izes gGmbH
Institut für ZukunftsEnergieSysteme

Dudelbingerhof GmbH Pyrolysis of digestate

Development Plan Summary (Contwig, Stambach, Germany)

Overview: Dudelbingerhof GmbH received support through the BioenNW project to develop an economical, as well as an ecological, sustainable new concept for the further use of the digestate residue from its biogas plant near Contwig.

The biogas plant near Contwig has been operating for several years. It is fuelled by 50% maize silage, 20% grass and 30% manure.

A preliminary investigation estimated the quality of the digestate. The results of this assessment showed a lower heating value of approximately 15.2 MJ/kg or 4.2 kWh/kg with an annual tonnage of around 1,200 Mg/a with a dry substance content of 85%.

The biogas produced is combusted directly in a Combined Heat and Power (CHP) engine on the biogas plant site. The thermal energy produced is used for the heating of the buildings, the digester, as well as the farmer's house which is located near to the plant.

Pyrolysis as preferred conversion technology

The pyrolysis process typically starts with the drying of the feedstock. This pre-treatment requires a dryer to reduce the feedstock's water content to the required level for the chosen pyrolysis technology. The higher the water content of the feedstock, the more expensive the process. Two pyrolysis processes were identified for potential utilisation of the dried digestate at the site near Contwig: the Pyroformer™ (developed by the European Bioenergy Research Institute (EBRI) at Aston University in Birmingham, UK) which would require pelletisation; the PYREG 500 (a product of Pyreg GmbH in Dörth, Germany) would require no pelletisation.

Both pyrolysis technologies produce a solid char fraction (biochar) and it can be assumed that this biochar can be used as fertilizer as it is made purely from maize, grass silage and manure.

The thermal energy generated could be used for drying the digestate and/or any other biomass such as wood chips. If using the Pyroformer™, the generated power could be injected into the grid and would be eligible for subsidies from either the German Renewable Energy Sources Act or the Combined Heat-and-Power Generation Act.

Permits and integration

The plant would need to obtain the necessary official approvals and permits for operating a pyrolysis plant as the biogas plant near Contwig had not been granted the necessary emission permit. The physical integration of a smaller pyrolysis unit on the site of the existing biogas plant is possible. However, there is currently no local demand for thermal energy.

The operator of the biogas plant is now investigating the possibility to store and transport the generated outputs via a latent-heat storage system, or to convert the dried digestate at another site with an adequate heat sink.

Profitability

The installation of a pyrolysis plant on site of the biogas plant near Contwig is technically feasible. However the profitability of such a scheme would depend on the chosen pyrolysis technology associated with necessary feedstock pre-treatment and the resulting quality of the biochar produced. Costs related to the necessary environmental approvals and permits would also need to be taken into account.

There is currently some unknown data that would need to be ascertained in order to define the economic viability of the proposed scheme. This includes capital and operational cost for both pyrolysis technologies.

Final conclusion

The development plan showed that it is technically feasible to operate a pyrolysis unit, or any other thermal conversion technology, to further process the digestate from the biogas plant near Contwig.

The following factors also have to be taken into account to ascertain whether the further processing of digestate is economically viable: the capital investment and operational costs of the proposed technologies and obtaining the relevant permits and associated costs.

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.

For further information contact the Bioenergy Support Network:

Email: **bioenergy@aston.ac.uk**
Web: **www.bioenergy-nw.eu**
Tel: +**44 (0) 121 204 5318**

Report issued in October 2014

BioenNW
Delivering Local Bioenergy to NW Europe

Investing in Opportunities
This project has received European Regional Development Funding through INTERREG IVB.
INTERREG IVB