

Potential of Pyrolysis Oil Biomass Residues for Residential Heat Generation

Substantial Greenhouse Gas Emission Savings and Ash Recycling are Realisable

The Residue2Heat project reveals that substantial greenhouse gas emissions savings and ash recycling are possible by switching to fast pyrolysis bio oil for residential heating.

The goal of the EU research project “Residue2Heat” is to use various streams of biomass waste for residential heat generation. By means of the fast pyrolysis process, the biomass waste is converted into fast pyrolysis bio-oil, a 2nd generation biofuel suitable for combustion in an adjusted residential boiler. Between 77% and 95% emission savings can be expected depending on the feedstock utilised when using fast pyrolysis bio-oils (FPBO). This is the outcome of an assessment performed in the Residue2Heat project. These values reveal that the Green House Gas (GHG) emission saving requirements of both the European Union’s current Renewable Energy Directive (RED) and in the future draft (RED2) are met.

By ash recovery and recycling during the production of pyrolysis oil positive environmental impacts can be achieved. The present investigations have shown that the ashes derived during the FPBO production process, seem to have positive effects on plant growth in small-scale experiments. Moreover, the physico-chemical properties from the aforementioned ashes seem to be similar to those from other type of ashes. Among the possible benefits could be their application as soil amendment in agriculture.

Furthermore, a sustainability risk analysis has been prepared for the pyrolysis oil production based on wood residues and its combustion in a small scale residential heating boiler. Various feedstocks, like wheat straw, bark and Miscanthus, have been

included in this analysis. In principle, all studied feedstocks can be applied in a sustainable manner for residential heating through FPBO. Some possible risks were identified that need to be monitored and taken care of when applying these feedstocks, for instance by sustainability certification:

- Carbon stock: Maintain soil carbon balances due to harvesting;
- Indirect change of land use: Cultivation should not replace food production;
- Biodiversity: Keep nutrients and soil quality when using biomass residues;
- Cascading use of biomass: Use (residual) biomass first for products (e.g. biomaterials) before their use as energy.

The full potential of pyrolysis oil from biomass residues for residential heating will be further explored in the Residue2Heat project. Within the project market studies are conducted related to this new fuel and its modified heating system, which will provide further knowledge for a successful market launch. The long-term goal of "Residue2Heat" is to produce FPBO on the basis of agricultural and forestry biomass residues, which neither can be used for food or feed production nor leads to indirect land use change (ILUC). The conceptual approach aims to obtain local biomass, convert it into FPBO in relatively small production facilities with a processing capacity from 20,000 to 40,000 tonnes of biomass per year and distribute the fuel locally to end-users.

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More information is available at:

www.residue2heat.eu

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About the Residue2Heat consortium

The EU research project “Residue2Heat” combines the development of production technologies for the production of renewable fuels with the development of heating systems for the residential heating market. The consortium is composed of three universities, three research institutes and three small and medium enterprises from five different countries.

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- OWI Oel-Waerme-Institut GmbH (technical coordinator, DE)
- BTG Biomass Technology Group B.V. (NL)
- VTT Technical Research Centre of Finland Ltd. (FI)
- MEKU Energie Systeme GmbH & Co. KG (DE)
- IM-CNR Istituto Motori, Consiglio Nazionale delle Ricerche (IT)
- PTM Politecnico di Milano (IT)
- BTG BioLiquids B.V. (NL)
- UIBK University of Innsbruck, Institute of Microbiology (AT)