

A CFD study of biomass fast pyrolysis in a pilot-scale auger reactor- Salman Jalalifar- Australian Maritime College - University of Tasmania

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This paper presents a CFD study of a fast pyrolysis process in a pilot-scale auger reactor. By providing a detailed CFD simulation of this reactor, we are capable to obtain a clearer insight into the complex physical phenomena associated with multi-phase flow dynamics, heat transfer and chemical kinetics. The three main products of the process are solid bio-char, condensable vapours and non-condensable gases. Therefore, a multi-fluid model coupled with a chemical solver is a suitable approach for the simulations. The feedstock is a lignocellulosic biomass which composed of cellulose, hemicellulose and lignin. The biomass decomposition is simplified to ten reaction mechanisms. Three different phases that are taken into account are condensable/non-condensable phase or the gas phase as the primary phase, solid reacting phase or biomass phase as a secondary phase and non-reacting solid phase (steel shots) or heat carrier as the other secondary phase. Each phase composed of different species. The results for the product yield shows a good agreement between the CFD results and the experimental data previously received for the simulated reactor. The outcome of this study provides a validated CFD model for industry and researchers that may apply to optimize the operating conditions of the auger reactors in future.

Recent Publications:

1. Jalalifar S, Abbassi R, Garaniya V, Hawboldt K A and Ghiji M M (2018) Parametric analysis of pyrolysis process on the product yields in a bubbling fluidized bed reactor. *J of Fuel* 234:616-625.
2. Papari S, Hawboldt K A and Helleur R (2017) Production and Characterization of Pyrolysis Oil from Sawmill Residues in an Auger Reactor. *Ind. Eng. Chem.* 56(8):1920-1925.
3. Papari S and Hawboldt K A (2017) Development and Validation of a Process Model To Describe Pyrolysis of Forestry Residues in an Auger Reactor. *Energy Fuels* 31(10):10833-10841.
4. Aramideh S, Xiong Q, Kong S C and Brown R C (2015) Numerical simulation of biomass fast pyrolysis in an auger reactor. *J of Fuel* 156:234-242.
5. Jalalifar S, Ghiji M M, Abbassi R, Garaniya V and Hawboldt K A (2017) Numerical modelling of a fast pyrolysis process in a bubbling fluidized bed reactor. *IOP Conference Series: Earth and Environmental Science* 73:012032.