

Title:	Process design and techno-economic evaluation of a bio-refinery using lignocellulosic biomass feedstock
Abstract:	A process study using Aspen Plus is conducted on a conceptual integrated biogas and hydrothermal liquefaction plant. The study provides, as its aim, an estimate of the feasibility of such a process. The study presents simulation and economic analyses of a process using animal manure slurry as feedstock, which is treated with a lignocellulose substrate in a co-digestion process. The digestate from the biogas plant is then converted to bio-crude (bio-oil) in a hydrothermal liquefaction process. The bio-crude from this step is upgraded in a separate reactor unit, allowing for hydrodeoxygenation and hydrodecarbonylation for the production of fuel-specification biodiesel. The biorefinery concept also makes use of a membrane step, in the treatment of biogas purged from the biogas plant, in order to recover methane, which is employed in methane steam reforming to produce hydrogen. Hydrogen from this step is used in the upgrading reactor, which yields the refinery's biofuel. The concept offers an integrated and sustainable way of converting organic residuals into a high-value fuel, apart from heat and power generation. Process and economic indicators are presented and discussed in the study.
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Start date:	2013
End date:	2017
Feedstock:	Animal manure (slurry) + lignocellulose substrate additives
Value chain products:	Biogas (methane, hydrogen); carbon monoxide, carbon dioxide, water; bio-crude (oil); phenol, hexadecanoic acid, bio-diesel (benzene, cyclo-hexanone, cyclo-hexane, hexadecane, penta-decane)
Geographic source of the feedstock:	North-West, Gauteng, Free State