

ENERGIA *demo*

NEW TECHNOLOGIES IN ENERGY SAVING AND EFFICIENCY

HOT WATER POWER PLANT RUN ON BIOMASS



Since February 2000, La Granja residential area in Molins de Rei has a hot water power plant run on biomass with 2,250 kW of thermal power. This is currently supplying heating and sanitary hot water to 250 dwellings in this area.

It is envisaged that, by the year 2003, the number of dwellings connected to the grid may be 695. This increase will involve some useful-heat production in the range of 6,800 MWh/year, with a biomass consumption of 2,200 yearly tonnes. Such energy production will imply primary energy savings of some 730 toe/year, and will prevent over 1,700 yearly tonnes of CO₂ from being dispersed into the atmosphere.

MOLINS ENERGIA, SL
MOLINS DE REI (BAIX LLOBREGAT AREA)

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ENERGIA *demo* is a collection of technical reports on the following areas:

- ENERGY SAVING AND DIVERSIFICATION
- ENERGY EFFICIENCY
- RENEWABLE ENERGIES
- WATER SAVING
- ENVIRONMENT



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introduction

In 1997, the Council of Molins de Rei, Entitat Metropolitana de Serveis Hidràulics i Tractament de Residus (EMSHTR) and Institut Català d'Energia (ICAEN), through their affiliated company Efiensa, formed Molins Energia, SL. The aim was to build and keep a heat generation plant operative, run on biomass, as well as to supply hot water to 695 newly-built dwellings in La Granja residential area, Molins de Rei, thanks to a District Heating grid.

The above three public organisations called for a tender in 1999 in order to select a private company that would become part of Molins Energia, SL and would take care of building and managing the plant. This public tender was awarded to a grouping of companies formed by Hidrowatt, SA and Companyia d'Aigües de Sabadell, SA, gathered



The heat plant run on biomass supplies heating and hot water to 250 dwellings in La Granja residential area, Molins de Rei.

under the following name: Biomassa Aprofitament Energètic, SL.

The project received financial support from the European Commission -within the framework of Thermie European Programme-, from the Spanish Ministry of Industry and

Energy -PAEE Programme- and from the Directorate General for Energy and Mining of the Catalan Government. The overall investment, including the supply grid cost, was 1,622,000 Euros (270 Million Pta), of which 456,700 (76 Million Pta) were subsidised.

project

The main elements included in the heat plant are: a biomass boiler with 2,250 kW of thermal power (this boiler is prepared to generate hot water after combusting solid fuels), 3 natural gas modular boilers (used to support the biomass boiler should there be stops or consumption peaks).

Biomass -mainly almond shells, chipped pine cones and forest kindling- reaches the plant on lorries, which unload it in a 180 m³ silo. This size provides the boiler with operative autonomy for 55 hours at full power. The silo has a moveable bottom formed by three non-finished bolts in series, which are activated by electrical engines to guarantee the input of biomass in the boiler's combustion chamber.

The combustion chamber has a water-refrigerated moveable grate where biomass undergoes a two-stage combustion. To start with,



Close-up view of storage tanks, the silo and the biomass boiler in Molins de Rei plant.

organic matter is dried as fuel advances through the chamber's moveable grate -this is the process when volatile compounds come off- and combustion is later completed with the intake of secondary air. The biomass boiler sucks gases from the combustion chamber and makes them flow three times

through the boiler so that they yield their heat until reaching 160° C temperature. This way, before they are ejected into the atmosphere, they go through a high-efficiency multi-cyclonic sensor that separates small-sized particles from the gas flow.

The hot water generated in this

process is stored in two 100 m³ tanks during the hours the plant is in operation. From these tanks, water is pumped to the supply grid at a 2.5 bar pressure by means of a system composed of three centrifugal pumps. The storage system is only kept operative during the daytime -16 hours per day-, so that the hot water stored in the tanks guarantees the dwellings own heat demand overnight. This system automatically adjusts the delivery of water to be pumped depending on the current energy demand so that the powered



Compact facility including heat exchangers at each dwelling.



View of the biomass boiler and the chamber where combustion of organic matter reaching the plant takes place.

Biomass boiler's thermal power	2,250 kW
Gas boilers' thermal power	817 kW
Maximum powered flow	250 m ³ /h
Momentum pressure	2.5 bar
Momentum temperature	90° C
Work programme	16 hours/day
Storage size	2 x 100 m ³
Biomass silo size	180 m ³

The plant own characteristics.

water temperature can be maintained constant at 90° C.

The supply grid is almost 2,400 m. long. It is formed by stainless steel pipes with diameters ranging 60 to 273 mm. These also have a polyurethane coating which enables hot water to practically bear no temperature loss along the runoff.

Each dwelling has a small-sized and compact facility in its kitchen or laundry room, which is composed of

two heat exchangers where hot water from the supply grid yields its heat to the dwelling's heating or hot water generation system. Each dwelling was furnished with a calorie meter to gauge the flow and temperature jump between hot water intake and outlet. This allows ready information on energy consumption at any time. The meter also has a communications bus to enable readings from the plant's control room.

results

The hot water supply service at Molins de Rei plant was operative by February 2000. Initially, it was run on natural gas boilers. The biomass boiler started its operation in January 2001 and it is currently at full operation as previously scheduled. There are presently 250 dwellings being serviced with heating and sanitary hot water and it is envisaged to have connected 695 dwellings to the grid by the year 2003.

Up to November 2001, the plant had consumed 500 tonnes of

biomass, with a useful-heat production of 1,540 MWh. This consumption accounted for saving 165 toe of fossil fuels and for preventing some 380 tonnes of CO₂ from being dispersed. Once the remaining dwellings have been connected until meeting the foreseen 695, biomass consumption will be in the range of 2,200 tonnes/year and heat production will be 6,800 MWh/year. This will imply saving 730 toe/year and stop 1,700 yearly tonnes of CO₂ from being dispersed.



The heat plant is fully automated and this allows viewing and modifying any operative parameter in the facility from a central computer.

participants

Ownership

- Molins Energia, SL:
 - Molins de Rei Council.
 - Entitat Metropolitana de Serveis Hidràulics i Tractament de Residus (EMSHTR).
- Institut Català d'Energia (ICAEN), through Eficiència Energètica, SA (EFIENSA).
- Biomassa Aprofitament Energètic, SL.

Project and "turnkey" construction

- Biomassa Aprofitament Energètic, SL (Hidrowatt, SA and Companyia d'Aigües de Sabadell, SA).

Main equipment suppliers

- DANTRIM
- DANSTOKER
- CTR-LÖGSTOR

Financing

- Directorate General for Energy and Mining. Government of Catalonia.
- THERMIE Project, European Commission's DG XVII.
- Spanish Ministry of Industry and Energy (PAEE Programme).



technical characteristics

PROJECT'S NAME: Hot water plant run on biomass.

PLANT'S OWNERSHIP: Molins Energia, SL.

PLACE: Molins de Rei.

OVERALL INVESTMENT: 1,622,733 Euros (270 Million Pta).

NUMBER OF EXPECTED USERS: 695 dwellings (2003).

EXPECTED FUEL CONSUMPTION: 2,200 tonnes/year (2003).

EXPECTED HEAT PRODUCTION: 6,800 MWh/year (2003).

For further information, please contact:

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