

BIOGAS IN SOCIETY
A Case Story

SØNDERJYSK BIOGAS BEVTOFT

Hi-tech Danish biogas installation a key player
in rural development



Source: Sønderjysk Biogas



Figure 1:
Panorama photo of
Bevtoft Biogas Plant
(Source: Sønderjysk Biogas)

MISSION AND VISION

Beginning operation in April 2016, the Sønderjysk Biogas Plant Bevtoft (Figure 1) has the capacity to co-digest over 600,000 tons of biomass yearly. The plant is owned and operated in a joint-venture between E.ON and Sønderjysk Biogas Invest A/S, a company owned by local farmers. The overall investment in the project was €33 million. The plant in Bevtoft has a production capacity of 21 million Nm³ of biomethane per year, which is equivalent to the annual energy consumption of 15,000 households, biofuel for 571 city buses or 10,000 cars (Box 1), while providing an estimated CO₂ reduction of 51,000 tons per annum. As part of the project, Puregas Solutions have delivered their largest upgrading plant ever with a capacity of 6,000 Nm³/h of biogas.

The establishment of the biogas plant has enjoyed a broad local support from the start; locals have been consulted at several stages during the decision-making process. There was also a political incentive, to find a solution to digest the available slurry and agricultural biomass in the area, and to increase its value as a fertiliser. The biogas plant has a strong association of slurry suppliers; farmers were queuing to become members, as they believe in the benefits of biogas. Biogas is good for the environment, it reduces the carbon footprint of the farm, it contributes to Denmark's transition towards a fossil free society, and it creates new growth opportunities for local rural areas and for local agriculture. The plant contributes to developing the rural community, and frequently sponsors local events, gives tours to school groups, and is also interesting on a scientific level, due its hi-tech and innovative technology of manure based biogas production. It is not only the local community that is benefits from the biogas plant; but the plant demonstrates that

Southern Jutland is a good place to work and live, and that it is possible to create a good working relationship with the municipality. It has also had an effect on job creation, both at the plant, but also in the rural community, in electricity provision, cleaning and transport businesses, and offers on-going service and maintenance work for local subcontractors. Sønderjysk Biogas is committed to preventing any possible negative effects from the plant, and encourages continuous, close dialogue with the neighbours and local citizens.

Box 1. Details of the Bevtoft Biogas Plant

Biogas plant area:	160000 sqm
Construction costs:	DKK250 million (€33 million)
Start of operation:	October 2016
Treatment capacity:	Up to 600,000 tonnes biomass per year
Biogas technology:	Well-proven, 2 step digestion co-digestion system
Pretreatment:	Highly flexible pre-treatment of raw materials
Biogas production:	About 21 million cubic meters of methane (equivalent to energy for 15,000 households or biofuel for 10,000 passenger cars)
Feedstock:	local slurry, straw and other digestible biomass material
Use of biogas:	upgrades with Amino technology and sells the biomethane to the gas network



Figure 2: Slurry transport takes place in specially designed vacuum tankers (Source: Sønderjysk Biogas)

TECHNICAL PROCESS DESCRIPTION

All raw materials are weighed in order to always maintain an overview of inputs and outputs. This allows both the net return and the efficiency of the plant to be measured. The vast majority of the raw material received by the biogas plant is slurry from farmers (Table 1 & Figure 2). Alongside this, the plant also receives straw and organic waste from the industrial sector. The AD process takes place in two steps. The first step is thermophilic, at 52°C, and the second step is mesophilic, at 35°C.

The produced biogas is upgraded to biomethane, by removal of CO₂, hydrogen sulphide and water, through an amine scrubber process. Puregas Solutions unique CAPure biogas upgrading process recovers over 99.9% of the biomethane present in the raw biogas, by chemically absorbing the CO₂ from the raw gas. The selective organic solvents used in this process are highly efficient, resulting in an end product containing more than 99% methane. The biomethane is injected into the natural gas grid without the need to enrich with propane, thus saving significant costs. CAPure technology achieves this very high methane recovery, reducing methane slip to below 0.1%. There is no additional cost or

energy requirement associated with treating the off gas and harmful emissions to the environment are avoided.

The digested substrate (digestate) is returned to the farmers as nutrient declared biofertiliser, to be applied on their fields. The advantage of digestate is that the nutrients are in mineral form, which are easily available to plant growth. At the same time, the slurry odour is significantly reduced. The biogas system is an example of the circular economy (figure 3).

Table 1: Biomass input

Type	Tons
Animal slurries	425,000
Animal bedding /deep litter	10,000
Straw	50,000
Organic wastes	55,000
TOTAL	540,000

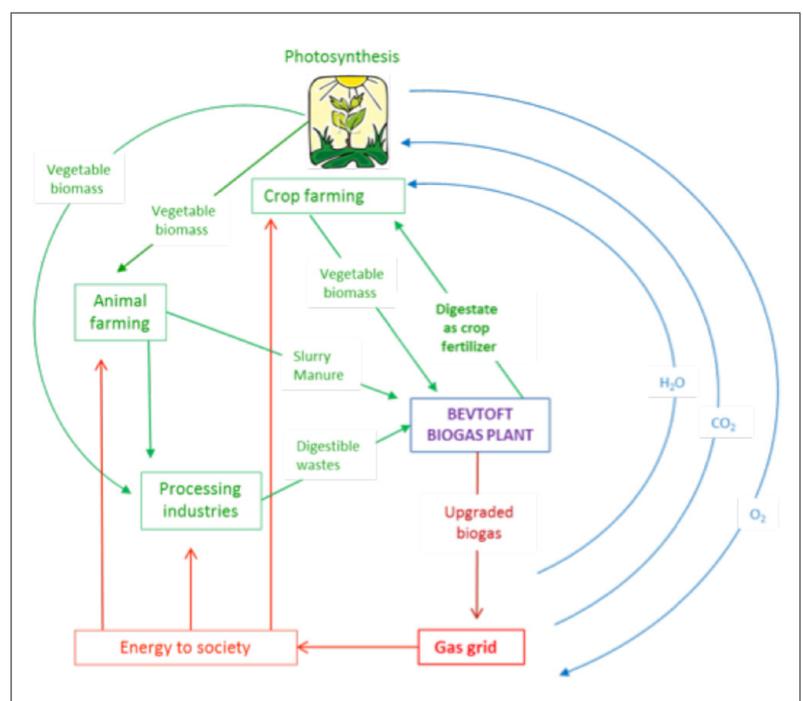
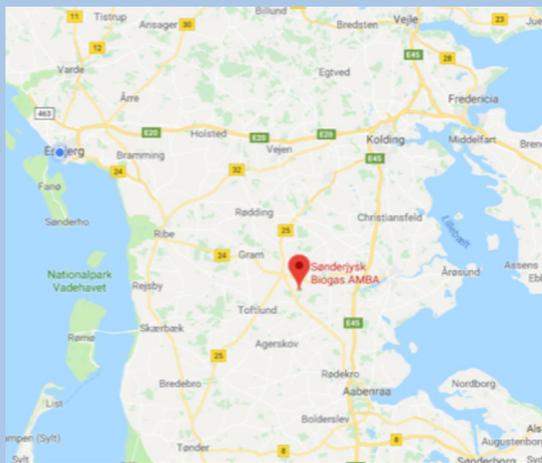


Figure 3: The closed loop of biogas – a simplified biomass and biogas flow diagram of Bevtoft Biogas Plant



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Plantagevej 65, 6541 Bevtoft
Danmark

IEA Bioenergy task 37
“Energy from Biogas”
<http://task37.ieabioenergy.com>

Address:

Sønderjysk Biogas Bevtoft
Plantagevej 65, 6541 Bevtoft
Danmark

Builder:

Sønderjysk Biogas Bevtoft A / S
Engineer:

Niras A / S, Hera Consult A / S,
Sønderjysk Agricultural Association
Suppliers:

Jakobsen & Blindkilde A / S, Farmatic
Anlagenbau GmbH, Purac Puregas
GmbH

**For more information about Bevtoft
Biogas Plant, please see**
www.soenderjyskbiogas.dk

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Further Information

IEA Bioenergy Website
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ESTIMATED ENVIRONMENTAL, CLIMATE, AND SOCIAL BENEFITS

It is estimated that Bevtoft Biogas Plant brings about many benefits to society, including:

- Improvement in security of energy supply;
- Production of decarbonised energy, resulting in a CO₂ reduction of 51,000 t each year;
- Reduction in the environmental impact of agriculture;
- Reduction in odours from slurry;
- Reduction in leaching and emissions of nitrate and nitrous oxide from slurry application;
- Use of digestate in redistribution of nutrients from manure onto larger areas;
- Improvement of the economy of the farm through higher crop yields;
- Monetary savings for farmers in purchase of mineral fertilizers;
- Contribution to further development of nature conservation to produce energy;
- Creation of jobs, approximately 100 in the construction phase, with 30–40 local jobs, and 10 permanent jobs, at the biogas facility.

IEA Bioenergy Task 37



IEA BIOENERGY

The IEA Bioenergy Technology Collaboration Programme (www.ieabioenergy.com) is a global government-to-government collaboration on research in bioenergy, which functions within a framework created by the International Energy Agency (IEA – www.iea.org). As of the 1st January 2016, 23 parties participated in IEA Bioenergy: Australia, Austria, Belgium, Brazil, Canada, Croatia, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Republic of Korea, the Netherlands, New Zealand, Norway, South Africa, Sweden, Switzerland, the United Kingdom, the USA, and the European Commission.

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