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STEAG New Energies GmbH Pyrolysis of wood waste

Development Plan Summary (Dresden, Germany)

Overview: STEAG New Energies was supported by the BioenNW project to develop a new economical and ecological sustainable concept for the fine fraction (less than 8mm) of used waste wood from an existing Combined Heat and Power (CHP) plant.

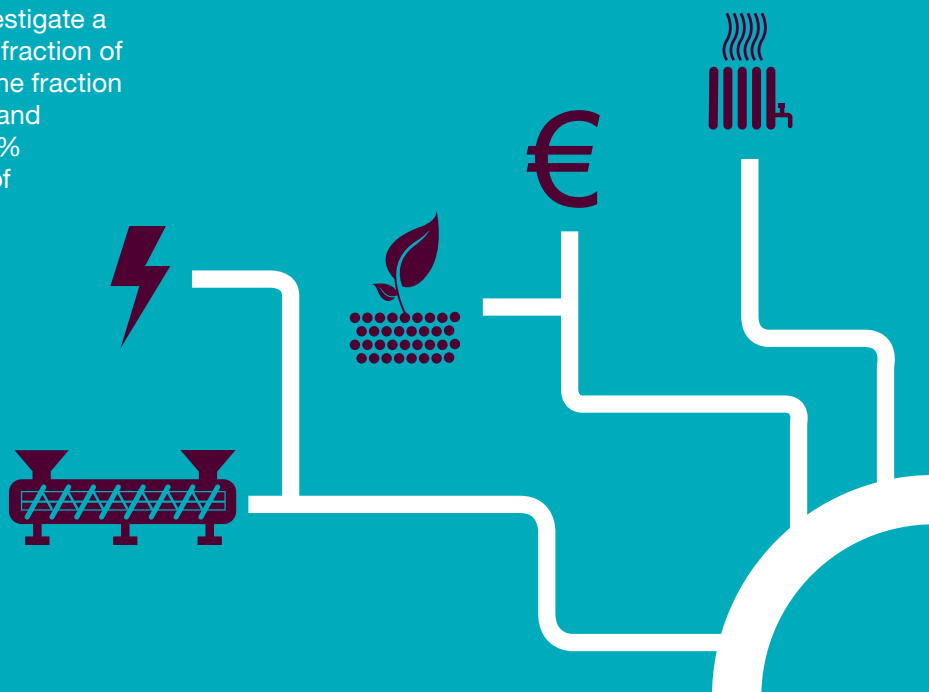
Pyrolysis as a preferred conversion technology

Since 2004, STEAG New Energies GmbH has operated a woodchip CHP plant in Dresden, Germany. This co-generation plant is fired by waste wood (categories A1 – A4) according to the regulations of the German Waste Wood Ordinance 1. The plant has a maximum power output of 7.2 MW of electrical power and a maximum of 12 MW of thermal power. The produced thermal energy is directly fed into a district heating system.

STEAG New Energies GmbH wanted to investigate a conversion process to add value to the fine fraction of wood waste. A preliminary analysis of the fine fraction of waste wood showed an average mineral and incombustible part of the fine fraction of 30% and an average lower heating value of this of 8 MJ/kg or 2 kWh/kg. Pyrolysis was investigated as a potential solution to treat this waste.

The pyrolysis process typically starts with the drying of the fuel. This pre-treatment requires a dryer to reduce the feedstock water content to the required level for the chosen pyrolysis technology. The higher the water content to be reduced, the more expensive the process.

Two pyrolysis processes were identified: the Pyroformer™ (developed by the European Bioenergy Research Institute (EBRI) at Aston University, UK) which would require pelletisation; and the PYREG 500 a product of Pyreg GmbH located in Dörth, Germany) which does not require pelletisation.



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Both pyrolysis processes produce a solid char fraction. Due to the contaminants content of the feedstock, it is currently assumed that the char produced during pyrolysis cannot be used as fertilizer. However this will need future clarification.

Pyrolysis also produces a gas and a liquid fraction which can be combusted directly, ideally in a downstream waste heat boiler. The generated power can be fed into the existing public power grid and is eligible for subsidies under the German Combined Heat-and-Power Act but not by the German Renewable Energy Sources Act as it is declared as waste wood within the categories A1-A4. Residues from wood processing industries might be eligible for subsidies under one of the above Acts but not both.

Permits and integration

The necessary permits should not be a problem as the site of the CHP plant has already been approved by the 4th German Federal Emission Protection Ordinance and subject to the requirements of the limits of the 17th German Federal Emission Protection Ordinance. The addition of a smaller conversion unit to process the fine fraction of used waste wood will not be a problem as there is sufficient space on site.

Profitability

The profitability of the pyrolysis of the fine wood fraction at the Dresden CHP would depend on the necessary pre-treatment of the feedstock and the quality of the char produced. There were a large number of unknown data or facts such as costs of a professional screening system, the quality of the char produced, and the improvement of the overall efficiency of the plant (if using only the fraction bigger than 8 mm). The following two factors would reduce the cost: due to its existing water content (between 5-20%), it will not be necessary to dry the fine wood fraction; pelletisation is not required if using the PYREG 500 technology.

Final conclusion

The development plan showed that it is technically feasible to operate a pyrolysis unit - or any other thermal conversion technology - to treat the fine fraction of used waste wood on the CHP site in Dresden.

The following factors would have to be taken into account to ascertain whether the integration of further processing such as pyrolysis for the fine fraction is economically viable. The increase in efficiency and the resulting additional profit of the existing CHP plant needs to be determined and compared to the following additional costs; implementation of a screening system and, depending on the pyrolysis technology chosen, a pelletizer.

The use of the biochar resulting from the pyrolysis process as a fertilizer remains to be clarified.

This development plan has been produced through BioenNW – a €7.9m strategic initiative of the European Union INTERREG IVB North West Europe Programme (2011-2015). BioenNW is led by the European Bioenergy Research Institute at Aston University, UK and sees 11 partners working together to deliver small-scale bioenergy schemes throughout North West Europe.

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