

T@W Good Practice Form

Setting

Title:	Biomass Forest Residues Plant
Country:	Portugal
Location:	Mortágua
Start date:	1998
End date:	1999
Technology keyword(s):	Forestry and energy crops
Host sector:	

General description

Summary:

In 2005, 87% of the Portuguese energy needs were fulfilled by exported fossil fuels - oil, gas and coal. It is necessary to decrease the consumption of fossil fuels and increase the use of renewable energy sources. Portugal has a high potential of renewable energy resources, namely biomass - forest residues and wood waste. The use of biomass to produce energy has advantage beyond the decrease of greenhouse gases emissions and the decrease of the energy invoice, that are related with the reduction of fire risks by cleaning the forest, removing the combustible matters.

To use this potential, the Portuguese Government, already in 1990, asked EDP (Energy of Portugal, S.A), the Portuguese utility, to build and manage a power plant, which the input will be the forestry residues.

CBE (Portuguese Centre for Biomass Energy) performed the studies and concluded that Mortágua was a good location to implement the power plant, because the region has about 27% of the total Portuguese forested areas, and produces around 480.000 tons/year of dry forest residues. Another important reason to choose this location, was the high number of wood industries in the region, namely sawmills, which produce wood residues such as bark.



Fig. 1 - Mortágua Power Plant (*BIOMASS - Forest Residues Plant - Energie-Cités*)

The final decision to start the construction was made in December 1997. The construction started in January 1998 and the plant started to work in August 1999. EDP is the promoter of the power plant and CBE is responsible for the biomass project.

The Mortágua power plant has an installed capacity of 10 MW with a gross efficiency of 26.5%. The plant was designed to operate 7,800 hours/year and to sell about 60 GWh/year to the electrical national grid.

Aims:

The project was developed based in four main objectives - the reduction of the external energy dependence, the decrease of the greenhouses gases related with electricity production in thermal power plants, the use of an endogenous renewable resource and the reduction of fire risks by cleaning the forest.

Portugal has high external energy dependence, mainly fossil fuels, so it is important to increase the use of endogenous energy, keeping in mind that Portugal has a great forest biomass potential, it is crucial to exploit this resource.

Summary of Results:

In 2005, the power plant consumed around 91,882 ton of forest residues, $800 \times 10^3 \text{ Nm}^3$ of natural gas and 315,448 m^3 of water, to produce about 51,389 MWh of electricity. Regarding the emission of greenhouse gases the plant emitted 1,729 ton of CO_2 , 0.03 kton of SO_2 , 0.15 of NO_x and 0.02 kton of particles.

Technical details

Technical details:

The Mortágua power plant has a fuel storage area with a weighting station and a drying system.

In a first stage the forest residues are weighed and crushed, and then they are stored in an uncovered container or discharged in a covered pit. After, the residues are removed from the pit and fed into a silo situated in front of the boiler, through a computerised crane. The boiler is able to produce 30 MWth and was designed to burn about 8.7 tons/year of residues with a LCV (low calorific value) of 13.800 kJ/kg and 30% moisture content full load. The input of fuel is made by suspension or by water cooled vibrating grate. The boiler can also use natural gas as a start up and regulation fuel, burning the fuel mix. The combustion temperature is approximately $1,000^\circ\text{C}$. It is possible to increase the total efficiency making a fuel with 40% of pine bark and 60% of forest residues. The boiler can produce a maximum steam flow of 11.1 kg/s at 42 bars and 422°C . The generator is driven by a condensing turbine.

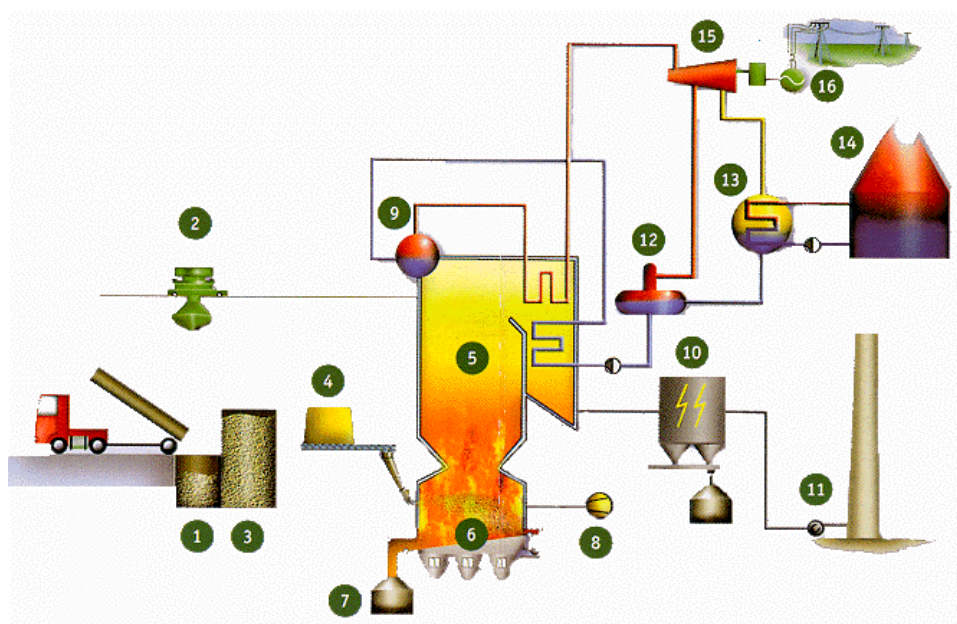


Fig. 2 - Power Plant scheme (*THE ANALYSIS REPORT OF PLANT NO. 13, Cofiring of biomass - evaluation of fuel procurement and handling in selected existing plants and exchange of information (COFIRING) - Part 2*)

- | | | |
|------------|---------------------------------|-------------------------|
| 1 – Pit | 7 – Ashtrays | 12 – Degasifier |
| 2 - Crane | 8 – Fans | 13 – Condenser |
| 3 – Silo | 9 – Holdfast | 14 – Refrigerator Tower |
| 4 – Hopper | 10 – Electrostatic precipitator | 15 – Turbine |
| 5 – Boiler | 11 – Chimney | 16 - Generator |
| 6 – Grate | | |

Energy data

Energy data:

Electric Power	9 MW
Electric energy produced	56.857 MWh
Electric energy available	51.389 MWh
Biomass Consumption	91.882 ton
Gas Natural Consumption	800 x 10 ³ Nm ³

Environmental data

Environmental data:

The use of biomass to produce electricity has some advantages at environmental level, namely the diminution of greenhouse gases emissions, the reduction of fossil fuel consumption and the decrease of fire risks by cleaning the forest.

Beyond that, this plant, to reduce the emission of particles and greenhouse gases, has an air emission cleaning system that limits the emission of particles to 100 mg/Nm³, the emission of CO to 200 mg/Nm³, the SO₂ emissions to 300 mg/Nm³ and the NO₂ emissions to 340 mg/Nm³.

Another important environmental aspect is the end use of the ashes produced during the biomass combustion. In this case the bottom and fly ashes will be disposed in an uncovered area or can be used in the agriculture.

Economic data:

Economic data:

The use of an endogenous energy resource helps to the reduction of the energy invoice of the country, due to the reduction of fuel importation.

Capital cost: 27.5 MEuros

Contact information:

Organisation / Agency:	EDP Produção - Bioelétrica, SA
Main contact	Gil Patrão
Address:	Av. Urbano Duarte, 100, 3030-215 Coimbra Portugal
Tel:	+ 351 239 00 20 21
E-mail:	gil.pat rao@edp.pt