Life-cycle assessment of a waste refinery process for enzymatic treatment of municipal solid waste - DTU Orbit (22/02/2019)

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Decrease of fossil fuel dependence and resource saving has become increasingly important in recent years. From this perspective, higher recycling rates for valuable materials (e.g. metals) as well as energy recovery from waste streams could play a significant role substituting for virgin material production and saving fossil resources. This is especially important with respect to residual waste (i.e. the remains after source-separation and separate collection) which in Denmark is typically incinerated. In this paper, a life-cycle assessment and energy balance of a pilot-scale waste refinery for the enzymatic treatment of municipal solid waste (MSW) is presented. The refinery produced a liquid (liquefied organic materials and paper) and a solid fraction (non-degradable materials) from the initial waste. A number of scenarios for the energy utilization of the two outputs were assessed. Co-combustion in existing power plants and utilization of the liquid fraction for biogas production were concluded to be the most favourable options with respect to their environmental impacts (particularly global warming) and energy performance. The optimization of the energy and environmental performance of the waste refinery was mainly associated with the opportunity to decrease energy and enzyme consumption.

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