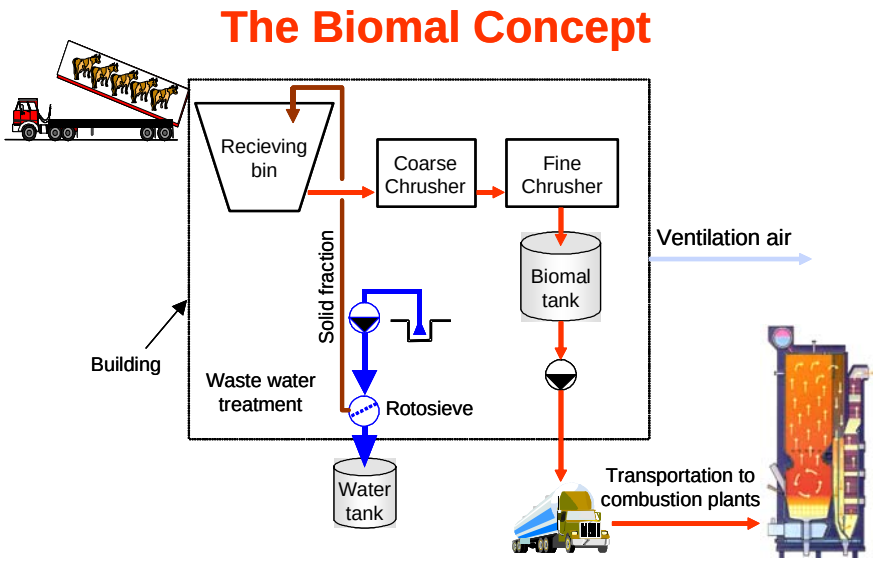
BIOMAL

The LIFE Environmental project BIOMAL, which started in January 2004, has now successfully been completed. A new fuel preparation plant has been taken into operation in Karlskoga, Sweden, producing 85 000 tons of Biomal fuel annually. The project includes a full scale demonstration of the Biomal Concept where animal by-products are crushed and grinded to a renewable fuel. The energy content in the Biomal fuel is used for production of heat and power.

Within the European agricultural sector about 16 million tons of animal by-products are produced annually. These by-products have to be taken care of and the conventional way is to render the animal-by-products to meat and bone meal after separation of the animal fat. The rendering process is energy consuming and unnecessary complicated and expensive.
A less complicated concept to take care of the animal-by-products was hence developed by the companies **Konvex** and **S.E.P. Scandinavian Energy Project** in close cooperation with **Karlskoga Heat and Power Plant**. The raw material, carcasses and rest products from slaughter houses, is just crushed and grinded and used as a fuel in conventional district heating plants. The concept is called the Biomal concept and the fuel produced is called Biomal.



The Biomal Concept, process description.

The LIFE Environmental project BIOMAL, which started in January 2004 has now successfully been completed by the three partners Konvex, Karskoga Heat and Power and Findest Oy. The LIFE Environmental program has funded the project with about one million euros. The total coast for the project has been about 8 million Euros. The project has resulted in 7 new jobs in Karlskoga.

The main goal with the project has been to build a new grinding plant and to demonstrate the new concept for safely taking care of animal by-products and at the same time produce a renewable fuel, called Biomal. The objective has also been to demonstrate Biomal as a fuel and its environmental benefits. The project has included:

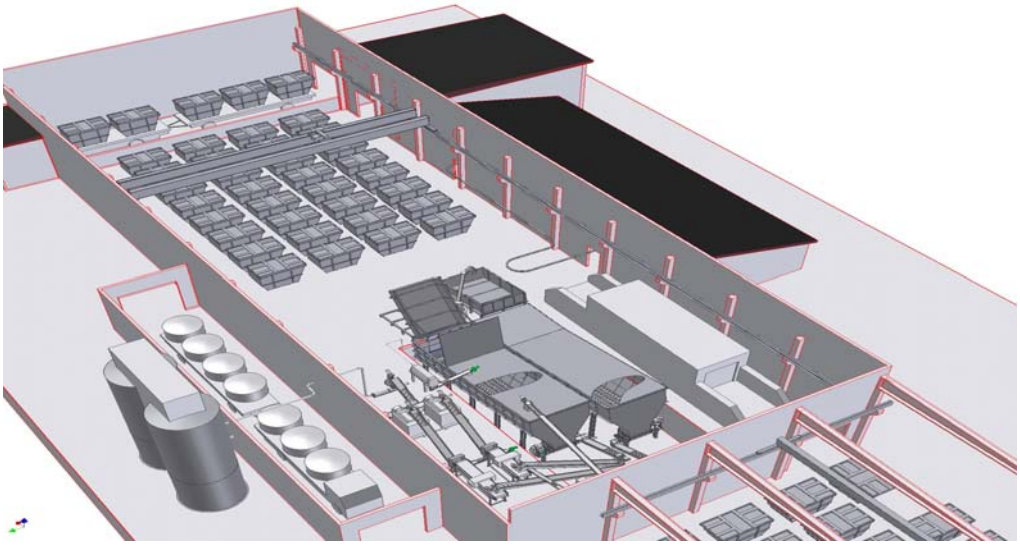
- Investigation of the fundamentals of the grinding plant such as, where to place the demonstration plant, the suitable capacity and the process design.
- Calculations, conceptual design and basic engineering. Preparation of tender inquiries and purchasing.
- Evaluation of the operating conditions of the demonstration plant
- Evaluation of Biomal as a fuel at Karlskoga CHP-plant and at some other plants.
- Dissemination of the result and administration of the project.

The site location was determined to Mosserud in Karlskoga, in the middle of Sweden, where the plant is located next to the city landfill. The proper capacity of the grinding plant was decided to 85 000 tons/year.

Map of Sweden showing the location of Karlskoga

The Mosserud landfill

The new grinding plant was taken into operation without any problems. The construction started in November 2005 and the plant was in full production one year later delivering Biomal to the two district heating plants in Karlskoga and Uddevalla in Sweden.



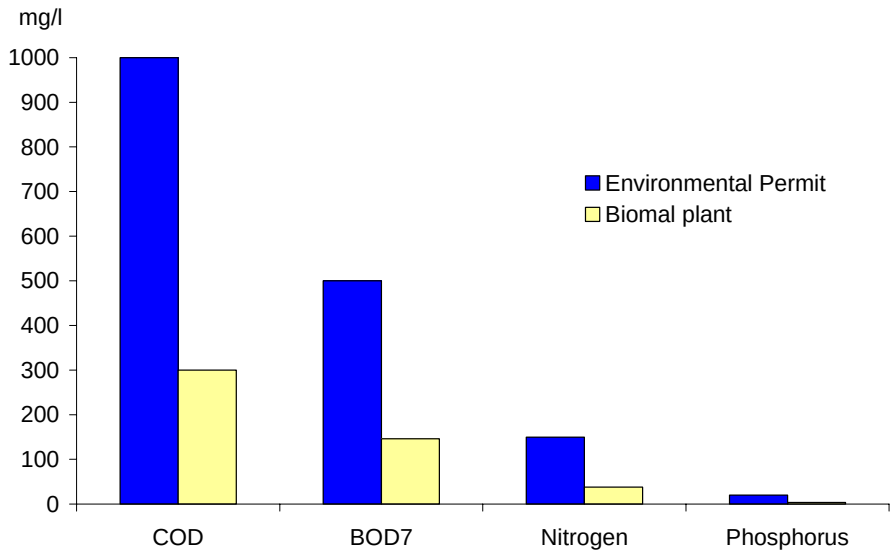
A schematic drawing of the Biomal plant

The grinding plant consists of two parallel production lines each with a coarse crusher, metal detector, grinder and a product silo. The raw material is delivered in closed containers by truck and the demonstration plant in Karlskoga is taking care of carcasses as well as by-products from slaughter-houses.

An example of a container truck delivering animal-by-products

The entrance of the Biomal plant.

When the new Biomal plant was delivered and taken into operation it was verified that the energy demand was reduced by about 90 % compared to a conventional rendering plant. The total installed power is about 20 % of a normal rendering plant or about 1 MW. The effluent discharge is kept very low since most of the wash water is collected and re-circulated to the Biomal. The only discharge of water is from the sanitary effluent except during the summer period when some process water may be sewed. Measurements have shown that the water emission is well below the environmental permit for the plant.



The water emission is well below the environmental permit for the Biomal plant.

In addition to being a much simpler and less energy consuming process than a rendering process the risk for smell also lower, which has been confirmed by the daily observations during the first three months of operation.

The Biomal fuel has the consistency of minced meat and is delivered to the end users in bulk vehicles. The Biomal fuel is pump through a closed piping system into the boilers where it is co-combusted together with fuels such as wood chips, peat or recovered wood. Energy is recovered from the Biomal by producing renewable heat and electricity.

A bulk vehicle delivering Biomal to a combustion plant

A receivingstation for Biomal

Karlskoga Combined Heat and Power plant in Sweden, one of the plants firing Biomal

The advantages with the Biomal concept are:

- The risk for BSE-infection or other diseases is eliminated.
- The Biomal concept is an energy effective method compared to the more complicated conventional rendering method.
- The risk for smell is reduced while the stages where the material is heated up is removed.
- The water usage and the discharge of biological oxygen demanding substances from the fuel preparation are reduced.

The produced Biomal is a renewable fuel, which does not contribute to the global warming and can replace fossil fuels for production of heat and power. Several combustions tests at the Karlskoga heat and power plant has been carried out within the project and the environmental aspects of the combustion have been evaluated. The testing of Biomal as a fuel shows that:

- Biomal has a heating value comparable with ordinary wood chips
- Biomal is safely transported to the end users in bulk vehicles
- Biomal is easy to feed into the boilers in closed systems
- Co-combustion of Biomal results in good combustion conditions and low emissions
- Although the Biomal fuel has a higher nitrogen content than ordinary bio fuels the NOx-emission do not increase. In some cases (depends on the actual boiler design) the NOx formation is considerably decreased when Biomal is used in the fuel mixture.

Biomal is now used as a co-combustion fuel at totally four plants in the south of Sweden. The normal energy contribution from the Biomal is about 20-40 % of the total energy production.

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