilling waste.

Lessons learned

A few initial teething problems were experienced, but the plant is now operating as planned. The bio-manure produced at the plant is of high quality, not least because the nitrogen is more easily available for the crops than is the case for the fresh undigested manure. In the planning stages, it is very important to make sure that an even and stable supply of substrate can be guaranteed, to prevent interruptions in operations. The process is checked on a daily basis. An automatic surveillance system is also linked to the plant.

Benefits for the environment and society

Alviksgården is self-sufficient. The pigs are born, grow and die on the farm, and their feed is produced on the farm's own land. Construction of the biogas plant has produced many benefits for the business and for the environment. The need for transport to and from the farm has been minimised. The costs of handling and transporting the slaughterhouse waste have decreased, a practically odour-free bio-manure provides nutrients to the soil, and the farm is now self-sufficient in energy.

Apart from the electricity generated, the plant also produces enough hot water to replace an equivalent consumption of c. 150 m³ of oil each year.

Facts 1. Basic data on the biogas plant

Start year (biogas production):	2000
Digester volume:	1 000 and 1 300 m ³
Process temperature:	50 °C
Investment costs:	20 million SEK

Facts 2. Yearly inputs and outputs

Substrate:	
Pig manure	16 000 tons
Slaughterhouse waste	1 800 tons
Biogas:	
From the biogas plant	9 600 MWh
To electricity generation	4 300 MWh
To heating	5 300 MWh
Bio-manure:	
Bio-manure	18 000 tons

Contacts

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Suppliers

Biogas plant:	<p>Dansk Biogas www.danskbiogas.dk</p> <p>Electricity generation: Deutz www.deutz.com</p>
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