

This is one of 12 case studies presented in the report "Biogas from manure, and waste products – Swedish case studies"
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This handbook is published by the Swedish Gas Centre, the Swedish Gas Association and the Swedish Biogas Association and these associations take full responsibility for the contents. The Swedish Environmental Protection Agency and Swentec (Swedish Environmental Technology Council) provided financial support for the production and translation of this handbook.

The biogas plant at Domsjö fabriker

Facts/unique: The largest producer of biogas in Sweden. High quality biogas with a methane content of 85%.

The bio-refinery 'Domsjö fabriker' is located in Örnköldsvik, on the shore of a bay of the Baltic Sea. Paper pulp has been produced here since 1903. In recent years, production has developed away from traditional paper pulp as the main product to an advanced bio-refinery which manufactures special celluloses, ethanol and ligno-sulphonate. Environmental issues have been a top priority for many years, and the company has a well developed environmental policy which prescribes effective exploitation of raw materials, chemicals and energy to support sustainable development in the long-term. One example of this is that the factory was the first in the world in 1991 to bleach cellulose in a closed system. Chlorine-free bleaching has been practiced since 1990. As one part of the company's environmental efforts, Sweden's then largest biological waste treatment plant was opened in 1985. In this plant, wastewater is treated in two stages, the first of which is anaerobic digestion to produce biogas, and the second is an aerobic step with free access to oxygen.



Figure 1 The biogas plant at Domsjö. The blue and white tanks are anaerobic digesters and the polished steel container is a de-gassing tank.

The plant at Domsjö fabriker is the largest single producer of biogas in Sweden (in terms of MWh biogas produced). The biological treatment plant is highly efficient, purifying 2,070,000 m³ of wastewater annually. The personnel are continuously trained in environmental issues. The conscious efforts at the company to improve the environment have had noticeably positive effects on ecological conditions in the bay of Örnsköldsvik. The biogas process is an important component of this work.

The biogas plant and substrate

Wastewater from the bio-refinery 'Domsjö fabriker' and from nearby chemical plants run by Akzo Nobel and Sekab is used as substrate for the first anaerobic step in the biological treatment process. The biogas plant treats 2,070,000 m³ of wastewater annually, but there is sufficient capacity to treat more. Digestion takes place in two reactors with a total volume of 30,000 m³, with continuous mixing. The retention time is 3 days in the anaerobic step, which has a process temperature of 37°C.

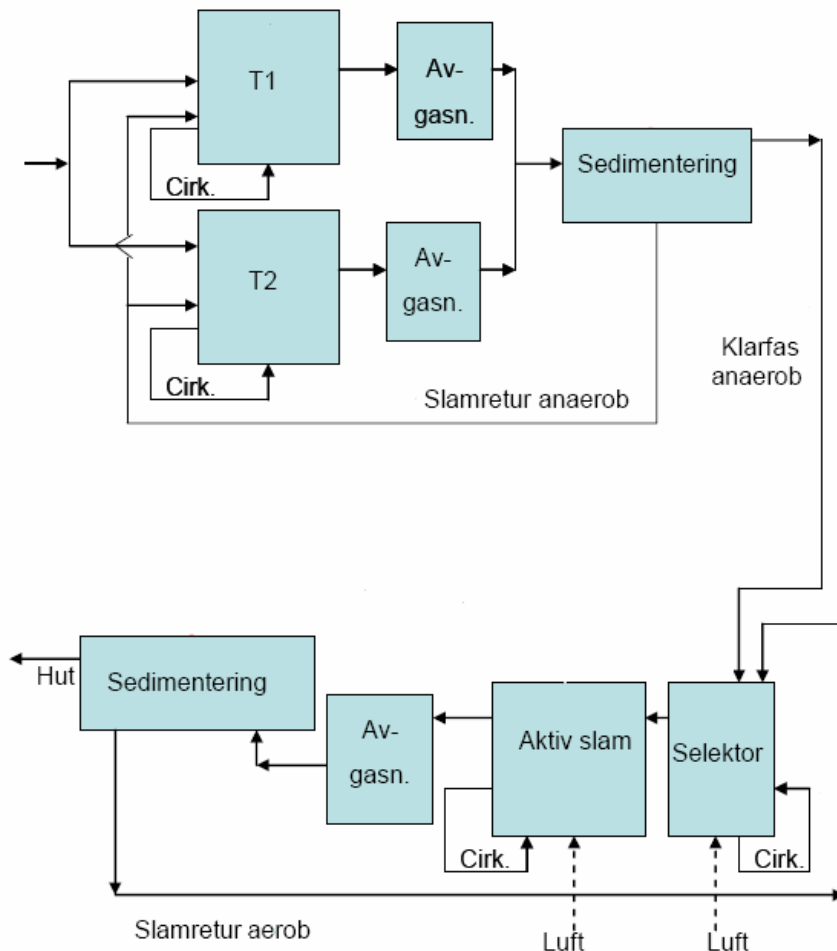


Figure 2 Process diagram of the biogas plant at Domsjö. T1 and T2 are two parallel anaerobic digesters. The aerobic step commences with the selector.

Use and distribution of the biogas

The biogas plant produces a little more than 85,000 MWh of biogas per year. The gas has a high quality, with a methane content of 85%. The energy in the biogas is exploited within the company for heating using a steam boiler. Less than 1% of the biogas is flared off. The biogas will soon be used to produce power and heat, with part of the electricity used internally, and the rest sold on the grid.

Digestion residue

After anaerobic digestion, the wastewater moves on to an aerobic step where the decomposition of the substrate continues in aerated basins. The sludge produced from the anaerobic digestion step is returned to the process as it contains active microorganisms that are critical for the process. The sludge from the aerated step (c. 2,500 tons annually) also contains bacteria and other suspended material and is used to manufacture soil conditioners.

Financing

The total investment cost for the biogas plant was 72 million SEK (in 1985). Since then, several extensions to the plant have been built, with the costs shared with Akzo Nobel and Sekab, in proportion to the waste volumes supplied by each company.

Lessons learned

The biogas plant is continuously being developed and improved to remove bottlenecks and increase the capacity to accept more wastewater. Decomposition of the organic substrate is already very efficient, and the plant produces large amounts of biogas. It is now possible to catch salmon in the bay close to the industrial area, and thanks to the production of biogas, the plant is now using much less fossil fuel. One problem that can sometimes occur during anaerobic digestion is that the composition of the industrial wastewaters can vary considerably, which may occasionally cause foaming and loss of sludge.

Benefits for the environment and society

The efficient biological treatment of industrial wastewaters from Domsjö fabriker, Akzo Nobel and Sekab has resulted in much cleaner discharges from these factories. Measurements show that ecological conditions in the bay of Örnköldsvik have improved, and the lake bottoms in this area have been re-colonised. Salmon are once again swimming up the Mo river. The energy in the biogas replaces large quantities of fossil oil that were earlier used in manufacturing at the Domsjö fabriker.

Facts 1. Basic data on the biogas plant

Start year (biogas production):	1985
Digester volume:	2 x 15 000 m ³
Process temperature:	37 °C
Total investment costs:	72 million SEK

Facts 2. Yearly inputs and outputs

Substrate (capacity):	
Wastewater from Domsjö	1 930 000 m ³
Wastewater from Akzo Nobel	183 000 m ³
Wastewater from Sekab	256 000 m ³
Biogas:	
From the biogas plant	85 000 MWh
Digestion residue:	
Soil products after aeration step	2 500 tons

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