CFD MODELING AND SIMULATION OF A HYDROTREATMENT REACTOR COUNTERCURRENT USING JATROPHA CURCAS L. VEGETABLE OIL

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Introduction. Currently, the demand for energy is increasing worldwide, especially in Mexico, and it is expected that in the coming years it will increase due to population growth and developments in society. The main source of energy generation to meet current needs is fossil fuels, this gives rise to the emission of CO_2, leading to environmental problems such as; climate change and global warming. Therefore, it is important to offset the environmental impact and generate alternative fuel sources to meet demand.

To overcome the deterioration of the biomass oil properties by pyrolysis, an improvement process is required before its application. Currently, there are several techniques available to convert bio-oils into fuels; Catalytic hydrodeoxygenation, zeolite upgrading, catalytic cracking [6], supercritical technology and emulsification.

Bridgwater presented a review on biomass fast pyrolysis and suggested that biorefineries have the best possible scope for biofuel improvement. Recently, Yaseen experimentally studied the HDO of fast pyrolysis bio-oils from various feedstocks using carbon as catalyst support.

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Gallakota carried out CFD simulations on the effect of catalysts (Pt/Al_2O_3, $Ni–Mo/Al_2O_3$, $Co–Mo/Al_2O_3$) in the hydrodeoxygenation of bio-oils, Guardo's work focused on CFD modeling of external mass transfer and intra-particle diffusion effects on supercritical hydrogenation of sunflower oil, Mendoza's work was on CFD analysis on the heat coefficient during palm oil hydrotreating.

Muharam also worked on the phenomenological model for the prediction of the performance of a sludge bubble column reactor for the production of green diesel.

Subramanyan focused on CFD Simulations of Catalytic Hydrodeoxygenation of bio-oil using Pt/Al2O3 in a fixed-bed reactor [Subramanyan, 2015].

This work has the following objective:

1. Find the mathematical model of hydrodynamics and mass transport in the countercurrent hydrotreating reactor using Fluent 16 to validate with the experimental data.
2. Simulate with Fluent the kinetics of a reaction and the mass transfer in the reactor.

Metodología. The dynamic reactor trickle-bed *reactor* (TBR) for the hydrotreatment process, using a commercial CoMo/γ-Al2O3 catalyst, Jatropha Curcas L vegetable oil was used as raw material, shown in figure 1.

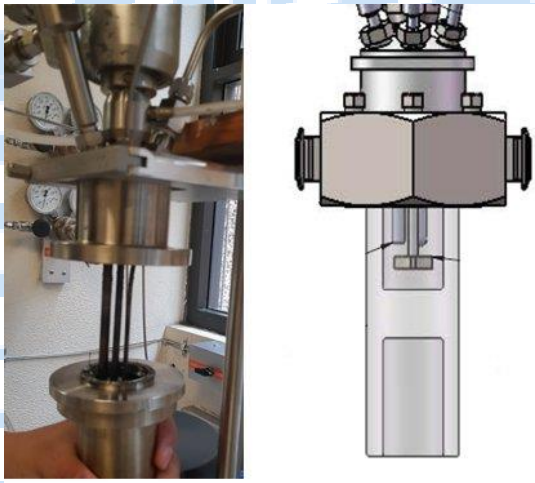

Fig. 1. TBR reactor in countercurrent that was studied.

The dimensions and operating conditions of the reactor are shown in table 1.