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Supercritical Gasification of Wet Biomass

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Introduction:

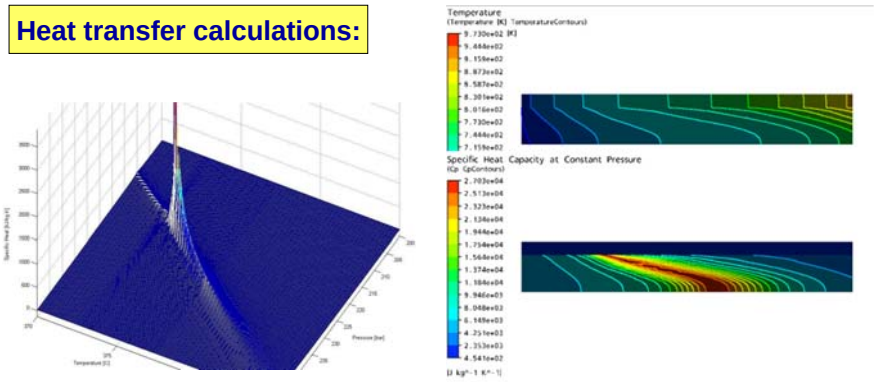
In 2040 the sustainable energy consumption in the Netherlands should be 600-1000PJ, that is about 30% of the total present energy consumption. This can be partly realized by co-firing in the present coal fired power plants and by co-refining of biomass in the existing oil refineries. However, wet biomass with more than 70% moisture content is not suitable for such processes and other conversion processes have to be developed. Gasification in supercritical water offers the opportunity to convert wet biomass in a hydrogen rich gas that can be used for a wide range of applications.

Current situation:

The research done on biomass gasification in supercritical water so far mainly focused on the composition of the product gasses and the conversion as a function of the process conditions ("proof of principle" and "operation window") .

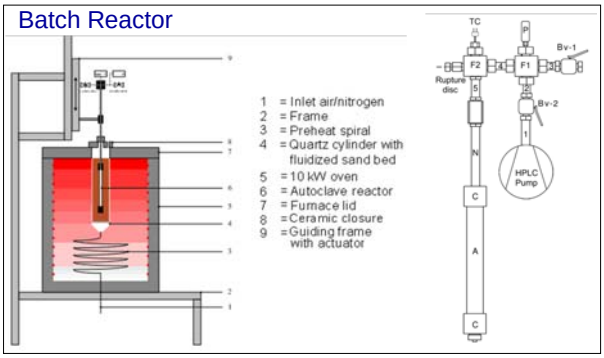
A better understanding of the fundamental phenomena playing a role in biomass gasification in supercritical water is essential for an adequate reactor- or process design.

Heat transfer calculations:

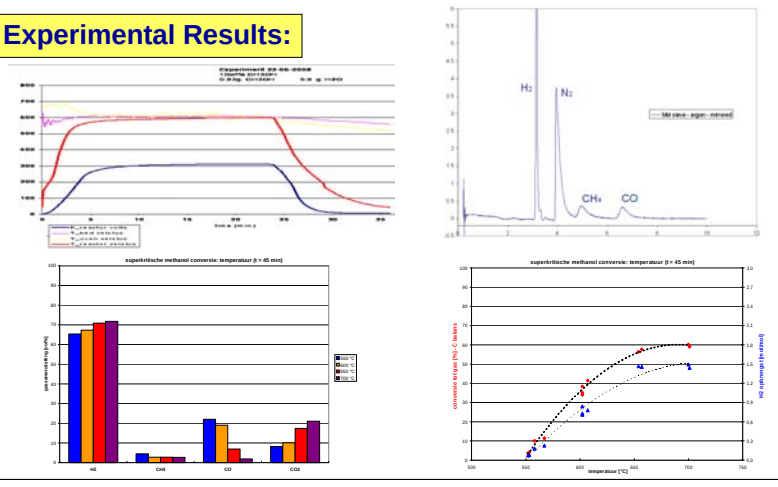


Experimental Approach:

Batch Reactor



Experimental Results:



Research Topic:

This research will focus on the development of a new type of reactor for the thermal conversion of biomass in supercritical water. For this purpose a new bench-scale batch reactor on a balance will be built and tested. In this project the following subjects will be investigated:

- **Diverse reactor concepts**
- **Integrated Heat Transfer**
- **Integrated CO2 capture**

Furthermore a detailed process model will be developed

Objectives:

On base of the results of this project new design rules for the thermal conversion of biomass in supercritical water will be developed to obtain higher throughputs, higher gasification efficiencies and a high quality gas.