

Combustion with mixed biomasses at Randers CHP



Background

Randers Combined Heat & Power plant was originally commissioned in 1982 as a 100% coal fired CHP plant supplying the town of Randers in Jutland with electricity and district heating. The CHP plant was originally owned by the municipality of Randers, but is today owned by the company Verdo A/S. The vision for Verdo A/S is to make a profitable growth by producing green energy. The company has many activities in the energy field, among others two pellet production plants in the UK, in Andover in Southern England and in Grangemouth in Scotland. Each pellet plant has an annual production capacity of 55,000 tonnes of wood pellets and 15,000 tonnes of briquettes.

Fuels for the CHP plant

Fuels 2011	Tons	GJ	%
Wood chips	144.896	1.448.960	50,0
Wood pellets	37.865	617.200	21,3
Dry biomass	37.865	617.200	21,3
Coal	8.583	214.575	7,4
Total		2.897.935	100

Expected fuel consumption in 2011.

Source: Verdo A/S

The fuels are renewable fuels as wood chips, wood pellets and dry biomass. The dry biomass is a mix of wood pellets, shea waste, grain screenings, soja waste and sun flower shells. Most of the wood chips is produced on the site from round wood imported from the Baltic area. The main part of the wood pellets is from Verdo's own pellet plants in UK. The rest of the dry biomass is traded on the market. For 7 months in 2010 the CHP plant was using 100% biomass. Today the coal consumption has dropped as low as 10% on an energy basis and is only used during wintertime. The ambition in Verdo A/S is a 100% shift to renewable fuels.



The storage for dry biomass at Verdo A/S

The logistic on the site is a daily challenge as the harbour area where the plant is located is quite narrow with few possibilities for expansion. The advantage is that medium size ships, used in the Baltic Sea and on rivers in Germany, Poland and Russia can call directly at the storage facilities of the plant. During hard winters the harbour is frozen giving problems with the limited storage facilities. It is very important to have continuous monitoring of the dry biomass storage, as self ignition has been detected some times.



The wood chipper at Verdo A/S



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The CHP plant

The boiler plant consist of 2 boilers. This provides high operational reliability and good opportunities to adjust the production to the actual district heating consumption. In the Danish context a CHP plant is a small power plant situated at a larger district heating network. The main priority for the energy production is to supply the district heating network. The second priority is the electricity production. The boilers were originally equipped with spreader stokers for coal firing, but in 1994 a gas burner was installed for landfill gas. In 2002 the plant was equipped with pneumatic air spouts for biomass firing. The combustion takes place in suspension and on a travelling grate.



Randers CHP plant with a lot of belt conveyors for fuel handling. The resevoir on the chimney is for the district heating system. To the left the out door storage for chalk used in the de-sulphurisation proces.

CHP plant data	
Boiler pressure	111 bar
Electrical output	52 MWeI
District Heating output	112 MJ/s
Super Heater temperature	525°C
Flue gas cleaning 1	El. Precipitator
Flue gas cleaning2	SO ₂ reduction
CO ₂ emission 2005	228.400 tons
CO ₂ emission 2010	48.300 tons
NOx emission 2010	445 tons
Sulphur emission 2010	8,8 tons
Dust emission 2010	34 tons
Residues. Bottom ash 2010	3.500 tons
Residues. Fly ash 2010	5.960 tons
Residues. Gypsum 2010	141 tons

Source: Verdo. Green Accounting 2010

Bottom ash is used for road construction. Fly ash is reused. Gypsum is used as building materials.

Producers view

Verdo A/S believes in green energy produced from carbon-neutral fuels. The best way to demonstrate this is to invest in biomass production and conversion. Verdo A/S is engaged in green solutions, and biomass fuels are characterized precisely by being environmentally friendly. The goal is to deliver green energy using environmentally friendly bio-based fuels. The main goal is to use 100% biomass for energy production round the year. In 2005 the CO₂ emission from the CHP plant was 228.400 tons. The target for 2011 is 20.600 tons.

Verdo A/S

Kulholmsvej 12
DK 8930 Randers NØ
Phone+45 8911 4727



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