

## Software Tool Design for Heavy Oil Upgrading by Hydrogen Donor Addition in a Hydrodynamic Cavitation Process

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**Abstract :** The hydrodynamic cavitation is a process in which the energy that the fluids have in the phase changes is used. From this energy, local temperatures greater than 5000 °C are obtained where thermal cracking of the fluid molecules takes place. The process applied to heavy oil affects variables such as viscosity, density, and composition, which constitutes an important improvement in the quality of crude oil. In this study, the need to design a software through mathematical integration models of mixing, cavitation, kinetics, and reactor, allows modeling changes in density, viscosity, and composition of a heavy oil crude, when the fluid passes through a hydrodynamic cavitation reactor. In order to evaluate the viability of this technique in the industry, a heavy oil of 18° API gravity, was simulated using naphtha as a hydrogen donor at concentrations of 1, 2 and 5% vol, where the simulation results showed an API gravity increase to 0.77, 1.21 and 1.93° respectively and a reduction viscosity by 9.9, 12.9 and 15.8%. The obtained results allow to have a favorable panorama on this technological development, an appropriate visualization on the generation of innovative knowledge of this technique and the technical-economic opportunity that benefits the development of the hydrocarbon sector related to heavy crude oil that includes the largest world oil production.

**Keywords :** hydrodynamic cavitation, thermal cracking, hydrogen donor, heavy oil upgrading, simulator

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