

# “Novel Cyclonic Thermo-gravimetric Reactor” for Flash Pyrolysis of Biomass

## Master Assignment

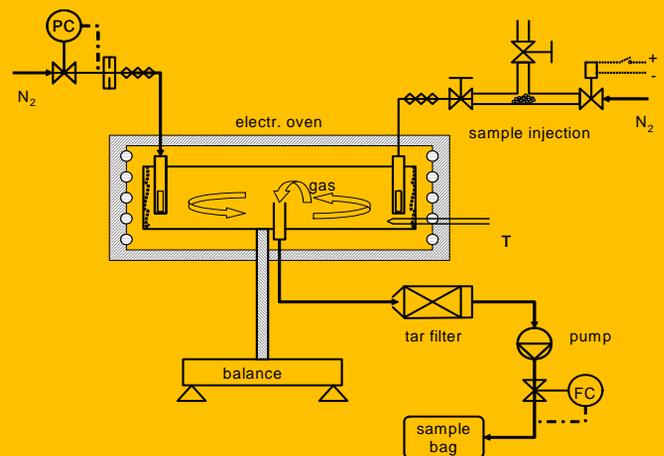
Pyrolysis-oil is a potential alternative to conventional energy resources and can be produced via pyrolysis of biomass. Pyrolysis is a thermal conversion process, in which biomass is rapidly heated to 450 - 500 degree Celsius in absence of an oxidizing agent. Biomass is converted into liquid oil, combustible gases and charcoal. To develop an optimal design of the reactor for flash pyrolysis, detailed information on the reaction kinetics, heat & mass transfer, hydrodynamics and product distribution are required. At the Laboratory of Thermal Engineering, a novel technology is being developed to analyze the fast pyrolysis process with respect to kinetics and product distribution. This technology is based on a new cyclonic thermo-gravimetric analyzer (TGA).

The reactor is the upper, cylindrical part of a regular cyclone that is placed on a balance for online measurement of the conversion rate. From these data both the kinetic constants of decomposition of the biomass solids and the product distribution of the pyrolysis process can be determined. Because of the enhanced heat transfer in the cyclonic reactor, this method is very suitable to provide the high heating rates required to optimize the liquid yield of fast pyrolysis process.

During this master assignment, the novel TGA technique will be further developed and optimized. The reaction kinetics will be studied at varying process conditions e.g. reaction temperature, biomass particle size etc. The effect of process conditions on pyrolysis products will be investigated. By looking at product distribution of bio-oil, char and combustible gas, biomass of different types will be screened.

### Candidate:

A potential candidate could be from chemical/mechanical engineering or any other relevant background.



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