

Combined heating
and power production
by wood chips

COMBINED HEAT AND POWER PLANT SUPPLIED WITH WOOD CHIPS

THE SUCCESSFUL CASE OF FONDO (TRENTO - ITALY)



Project idea

The CHP plant realized in Fondo - Val di Non (TN), has entered in function in November 2003. It is a co-generation plant producing heat for the domestic and industrial users and power - by means of a steam motor (Spilling engine) - streaming to the public network.

The municipality

Fondo is the main centre of the high Anaunia Valley (987 m.) located in the north western part of the Province of Trento. The population resident is of approximately 1500 inhabitants. It's an agricultural centre, trade of the wood industries, it's also well known as climatic station either in summer and winter.

The woodfuel supply chain

In the area the wood industry is a lot flourishing either in first and second processing wood industries; wood is gained mainly from the local forests and many companies are producing log for assembled boards, modules for the log-houses, wooden roof, pallet production. Depending on the local availability, the plant is supplied with wood chips coming from saw mills and wood residuals mainly deriving from the forest regular cutting and thinning.

furnaces with inclined moving grates has been installed, complete of the devices for the flue gas cleaning: multicyclone and electrostatic filter.

The steam generated from the furnaces flows through the motor and supplies the necessary energy for the conversion. The steam then goes out and flows in one exchanger steam/water for the feeding of the district heating. The parameter that regulates the operation of the system in the exercise parallel to the net is the pressure of the drainage vapour. To the damp motor is connected a feature of exclusion (by pass) to vapour valve.

If the exit-pressure of the motor goes down in spite of the full power, the reducer valve is opened until when the pressure of the wished steam of drainage is caught up newly. When the motor is off, the steam is guided through the pressure-lowering valve and lead to the exchanger steam/water. The steam motor is started manually; during such procedure, before the closing of the general switch from part of the synchronization apparatus, the engine group idles. The engine-group and the alternator are automatically controlled and switched off at a distance in case of error. All the system of co-generation, included the district heating, is remote-controlled. The peak efficiency of power production locally tested, is attested around 18-19%.

Particle control technologies

The system of emission treatment is composed by two batteries of multicyclones for the abatement of coars fly-ash and by an electrostatic-filter for aerosols removal.

Emissions and natural cycle of ashes

By operational conditions of the maximum potentiality, the two biomass furnaces, using also bark, produce in average 170 - 200 kg/h of ash.

District heating

The energy coming from the combustion of the biomass produces steam with pressure of 15 bars, then it is reduced to 0,5 bars. In the CHP plant the steam is leaded in an damp/water exchanger and is streaming in a system of piping in the district heating; the energy is therefore distributed to the 220 users - public and private - of the municipality of Fondo.

End-users connected to the district heating, captures the energy (warm water) through one substation consisting of one heat exchanger, one mechanical valve and appropriate instrumentation of measure of the heating (gauge, thermometer and energy counter)



The cogeneration plant

Storage and woodchips feeding

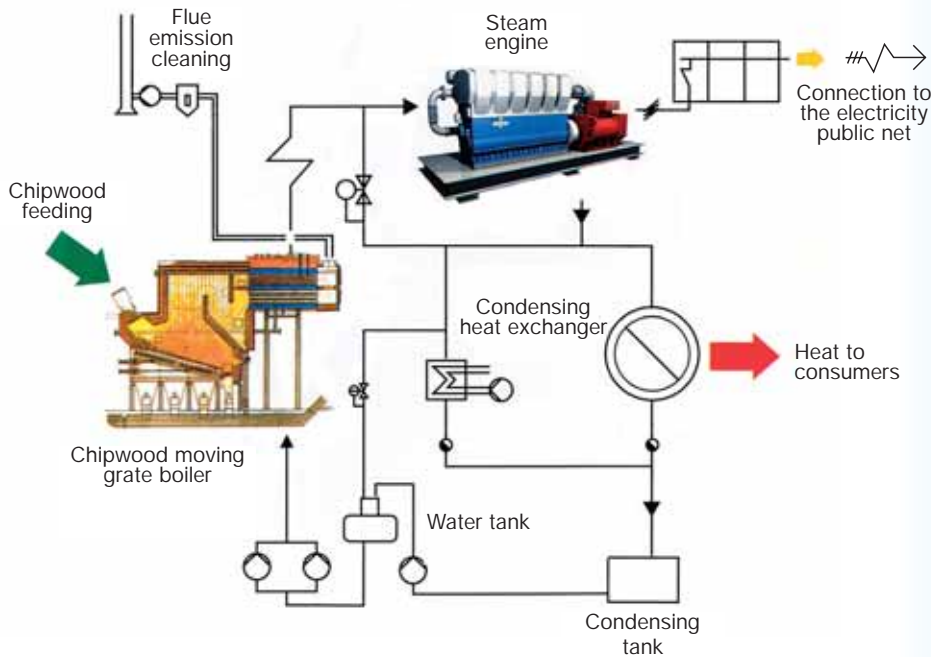
The storage has a capacity of 5.500 bulk cubic meter that enables an autonomy of the plant of approximately 25 days.

The woodfuel is fed through one mechanical shovel that discharges woodchips in two silos. Then the system of feeding to pushing-feeds the boilers in an automatic sliding bars system. Finally the wood chips is take in the furnaces by means of an hydraulic pushing system. In the heating room two steam



Plant Outline

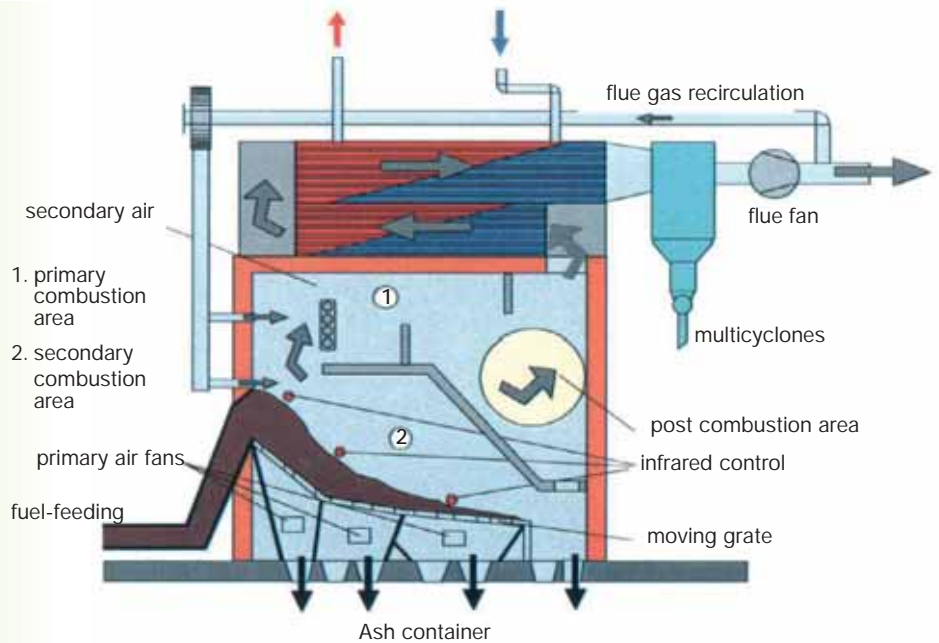
Every end-user is equipped of an "energy counter" that measures the real consumption of heating: end-user pays exactly what he consumes.



Chipwood storage area



The boiler



Technical and economical data

- Power of the boilers: **3,5 MWt + 2,5 MWt**
 - Type of boiler: **inclined moving grate**
- Annual consumption of woodchips: **7500 t (w 35-40%)**
30.000 bulk cubic meter
 - Chipwood price: **45 €/tonne**
- Length of the branch pipes: **5,5 km**
 - Length of the distribution pipeline: **2,6 km**
- Heating volume: **183.750 m³**
- Electrical power installed: **220 kW**
- Yearly power production (hy. of 3556 hours/y): **1.200 MWh**
- Yearly heating production: **7.000 MWh/y**
- Average efficiency of the boilers: **90%**
- Total investment: **6.040.000 €**

INFORMATION

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