

# Methane and Nutrient Salts from Waste Biomass: Development of a Catalytic Conversion Process in Supercritical Water



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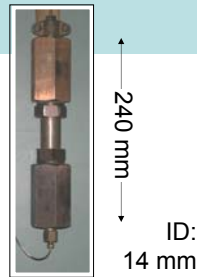
## Vision

Synthetic natural gas (SNG) can potentially be produced from biomass (liquid manure, wood) by a hydrothermal process. The hydrothermal route carries two major advantages over conventional gasification:

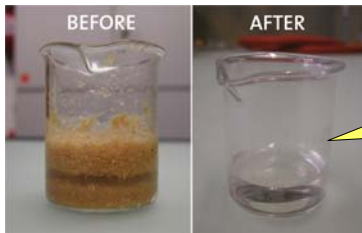
1. Drying is unnecessary.
2. Nutrient salts are recovered.

## Experimental

- Solids content  $\leq 30\%$ .
- Batch reactor, Raney nickel catalyst.
- 400°C, 300 bar. Supercritical.

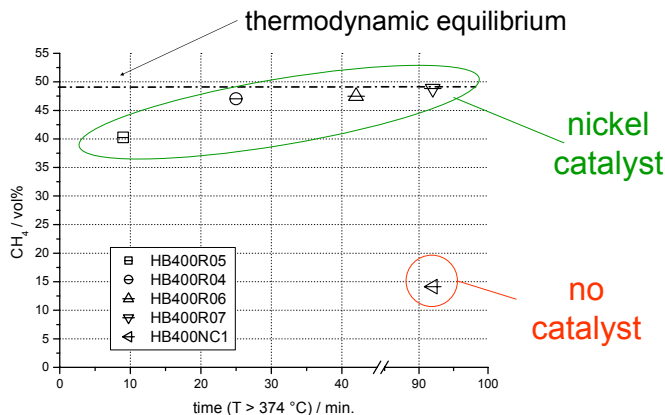


## Results



Complete conversion to gases and water

Gas composition achieved:



## Ongoing Work

- Salt separation studies in supercritical water.

*In-situ* visualization using neutron radiography.

Finite-element modeling of fluid flow and heat transfer.



- Realization of continuous process.

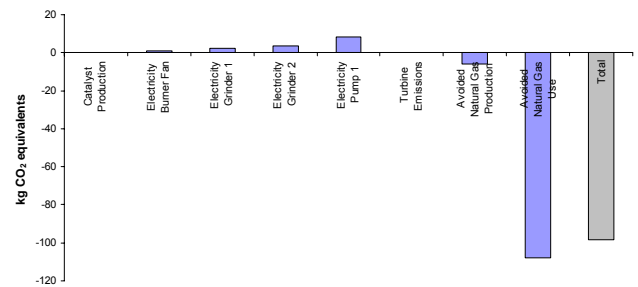
Gasification of liquid model systems with same C-H-O composition in biomass in continuous test rig.

Salt separation in continuous fashion, preliminary design.

Pumping of real biomass slurry, up to 20% solids, ground to  $x_D \leq 100$  microns.

- Environmental systems analysis.

Global Warming Potential per 1000 kg Biomass  
Example of preliminary results for manure feed.



Chemical process simulation (ASPEN+) and life-cycle assessment will be used to optimize the environmental performance of the process in a systems perspective.