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USE OF MODERN BIOMASS BOILER FOR HEAT AND ELECTRICITY GENERATION IN PŁOŃSK DISTRICT HEATING COMPANY

Sector: Biomass use

Timeframe: 2005 – 2007

Location: District Heating Company,
Płońsk, Poland



Photo: Dariusz Marczewski

PROJECT BACKGROUND

Płońsk (approx. 23 000 inhabitants) is a county town located in Mazowieckie Voivodeship. Until 1992 the city was supplied with heat by local district heating plant operating within the structures of the Regional District Heating Enterprise in Ciechanów. Since January 1992 newly established Płońsk District Heating Company (PEC - *Przedsiębiorstwo Energetyki Ciepłej*) took over responsibility for heat supply, exploiting one central thermal plant and 14 local boiler houses using coal and coke mixture as a fuel. The latter have been withdrawn from exploitation as a result of air pollution reduction - implemented by the city. In consequence one heat source was left - the Central Thermal Plant. Its operator, PEC in Płońsk, is constantly working to reduce air pollution and follow global energy generation trends by implementing wide-scale environmentally friendly investments.

PROJECT DESCRIPTION

Since 2005 till 2007 PEC in Płońsk was implementing an investment entitled "Modernisation of the district heating system in Płońsk". Modernisation works were conducted in two stages and included replacement of approx. 8 000 linear meters of pipelines with the new pre-insulated ones, as well as construction of new knots (15 single-function knots and

14 double-function knots). But the most important part of the project was the installation of a new steam biomass boiler with the capacity of 10,2 MW in the Central Thermal Plant. The boiler generates 14 tons of high-pressure steam per hour with the steam pressure amounting to 40 bars. Installation of the boiler was accompanied by the installation of a steam turbogenerator with the capacity of 2,08 MWe and the whole infrastructure necessary for co-generating heat and electricity, including automatic monitoring and control devices, pipelines, fittings, fuel storage and feeding system, storage sheds for wood chips, hot water preparation unit, dedusting installation, ash handling system, exhaust extractors and steam heating network supplying AGRIKO plant (DN 150/80 and L = 260 linear meters). Moreover, area around the CHP plant was recultivated.

The main fuel used by the plant are the wood chips (coming among others from the energy crops). Over 70% of thermal energy and 100% of electric energy is produced from biomass. The new biomass boiler includes special technological solutions which reduce emissions from the wood combustion. In order to eliminate soot and carbon oxides the combustion gases are kept long in the boiler and the amount of air delivered for the combustion process is precisely regulated (using lambda probe readings and regulation of the rotations of draught fans). Secondary air injection minimises carbon oxides emissions and



facilitates the afterburning of volatile and combustible components of the exhumate gases. Emission of dust, on the other hand, is limited by using efficient dedusting devices (multicyclone and pulse dust collector) installed behind the boiler.

Technical correctness of the system consists in the reduction of the source's thermal power from 50,6 MW to 36,8 MW (technological parameters of the boiler room and dimensions of the network are adapted to the consumers' energy demand). High degree of automation of the thermodynamic processes and their monitoring allow for efficient energy management and obtaining positive environmental results.

FINANCING SCHEME

Total cost of the investment (excluding the cost of investment servicing and liquidation of fixed assets) came to 33 625 000 PLN (\approx 8 406 250 EUR). 33,5% (11 300 000 PLN \approx 2 825 000 EUR) was covered with the subsidy from the EcoFund and further 53% (17 825 000 PLN \approx 4 456 250 EUR) with the loan from the National Fund for Environmental Protection and Water Management. Remaining 13,5% of the cost (4 500 000 PLN \approx 1 125 000) was paid from the municipal budget.

PROJECT RESULTS

Project implementation allowed for significant reduction of air pollution emission coming from the coal dust combustion, including reduction of GHG emissions. Achieved environmental effect includes:

- CO₂ emission reduction - 35 000 Mg/year, i.e. 77,2%
- SO₂ emission reduction - 144 Mg/year, i.e. 63,8%
- NO_x emission reduction - 54 Mg/year, i.e. 63,3%
- Dust emission reduction - 151 Mg/year, i.e. 76,7%
- CO emission reduction - 29,8 Mg/year, i.e. 19,3%
- Soot emission reduction - 4,8 Mg/year, i.e. 76,5%
- B(a)P emission reduction - 0,14 Mg/year, i.e. 98,6%
- Slag and ash production reduction by 51%.

What is more, the investment resulted in more efficient use of primary energy embedded in the fuel, which was possible thanks to the introduction of co-generation of heat and electricity. This also helped to reduce energy generation cost and decrease heat transmission losses. Reducing amount of equipment installed outside the building, on the other hand, contributed to the decrease of noise levels.

Implementation of the investment had positive impact not only on the state of natural environment and the quality (reliability) of heat supply, but also on the quality of life of Płońsk inhabitants. PEC company managed to reduce energy price by approx. 10% and currently people pay less for heat delivery than inhabitants of neighbouring cities. Therefore, heat energy is more affordable for them.

Another proof of project's efficiency is that the municipality managed to obtain financing for such a big and complicated undertaking. Its implementation helped to gather useful experience concerning co-generation of heat and electricity using biomass fuel, which may be of use for other municipal district heating plants still combusting coal dust. Therefore, Płońsk investment may become a kind of "catalyst" for the development of CHP plants in Poland.

In 2006 the project of construction of a biomass-fueled CHP unit in Płońsk received prestigious Energy Globe award for the best Polish project in the area of sustainable energy. The award was handed to Płońsk representatives in the seat of the European Parliament in Brussels in 2007.

MORE INFORMATION

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