S1.2.2 - *Numerical Simulations of the Removal of Water from Diesel Fuel using Hydrophobic Separator Meshes*

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The new constraints for reducing hazardous emissions and sustainable fuel production led to an increased usage of ultra-low-sulfur diesel (ULSD) and bio-diesel. Such fuels have a significantly lower surface tension coefficient with water in comparison to classical Diesel. Water contamination exists in fuel due to transportation, leakage, or storage. The principle of the Water-Diesel separation process is collecting water droplets at the outer surface of the separator. After a sequence of successive coalescence, water droplets get larger in size. Either large droplets fall down by means of gravity field or they are pushed through the separator by a significant increase in the overall pressure drop. The flow regime on the microscale is controlled by a different set of parameters: geometry of the mesh screen, contact angle, droplets radii, and the inflow velocity. Consequently, the design of meshes for water-diesel separation is a challenging task. Mathematical modeling and simulation can assist the design process and give further insight into the separation mechanisms. The present work is devoted to the modeling and simulation of the interaction between the water droplets and the separator. We simulate partial clogging of a sample of wire mesh screen by single or multiple water droplets. The simulations take into account the gravity force. We quantify the drag coefficient of the deformed water

droplet and the overall pressure drop. We also quantify the maximum pressure drop at which the droplets rupture from the screen. The simulations are carried out using the finite volume computational fluid dynamics library OpenFOAM®. The results help to develop a simplified description of the dynamics of water droplets interacting with a mesh screen.

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