

Pilot scale production of ethanol and biogas from waste fibre and fibre sludge

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To reach the EC Directives with ambitious targets for biofuels share in road transport, feasible processes for production of second generation ethanol are necessary. To provide one solution towards these goals, the FibreEtOH project was focused to demonstrate in a commercial scale a cost efficient paper fibre based ethanol production, using the production concept with high overall process integration and providing high overall energy efficiency and high green house gas reduction.

The concept of using waste fibre (Fibre-EtOH) was developed to tackle major challenges in the production of ethanol from lignocellulosics. Waste fibre fractionated from solid recovered fuel, and pulp and paper mill fibre sludge, provide all-year-round supply of biomass with high hexose content (44-56%) and acceptable ash content (13-14%). It was found to be suitable feedstock for ethanol production because of this and its easy hydrolysability without thermal or chemical pretreatment.

Fractionation of solid recovered fuel, continuous liquefaction, and simultaneous saccharification and fermentation as well as biogas production from the fermented residue were demonstrated in pilot-scale with promising results. High polysaccharide conversion could be obtained in high consistency liquefaction of the fibre feedstock in only 6-10 h although hydrolysis to monosaccharides was slightly slower. However, hydrolysis of waste fibre and fibre sludge released some recalcitrant mannan- and galactan-containing polysaccharides that would require additional helper enzymes to be further hydrolysed to monosaccharides. Continuous runs in pilot-scale were operated for several days with efficient ethanol production and without major problems from bacterial contamination. The residue of waste fibre and fibre sludge hydrolysis and fermentation was concentrated by evaporation and utilized as biogas with high yields. The results presented in the talk demonstrate the feasibility of the FibreEtOH concept as a potential 2nd generation bioethanol process.

This project has been financed by the 7th Framework Program of the European Commission under grant agreement TREN/FP7EN/239341.

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