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HEATING INSTALLATION BASED ON BIOMASS IN GREENHOUSES



Heating installation based on biomass in greenhouses in “Naturalcalá” Centre for Nature, Environmental Education and Leisure.

Place: “Naturalcalá” complex, in “El Encín” property, A-2, km. 38’2.

Municipality: Alcalá de Henares, Madrid.

Starting date: November 2007.

Participants:

- Alcalá Natura 21, S.A.U.
- Renewable Hispania XXI, S.A.

Description

The environmental complex Naturalcalá, located in Alcalá de Henares (Madrid), tries to give a global vision of nature and all its benefits for us, without forgetting to maintain the maximum respect and conservation.

The centre has two greenhouses, each of them of eighty square meters, for the cultivation of seedlings that will be used in the reforestation of “El Soto” property, as well as for the adjacent agro-thematic park.

Due to the climatology of Alcalá de Henares, and to the use that was going to be given to the greenhouses, it was considered the necessity of installing a heating system, for getting a higher yield from them. It had a double purpose in order

to protect the plants from the winter nocturnal frosts, and also to extend the time of culture beyond the natural culture season of the plants.

The installed system is based on the thermal generation with biomass, more concretely olive stone and its sub products, although they will be used mixed with the rests of the pruning of “El Soto” property and the agro-thematic park.

After studying the thermal needs and the calorific losses due to the construction materials of the greenhouses, it was estimated the necessity of an installation of 50,000kcal. The biomass heating system installed by the Madrilenian Company Renewable Hispania XXI is a “Inmecal Multi-fuel Biomass Boiler 50,000kcal”, that incorporates a system for energy and fuel saving, as well as a digital control panel and a wireless thermostat for the regulation of the temperature. Next to the boiler, a storage silo of two cubic metres has been placed.



The last part of the installation are radiators of twelve elements each, Rayco 600.

It was chosen to warm up by water instead than by air, after studying the difference in the

thermal inertia of both elements, being the chosen one higher than the air one.

The boiler and the silo were settled inside of one of the greenhouses to make use of the losses of heat, although the new boilers have very low losses nowadays.



Results

Although the boiler has a power of 50,000kcal/h, it is rarely used at that level (starting of the boiler and certain moments in a cold night). Therefore, the yield of the boiler is estimated in 30,000 - 40,000kcal/h.

Considering that the LHV (lower heating value) of the olive stone is 4,500kcal/kg, 8.88kg/h are consumed.

With an estimated daily working time of ten hours in winter, 88.8kg/day are necessary, reason why the silo has autonomy for approximately 23 days.

| Biomass use | |
|-----------------|-------------------------|
| Fuel type | Olive stone |
| LHV | 4.500 kcal/kg |
| Humidity | < 10% |
| Characteristics | Innocuous and odourless |
| Location | South of Spain |
| Price | 0,24 €/kg |

Next table shows a comparative carried out feeding the boiler up to 40,000kcal/h, 10 hours per day, during 4 months of the year, with olive stone and diesel oil for heating:

| | Olive stone | Diesel oil for heating |
|-------------|---------------|------------------------|
| LHV | 4.500 kcal/kg | 10.200 kcal/kg |
| Consumption | 8,88 kg/h | 3,92 kg/h = 3,33 l/h |
| Price | 0,24 €/kg | 0,72 €/l |
| Cost | 2,13 €/h | 2,39 €/h |
| Annual Cost | 2.556 € | 2.868 € |

* Prices were estimated at current market situation

Benefits

The boiler and the silo take up 4m² and are perfectly integrated inside of the greenhouse, being within sight of everyone that wants to see its operation, with security.

The fuel supply is guaranteed in our country due to the great current olive oil production, being its sub-products the ones used in the boiler. The heat provided by this material is very constant and the technology used makes that the system is impossible to explode.

The cost of the fuel is, as well, lower than the one of fossil fuels and it is not conditioned to the fluctuations of the international market nor to the energy crisis, which causes that it is very stable.

The use of biomass as bio-fuel for thermal production implies the use of non-polluting renewable energy 100% self-sufficient, so it does not need any other fossil conventional fuel of support.

Finally, it adds the possibility of mixing the residue with the products from the pruning of "El Soto" and the agro-thematic park, being this a closed system that interacts with the environment, since the residues produced by the combustion, ash, will be used as fertilizer.

The total investment has been of 15,985 €, receiving a subsidy of the 25.90% from the Regional Government of Madrid "Comunidad de Madrid".