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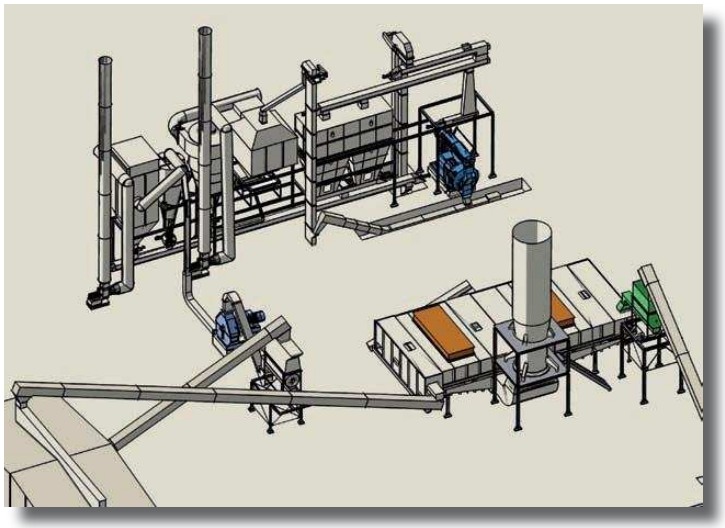
Pellets Production and Cogeneration Plant

Forests that are not managed properly can easily start burning, destroying valuable land and the environment. Forests should be properly managed and the products taken care of. Pellet production with cogeneration is one way.

Around the world, thousands of hectares disappear annually due to forest fires, which could be reduced with adequate management of the forests based on a continuous planning of the woodlands. This would reduce the quantity of wood that accumulates in the forests, causing uncontrolled fires of enormous dimensions which are an ecological disaster.

The cogeneration associated to pellets production is an innovation which can be used by institutions and organization managing the forest to generate wealth from this kind of resource.



All the design of the process engineering and the detailed engineering, from the reception of product in the plant to the electric power generation on one side and the pellets store before its delivery on the other, has been fulfilled 'turn key' by the Spanish firm Prodesa Medioambiente.

Innovative project

The project, developed by Prodesa Medioambiente and promoted by the Spanish company Galpellet in the region of Galicia (Spain), has been awarded by the Spanish Biomass Association with the Prize to Innovative Medium Size Projects, and it is the first medium scale CHP project in the Iberian Peninsula that combines cogeneration with biomass together with the production of biofuels.

All the biomass, the one that goes to the boiler to feed the cogeneration and the one that will be used to produce pellets, comes from such well organized forest management.

First step

As the starting point of the project, the affected forest area which will supply the raw material to the plant must be planned. A rotation must be established inside the considered area, in order that the biomass has enough time to regenerate in the woodlands. An exhaustive selection of the primary grinding machinery has to be done to choose the most adequate equipment for the type of biomass, always with a controlled cost that permits the biomass to be profitable and the obtained pellets to be competitive with the current market prices.

Technology

In this type of plant there are three main blocs: thermal oil boiler, cogeneration plant and pellets plant. The boiler burns low quality biomass (bark, wood residues) used to heat up the thermal oil. The oil works in a closed loop and is continuously being heated and cooled when it transfers heat to the cogeneration unit.

The biomass with less quality is directed to the thermal oil boiler, where its combustion generates heat for thermal oil at 315°C, which powers the cogeneration plant. The boiler has a mobile grates system which allows to burn different type of biomass with different sizes and moisture, enabling the combustion of poor quality wood that wouldn't be valid to pelletize or for other applications.

In the cogeneration, an organic fluid with a low melting point and a high molecular weight undergoes a traditional Rankine Cycle, with the advantage that the working fluid can work under lighter conditions of pressure, temperature and mechanical stress than if it were steam.

As a result we obtain: on one side electrical power, that can be sold to the net or consumed in our own plant, and on the other side hot water, which will be used to dry the biomass as a part of the pellets producing process.

Before pelletizing

Before transforming it into pellets, the forest biomass must reduce its size to 10-15 mm, by previous grinding. Depending on the size and the type of biomass that will be extracted from the woodlands, it can be done directly on site if the biomass is homogeneous enough. This will facilitate its transport, which would have a lower cost. Alternatively the biomass can be transported to plant, where it will go through different grinding stages to reach the desired size.

Conditions

One of the key points of the plant is the selection of the team Cogeneration – Drying of Biomass. In the ORC, 80% of the energy is transformed into thermal energy, whilst an 18% is transformed into electric energy. This is very favorable in this kind of plant where a high thermal consumption is required in order to dry the biomass before pelletizing it, and enables to reach a very high efficiency in the complete plant.

It is necessary that in the cogeneration besides producing enough thermal energy, it is generated in such conditions that it can be used with high efficiency in a biomass dryer. This is the case, given that for the correct operation of the ORC we need to dissipate a constant flow of water at a low temperature (under 100°C), which is ideal for a horizontal belt dryer.

Drying process

This is a recent drying technology comparing it to the classical drum dryer, and it has a number of advantages that make it ideal for this application. Firstly, it is an indirect dryer that enables the use of low temperature thermal energy coming from another process such as the hot water coming from the condenser of the ORC.

The low temperature dryer, as it is an indirect dryer, doesn't add any additional ash content to the wood, so it doesn't modify the composition nor the quality of the biomass. Working at low temperature, the color and the physical properties are also not altered, apart from guaranteeing emissions lower than 20 mg/Nm^3, which is less than what the most restrictive legislations permit.

Forcus Martínez, Prodesa Medioambiente
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Developing a clean energy together

Metso, Fortum, UPM, and VTT are jointly developing a clean energy alternative with domestic bio-oil.

Since June 2009, the Metso R&D Center in Tampere, Finland, has been producing high-quality bio-oil from sawdust and forest residues. Fortum is now joining this development project.

The consortium has developed a bio-oil production process in which a reactor, linked to a conventional fluidized bed boiler, can first gasify solid biomass and then compress it into liquid form. Through their five months of pilot testing and utilization of the R&D Center's 2 MW plant, the partners have improved the bio-oil production methods and the efficiency of the process. Already, more than 20 tons of bio-oil have been produced. An alternative to heavy and light fuel oils, domestic bio-oil decreases the burden on the atmosphere.

The Finnish technology developers are committed to ongoing improvements in the production of bio-oil from renewable resources. The companies' agreement for bio-oil test production extends through 2010.

Fortum now brings the important energy producer and end-product user angle to the research and development project.

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