

# BIOMASS

## Forest Residues Plant

# KÊ PICE

## (Poland)

*Manufacturing processes in the wood and furniture industry yield large quantities of waste which is a valuable fuel. New wood combustion technologies ensure efficient energy production and limit the emissions of particulate matter and exhaust gases during the combustion process. Biomass is a very important fuel in local applications, where it can replace coal, bringing both economic and environmental advantages.*

## THE CITY

The Municipality of Kê pice (10,000 inhabitants) has an area of 29,343 hectares. Kê pice is situated in the S<sup>3</sup>upski powiat, near the sea coast in north-western Poland. It is a region of forest and agricultural land, with clean air and water, isolated from transport routes.

### Climate data:

Average annual temperature: 7.4 °C



## CONTEXT

The boiler plant delivering heat to the housing estate in Kê pice started operation in 1981. A total of 7 “RUMIA” water boilers with a total power of 3710 kW were installed. The primary fuel was coal. The boilers were operated manually and fuel was transported and ash was disposed of using wheel-barrows. In the recent years, the boilers were already worn out and required major repairs before each heating season.

This situation gave rise to a plan for replacing the old coal-fired boilers with modern wood waste-fired boilers – wood waste is easily available in the vicinity of Kê pice. Limiting the emission of pollutants into the air was also very desirable in order to encourage the development of the tourism and leisure industry.

## EXPERIENCE OF KÊ PICE

In 1997, a technological and financial study was prepared as part of the “JOULE-THERMIE” programme entitled “Energy conservation: Developing wood combustion technology in Poland – the introduction of boiler plant in seven municipalities of the former S<sup>3</sup>upskie Voivodeship”. The Municipality of Kê pice was included in this study. The idea of utilising large forest resources to obtain fuel was raised by Ms Ewa Chantre, a representative of the French company “ECO-POLOGNE”.

A meeting of representatives of the following institutions took place in 1998:

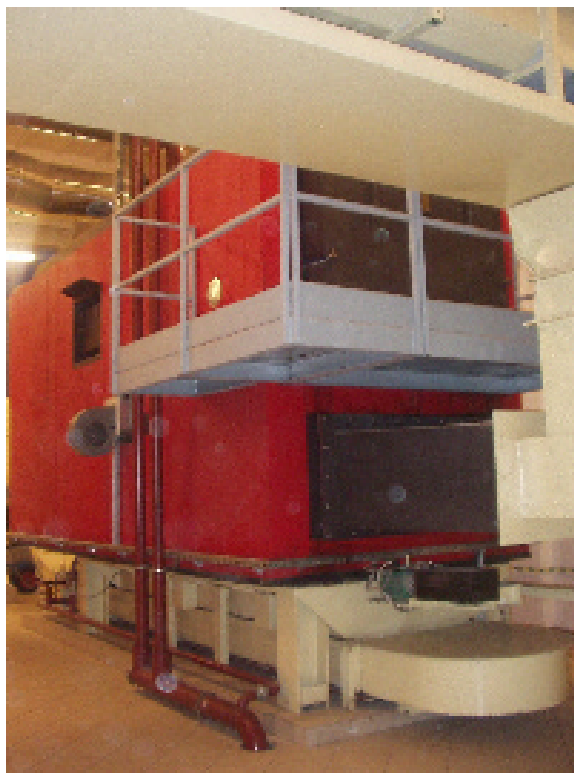
- The Urz'ad Miasta i Gminy (Town and Municipality Office) in Kępice,
- Energoeksport,
- SPEC IBMER Warszawa.

During this meeting, a decision was made concerning collective action to install a wood-fired boiler plant in Kępice.

Based on these arrangements, a document presenting the technological and economic assumptions of the project entitled "The modernisation of the boiler plant in Kępice" was prepared by Anna Grzybek from IBMER Warszawa. A construction design entitled "The technological aspect of a wood-fired boiler plant" was prepared in September 1999 by the HEISE&GOSTKOWSKI firm from Elbl'g.

### Costs and financing

The main investor, the Urz'ad Miasta i Gminy in Kępice, was already undertaking activities in order to collect funds to implement the project in 1999. These funds were obtained thanks to the efforts of Mr Stanis'aw Grze'ekowiak, the mayor of the Town of Kępice. The table below contains detailed data:



Financing source	Funds	Share
	EUR	%
Own funds	56,058	8.67
Credits	269,250	41.66
State Treasury subsidy	12,500	1.93
EKOFUNDUSZ	308,550	47.74
<b>TOTAL</b>	<b>646,358</b>	<b>100.00</b>

### Fuel supply

The Zak'ad Energetyki Ciepłej w Kępicach (the heating utility) is an institution funded from the municipal budget and must conform to public procurement laws. The heating utility bought the following quantities of fuel (delivered to its warehouse) following a call for tender which runs until the end of 2001:

- Wood chips: 3475 m<sup>3</sup> at the net price of EUR 20.5/m<sup>3</sup>,
- Sawdust: 2429 m<sup>3</sup> at the net price of EUR 9/m<sup>3</sup>.

The supplier obtains the fuel from sawmills



and wood processing facilities in the vicinity of K epice.

### Technical specifications of the boilers

The boilers have been manufactured by the French company COMPACT.

Thermal power	kW	1500	2500
Overall efficiency	%	83	83
Furnace power	kW	1810	3020
Exhaust gas stream	Nm <sup>3</sup> /h	4610	7400
Wood waste consumption	kg/h	725	1210
Heating surface	m <sup>2</sup>	80	128
Grate area	m <sup>2</sup>	3.5	4.9
Water capacity	l	4400	5300
Maximum working pressure	bar	4	4

Thermal power in relation to fuel humidity (according to the technical specification):

- 45% 2500 kWh/T
- 30% 3400 kWh/T
- 60% 1600 kWh/T

### Fuel quality

The technological and economic assumptions used during the modernisation of the boiler plant were as follows:

- average fuel humidity 50%,
- fuel heating value 4.3 GJ/m<sup>3</sup>,
- annual fuel consumption was assumed to be 9000 m<sup>3</sup> of wood.

The fuel utilised is of very good quality. Its heating value calculated over a 9-month period, taking heat production, the quantity of fuel used and the boiler efficiency into account, was 6.5 GJ/m<sup>3</sup>.

### Environmental aspects

The emission of pollutants for the year 2001, as compared to the year 2000, was as follows:



Pollutant	Emissions before project implementation	Emissions after project implementation	Pollutant emission reduction	Percentage Reduction
	tons	tons	tons	%
SO <sub>2</sub>	14.32	0.12	14.20	99.00
NO <sub>2</sub>	2.68	2.23	0.45	16.80
CO	68.85	66.96	1.89	2.70
CO <sub>2</sub>	2976.00	7675.00	-4699.00	0.00
B(a)P	0.008	0.000	0.008	100.000
PARTICULATE MATTER	5.78	0.05	5.73	99.00
SOOT	0.037	0.000	0.037	100.000

The values above have been calculated on the basis of emission indicators used to determine the pollution charges.

## EVALUATION AND OUTLOOK

Before modernisation, the boiler plant was manned by two employees working in shifts during the heating season. Work conditions were very difficult (manual coaling and ash disposal, the boiler room was full of dust and smoke). After the modernisation, the boiler plant is operated by one employee. The work includes storing the supplied fuel in a silo, programming the operation of the boilers depending on the load, ash removal, maintenance and controlling the operation of the boilers and additional equipment as well as cleaning the boiler room.

Thanks to the utilisation of the biomass-fired boiler to produce energy, the emission of greenhouse gases into the atmosphere has been significantly limited and the emission of other pollutants has been reduced. This has been advantageous for the health of the inhabitants and has improved the attractiveness of the area to tourism.

The utilisation of biomass for energy production involved the inhabitants of the community in the rehabilitation project and had a valuable educational function by drawing people's attention to energy conservation problems. The model solution implemented in Kê pice can also be presented to the representatives of the neighbouring communities.

## FURTHER INFORMATION

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