



**Polybutene**  
Piping Systems Association

## Case Study

Biogas Plant - Otternhagen, DE



Thermaflex | Flexalen



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### Thermafex I Flexalen



In the German village of Otternhagen a new biogas plant provides the small enclave comprising a farm and thirteen homes with heat from biogas production. The heat is transported via an underground network totalling two and a half kilometres of thermally efficient pre-insulated Flexalen pipes and connections.

The project is part of a regional program for the reduction of greenhouse gas emissions and reduction of energy costs.



Otternhagen is a rural section of Neustadt am Rübenberge, a town in the district of Hannover, in Lower Saxony, Germany. Recognised as a village since the early 1200s, Otternhagen is an elongated settlement situated on the local river Auter. The village is located close to a nearly thousand-hectare conservation area, which includes the Otternhagen Moor. Today, Otternhagen remains an idyllic rural area keen to maintain its local eco-system and also build on a tradition of Fuel self-sufficiency. The generation of electricity and heat independence derived from fossil fuels through cow dung, maize silage and grass is in line with the objectives of the regional action program of reducing greenhouse gas emissions, reducing energy costs and boosting the local economy.

#### **Fuel supplied from 145 hectares of farm land and 120 cows.**

For the biogas plant operation in Otternhagen, 75 hectares of the energy feedstock corn is planted. Another 70 hectares delivers cut grass, and depending on weather conditions, the grass can be cut 4 times a year to be used for energy generation. In addition, around 120 cows and their offspring

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provide enough manure for the applied manure component. The by-product digestate is used as high quality fertilizer for the arable land.

The main objective of the system is to supply heat for the Otterhagen livestock farm and the surrounding residences. The heating circuit is a cogeneration plant (CHP) which delivers a thermal output of 581 kW per day through the conversion of 2,500 cubic meters of biogas into electricity and heat.

To ensure uninterrupted production, the drive-way to the plant which receives deliveries of the energy feedstocks also utilises biogas-powered heating to prevent snow and ice; maintaining clear access all year long.

#### **Efficient pipes from latest technology materials**

To make the district energy network work reliably long-term and to retain the produced energy during the heat transport phase, the right selection of piping system is absolutely essential.

That is why the decision was made to install the Flexalen pre-insulated flexible plastic pipe system from Thermaflex. The plastic pipes are mostly manufactured with polyolefin resin grades which are classified low eco-impact and are completely recyclable.

The carrier pipes and fittings are made of Polybutene-1, a high-performance material that is very pressure and temperature resistant (up to 95° C and 8 bar). The flexible polyolefin foam with closed cell structure is resilient and offers excellent long-term insulation capability. Flexalen insulated plastic pipes offer an impressive effective life span of over 20 years.

Offering efficient installation with flexible routing (similar to laying cable) and extended continuous lengths, the Flexalen piping system is easily layed into trenches from a roll coil with a minimum number of connection points. The high quality connections are ensured by the homogeneous welding process made by the custom designed welding and fitting system. The complete project package of welding equipment and accessories were provided free of charge by the manufacturer.

During the transition of the heat pipes to the installation into the houses, the pipe ends were fitted with suitable retaining clips to the pipe ends of the system. That prevented any possible deformation and protected the transition fittings from shearing forces.

For Otternhagen and similar projects, to minimize energy loss through the heat pipes even further, the pipes are surrounded by a layer of sand grain size <3 mm, which has, after closing all sides, a strength height of ten centimetres. Also, when filling the trench with the excavated soil, fine-grained material was also mixed. This prevents continuous air channels and thus improves the insulating properties of the surrounding soil.

When the heat pipes pass under roads, there is minimal overlap of 80 centimetres required. For areas without traffic load, an overlap of 50 centimetres is enough. An important task is attributed to the compaction of the soil in the pipe trench. This serves not only to expel air bubbles, but leads also to a more pronounced layering of materials, sand and backfill. By doing this at the transition area between the layers an additional thermal barrier is created.

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In the Otternhagen project, the complete Flexalen system product range from DN20 to DN80 was used. Across a total linear distance of about one kilometre the entire advanced heating network utilised two and half thousand meters of insulated pipe and connections.

#### **An important national source of energy**

The new biogas plant in Otternhagen is now one of more than 7,300 facilities nationwide in Germany. Their total annual output of electricity is more than three gigawatts. This roughly corresponds to the nominal power of two major nuclear power plants, covering nearly fifteen percent of the electricity from renewable energy sources. Five million households receive electricity from biogas plants, thousands of homes are supplied with environmentally friendly heating via combined heat and power derived from waste heat.