Best-Practice-Projects for
Bioenergy utilisation in urban environments

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Project name: Energía Natural de Mora, S.L.
Location: Mora d'Ebre (Catalonia)
Bioenergy Technology Concerned: Integrated biomass gasification cogeneration plant

Executive Summary:
This is an integrated biomass gasification cogeneration plant based on reciprocating engines. The plant started in 1997 and produces a fuel gas by the gasification of almond shells.

CASE DESCRIPTION:

Background:
As soon as some of the industries consuming almond shells as a solid fuel close down and others moved to the use of natural gas, the sale of the almond shells as fuel was not longer an income source in the economic balance sheet of the dry fruit producing companies. In this context, almond producers started to experience financing problems to make profits out of this fruit's shells paving the way to find a new use for this biomass source, the gasification.

Description:
Eqtec Iberia, an independent engineering company, working in biomass gasification since 1991 together with Energia Natural de Mora S.L. (Enamora) has developed a proprietary biomass gasifier and synthesis gas cleaning system. The gasifier plant was designed to produce syngas suitable for internal combustion engines. It uses a cylindrical fluidised bed gasification reactor working at atmospheric pressure. The gasying agent is nonenriched ambient air, preheated up to some 250ºC before being introduced in the reactor. The gas obtained by the gasification process is used in 2 ignition spark VOLVO engines with a nominal capacity of 250 kW.
The plant, which started its industrial operation in October 1997 with 500 kW power alternative engines, has been proving to be technologically flexible and reliable and provided primary energy savings ranging over 500 toe every year, thus preventing some 1.500 tonnes of CO_2 from being emitted into the atmosphere.
The plant has been enlarged in April 2001 with one new 250 KW generator, being the total output 750 KW. The plant has been running for more than 20000 hours, and has produced more than 10000000 KWh of electricity; using several types of biomass like almond shells, wood chips, olive pits, etc.

Technical Data (capacity, output, etc.):
- Biomass Type: Almond Shells
- Biomass Consumption: 500 kg/h
- Main equipment: Cylindrical fluidised bed gasification reactor; 2 Power alternative engines.
- Nominal Electrical output: 750 kW
- Nominal Thermal output: 3500 kW
- Primary Energy Saving: 500 toe/year

Financial Data (investment, subsidies, etc.):
The basic programme that made this technology possible had a cost over 2,50 million Euros. This development effort will enable future applications under competitive market conditions

Which main problems had to be overcome?
Legal factors:
Socio-economic factors:

Economic:
The cost of the plant is higher than is expected for the next new facilities because in this first plant a lot of technology development has been necessary to finish the plant.
Others:

Information flow (which information needed, sources, difficulties, etc)
The plant is also used as a pilot plant for the testing of new possible sources of biomass because there are not many installations and previous experiences in the biomass gasification field.

Lessons learned
The success of the first phase made the company to be already at work to try and duplicated the facility's power and be able to generated 1 MW of electricity by feeding it with 1 t/h of almond shells. Once the almond shells system had proven to be flexible and reliable, Energía Natural de Mora and EQTEC Iberia started its plans to adapt the gasifier to other types of biomass, all types of wood, agricultural and forest refuse, bagasse from sugarcane or wine producers, bagasse from oil producers, olive pits, etc. Other fuels like sewage sludge and pneumatics has been tested with good results.
The produced electricity is sold completely to the grid to take advantage of the different price for the electricity generated from biomass cogeneration and the cost of the electricity taken from the public grid.

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