BIOMASS
Straw

PRZECHLEWO
(Poland)

Straw is a renewable fuel. It is readily available and cheap and the exhaust gases produced during the combustion process contain negligible quantities of sulphur compounds and much smaller quantities of nitrogen oxides than the exhaust gases produced by burning traditional fuels. There is an abundance of straw in Poland, especially on large farms, so the opportunity to utilise it, the financial incentives available and the pro-environmental policies of the local authorities favour the construction of straw-fired boiler plant.

THE CITY

The Municipality of Przechlewo (6300 inhabitants) is situated in the south-western part of Pomorskie Voivodeship. Almost the whole area of the community is located within the Tucholskie Forest along the upper course of the Brda river basin. The area of Przechlewo is 24,338 hectares. Almost 50% of the area of the municipality is taken up by forests, 30% is arable land, 7% - grassland, over 5% is underwater, the rest is wasteland and other types of land.

Climatic data:
Average annual temperature: + 7.5°C

CONTEXT

A boiler plant in Przechlewo, providing heating for 18 houses, a school, a kindergarten and three office and public utility buildings, used coal dust as fuel. However, after thirty years of operation, the boiler plant was in a bad technical condition and the operating costs were steadily rising due to the price of coal and the costs of necessary repairs. About 2000 tons of coal dust was burnt in the boiler plant each year; the net annual cost of fuel was EUR 105,000 (at EUR 52.5 per ton of coal dust). Moreover, the coal was transported from locations 600 km away, which was also expensive and which imposed its own burden on the environment. However, grain is grown on 3000 hectares of fields within the municipality and a lot of straw is produced there. Only one tenth was utilised by households and some of the straw was ploughed in. Most of the surplus was, however, burned in the fields, which constituted a serious health hazard for the population and caused environmental damage.

EXPERIENCE OF PRZECHLEWO

Polish agriculture produces about 25 million tons of straw (primarily cereal and rape straw) each year. Out of this, half a million tons is used for mushroom growing. One and a half

million tons is utilised by the farms as bedding material and animal feed and also to fertilise the fields. The agricultural utilisation of straw has been decreasing recently, primarily because livestock numbers have decreased. Straw surpluses have grown since 1990 and straw is an important source of renewable energy.

Such straw surpluses may be used for producing energy and provide additional income for farmers. In recent years, the average annual surplus of straw in Poland has been 8.1 million tons, which can yield as much energy as 5.4 million tons of average-quality coal.

Calculations conducted in Przechlewo demonstrated that 2500 tons of straw were necessary to produce heat and hot water; this quantity of fuel was available locally.

Financial aspect

With the help of the Ekofundusz Foundation, the WFOŒiGW (Voivodeship Fund for Environmental Protection and Water Management) in Gdañsk and the AWRSP (Agricultural Property Agency of the State Treasury), the Urz¹d Gminy (Local Authority Office) in Przechlewo decided to construct a straw-fired boiler to replace the coal-fired boiler plant, which was old, inefficient and emitted harmful substances.

The investment was financed by:

- The Ekofundusz Foundation 30.0%
- Preferential credit and subsidy from the WFOŒiGW in Gdañsk 24.0%
- The AWRSP in Gdañsk and the Municipality of Przechlewo 46.2%

The boilers were manufactured by Apacor Brzeg Dolny under the manufacturing licence of the French company Compte R. The Local Authority Office in Przechlewo, ZGK Przechlewo (Municipal Management Company) is the present owner of the boilers. The total cost of the investment (MEUR 1.625) included:

- the purchase of three straw-fired boilers with a power rating of 2 x 2.5 MW and 1 x 1.25 MW,
- the construction of a straw warehouse with an area of 1800m^2 housing sufficient straw for 1 month's operation of the boiler plant,
- the purchase of equipment for shredding and transporting straw,
- adapting an old structure to house the new boiler plant,
- the construction of the heat distribution network from pre-insulated pipes,
- the construction of dual-function heating substations.

It was calculated that the price of 1 MWh of energy produced would be EUR 31.5.

Environmental aspects
The new boiler plant reduced annual emissions by the following amounts:

- carbon dioxide by around 7000 tons,
- sulphur dioxide by about 100 tons,
- nitrogen oxides by 90 tons,
- particulate matter by 10 tons.

The ash produced by burning the straw can be used for agricultural purposes provided that the fertilised soil is monitored.

Profitability
The boiler plant is manned by 8 persons and one caretaker, the employees work in 4 shifts. The net cost of 1 ton of straw is EUR 32 and the boiler plant utilises 2500 tons of straw per year. The straw has to be prepared for combustion by compressing it into cubes; its humidity should be 22%. The thermal power of the installed COMPACT 250 boiler is 2.5 MW and its efficiency is 85%. The heating value of straw is ca. 14 MJ/kg.

The profitability is stable; there is no financial profit, but this fact is compensated for by the environmental benefits.

EVALUATION AND OUTLOOK

In comparison with a coal-fired boiler plant, a straw-fired boiler plant uses about 1.25 times more fuel by weight. The content of nitrogen oxides in the exhaust gases is three times lower than in the case of a coal-fired boiler and SO_2 emissions are extremely low.

The overall assessment of the installation under operation is favourable; its operation is less burdensome than that of a coal-fired boiler (the fuel only has to be loaded and burned three times a day).

The boiler plant in Przechlewo has been in operation since 2001 and is currently one of the largest biomass-fired energy facilities in Poland.

FURTHER INFORMATION

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