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Schmack Biogas GmbH: Pyrolysis of digestate from bio wastes

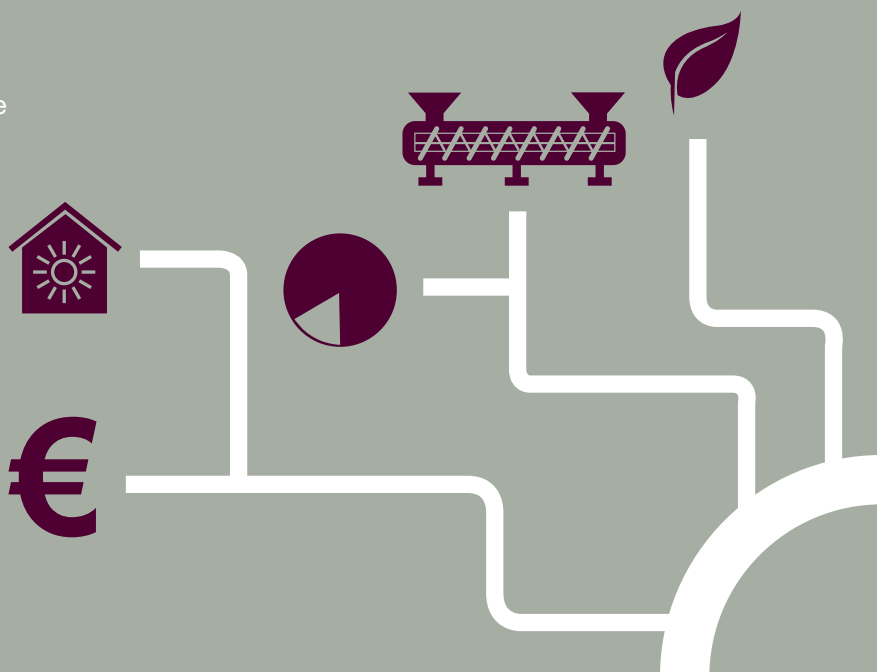
Development Plan Summary (Kirchberg, Germany)

Overview: The installation of a biogas plant at the company Schmack Biogas GmbH located at Rhein-Hunsrück Entsorgung (RHE) in Kirchberg (Rhineland-Palatinate) is planned. The biogas plant will be operated with the liquid/sludge fraction of pressed organic bio waste, which is collected and pressed by RHE. The use of how the produced biogas and thermal energy will be used has not yet been clarified. A basic study will be undertaken to show the possibilities of how to use the digestate within a further process such as pyrolysis.

The thermal output of the plant can be partly used for drying the digestate of the biogas plant. Pyrolysis as well as gasification as conversion technologies of the dried digestate of bio wastes could be a good solution to develop new and permanently available fuels. The produced biochar can potentially be used as a fertilizer.

Project detail

The goal of this study is to develop an economical, as well as an ecological sustainable new concept for the further use of the digestate from the biogas plant. In a preliminary investigation, the quality of the digestate was investigated. The key findings were that the lower heating value of the digestate is in the range of approximately 12.6 MJ/kg or 3.5 kWh/kg. The annual tonnage of the digestate is in the range of 10.500 Mg/a, with a dry substance content of approximately 15%.



Pyrolysis as a preferred conversion technology

The pyrolysis process usually starts with the drying of the feedstock. This step needs a dryer and – depending on the water content of the raw feedstock and the required maximum water content of the used pyrolysis technology – a significant amount of energy. In the city of Kirchberg, in case of using a Pyroformer™ (developed by the European Bioenergy Research Institute at Aston University), pyrolysis starts with drying (50% – 90% dry matter) followed by pelletisation. In the case of using a different pyrolysis technology – for example a PYREG 500 (a product of Pyreg GmbH located in Dörth, Germany) - neither drying or pelletisation of the digestate would be necessary. One product of both technologies is a solid char fraction. If using only green cut wastes it can be assumed that the charcoal produced can be used as fertilizer – biochar – but an appropriate certification has not yet been done. In the case of installing a Pyroformer™, the produced gaseous and liquid outputs would be used in a CHP unit. The generated power is fed into the public grid and subsidised in line with the German Renewable Energy Sources Act (EEG 2014) or by the German Combined Heat-and-Power Act (KWKG). In the case of using a PYREG 500, the gaseous and liquid fractions are combusted directly in the PYREG process via a FLOX™ burner. In both cases the generated thermal energy can be used directly on site and in the planned digestate dryer.

Permits and integration

The landfill terrain of RHE has a general official approval as landfill terrain. Every additional installation on this site needs to comply with this approval. The operation of a pyrolysis plant requires an approval by emissions laws (4th German Federal Emission Protection Ordinance and subject to the requirements of the limits of the 17th German Federal Immission Protection Ordinance). The integration of a smaller pyrolysis unit on site with the biogas plant should be possible but the efficient use of the thermal energy has to be ensured. RHE is considering different possibilities to use the generated outputs.

Profitability

The installation of a pyrolysis plant on site of the RHE landfill terrain in Kirchberg is technically feasible but presently a statement concerning the profitability cannot be made. Further investigations have been agreed with RHE. The result is particularly dependant on the choice of preferred technology, the resulting necessary pre-treatment of the feedstock and the quality of the produced char, as well as the costs of the necessary environmental approvals and permits. Presently there is a lack of knowledge regarding the investment and operational costs for these pyrolysis technologies as well as the official approvals for using a pyrolysis unit on this site. These questions will shortly be addressed through a detailed business case.

Final conclusion

Basically the operation of a pyrolysis unit or any other thermal conversion technology using the digestate of the planned biogas plant, operated with biowastes is suitable. The possibility of utilising the produced char as a fertilizer has not yet been clarified but will be investigated in the detailed business case. To decide whether an installation of a pyrolysis unit at the location of the Rhein-Hunsrück Entsorgung in Kirchberg is feasible, the legal approval issues as well as the costs of the necessary approval procedure must be determined.

This development plan is part of BioenNW, a €7.9m strategic initiative of the 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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