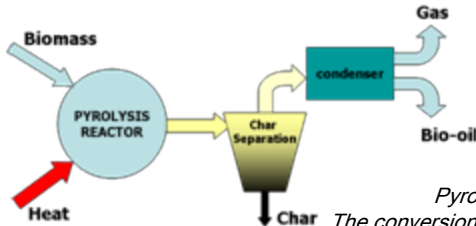


A new technology for fast pyrolysis of biomass: -development of the PyRos reactor-

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Introduction



Pyrolysis:
The conversion to condensable liquids, gases and char by heating the material in an oxygen free environment.

The hot vapours are quenched with cooled bio-oil and separated in a second RPS used as demister for small droplets and aerosols. The remaining gases and char can be used to heat up the heat carrier and transportation gas.

Features of the PyRos reactor are:

- high heat transfer rates
- short gas residence time
- controllable particle residence times
- particle free vapour production
- integration of reactor and particle filter
- compact/low cost reactor

Flash pyrolysis is a process with the aim of high oil yields, up to 75 % of liquids. This process can be characterized by:

- high heating rates of the particles (< 2 sec)
- temperature between 450 and 600 °C
- short gas residence time at high temperatures (< 1sec)

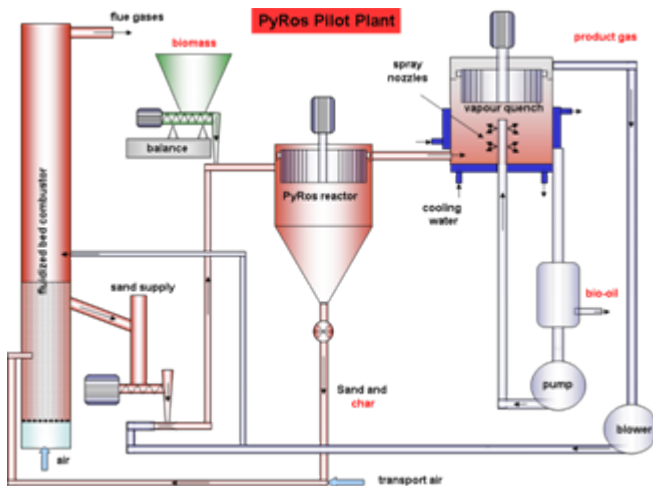
The produced bio-oil from the process - with a five time higher energy density compared to the biomass - can be easily stored and transported. So the production and use of the bio-oil can easily decoupled in time and place.

The major problem of present reactors for flash pyrolysis are the carry-over of char, causing the following problems:

- solids in the oil
- increase of the viscosity over time by catalytic action of char
- alkali concentrated in the char dissolves in the oil (pH = 2 -3)



The PyRos process



In the PyRos-process (patented by TNO NL99/00688) the pyrolysis is implemented in a cyclonic reactor with an integrated hot gas filter (the rotational particle separator, RPS, US-patent US5073177). In this way a particle free bio-oil can be produced. The biomass and the inert heat carrier are introduced as particles in the cyclone, the solids are transported by recycled vapours from the process.

By centrifugal force the particles are moved to the periphery of the cyclone where the pyrolysis process takes place. Evolved vapours are transported rapidly to the centre of the cyclone and leave the cyclone by the rotating filter.

Experimental

- Mathematical modeling to scale up the process
- 30 kg/hr Pilot plant a fully integrated pilot plant with char/gas combustion, inert heat-up and liquid collection.
- Kinetic measurements on a novel TGA at flash pyrolysis conditions

