

# Production & combustion of biomass pellets at Vattenfall A/S in Denmark



## Background

Køge Biopellet Factory is a pellet producing plant built in 2004 by the utility company Energi E2. It was built as 2 plants, one producing wood pellets with a capacity of 180.000 tons/year, the other producing straw pellets with a capacity of 110.000 tons/year. The pellets was planned to be used in 2 power plants in Copenhagen: Wood pellets at Avedøre power plant and straw pellets at Amager power plant. It was not allowed by Copenhagen municipality to take this large amount of trucks daily into central Copenhagen. Therefore Energi E2 built the pellet plant 45 kilometers outside Copenhagen by Køge Harbour, and the pellets are then shipped into Copenhagen by boat. In 2006 Vattenfall A/S took over the straw pellet plant. The wood pellet plant, was stopped in 2007.

Pelletising straw	Køge Biopellet Factory
Technology type	Ring die
Production capacity, t/a	110.000
Price of pellets, €/MWh	See below
Investment, €	See below

The investment in 2004 for both the wood pelletplant and the straw pelletplant was 50 million Euro (Source: Forskning i Bioenergi, nr. 3, 2004). The straw pellets are not sold in a commercial market, because all pellets are used inhouse at Vattenfall A/S. This means that there is no market price for straw pellets in Denmark. There is no information about the production costs.

## Raw material

The raw material is straw in big bales of approx. 530 kg each. They are delivered by farmers at Zealand and nearby Islands with a maximum distance of about 140 km. The toll bridges to Sweden and to Funen are barrierers as the toll is at least 160 Euro for a truck, making the business unprofitable for the farmers. The truck takes 24 bales, 12 on the truck and 12 on the trailer in 2 layers. The second raw material is grain screenings delivered in bulk.



Truck with 24 bales waiting for unloading.

The 24 straw bales are unloaded by a crane taking 12 bales in one lift. During the lift off the water content is measured by micro waves and the weight is measured.

### Characteristic of raw material

Raw material	Straw	Grain screenings
Moisture content, %	13	10
Heatingvalue, MJ/kg	14,5	16,5
Bulk density, m <sup>3</sup> /t	130	250
Ash content, %	5	10
Ash melting tem, C	870	N/A
Cost of biomass, €/ t	N/A	N/A
Quantity, t/a <sup>1)</sup>	800.000	30.000

1) Straw available for combustion on Zealand is around 800.000 tons

## Pelletizing process

The pellet production runs 24 hours a day reaching around 300 tons/24 hours. There are 4 pellet lines. There is no drying unit for the raw material in the process line.

The % of grain screenings mixed with straw depends on what is available. Maximum ration of grain screenings is 20%.



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## Transport & storing

The produced pellets are transported by a long conveyor belt to the harbour to a bulk storage waiting for ship transport to Amagerværket in Copenhagen.



*Bulk storage for straw pellets at the Køge Harbour*

## Combustion at Amagerværket

Vattenfall A/S has in 2010 finished a larger rebuilt of Unit 1 at Amagerværket for combined coal and biomass use. The capacity of Unit 1 is 88 MWe1 and 331 MJ/s district heating. The plant has 3 boiler units and the annually designed biomass consumption is 400.000 tons wood and straw pellets.

## Producers view

Vattenfall A/S has more than 40 CHP plants in operation, which partly or totally are fired with biomass. Every year the biomass consumption exceeds 3 million tons, and the amount is increasing. Vattenfall A/S is one of the worlds leading companies in the energy sector.

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*Amagerværket in Copenhagen is a very large Power Plant supporting the city with district heating and electricity. The plant is designed for both coal and biomass and has advanced flue gas cleaning systems*

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