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S2.3.2 - *Effect of Mesh Pore Size on the Electrowet Coalescer Performance*

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Electrowetting is a phenomenon that is observed when a liquid drop changes its contact angle on an electrode surface due to an externally applied electric field. It has been observed in previous research that electrowetting can be used to enhance the coalescence of water drops in immiscible oils such as diesel fuel. Dispersed water drops in diesel fuel can cause undesirable emulsions, acting as a contaminant and can diminish lifetime and performance of diesel engines. Therefore, separating dispersed water from diesel fuel is crucial and is of high importance, hence this became the motivation behind this research. Prior works proved the electrowetting phenomena can the separation performance of filters, gravity settlers, etc. by pre-coalescing the drops. The proof of concept of the wire mesh electrowet coalescer (EWC) was conducted and showed the EWC could enlarge drops from 30 micron to about 2 mm and required minimal energy to perform. The prior works showed the EWC performance is influenced by the mesh size, gap distance, dielectric coatings on the wire mesh, the flow rate, and the applied voltage.This work focuses on optimizing the design of the

EWC. In a recent microscope study of drop coalescence in wire mesh, mesh size had an effect on coalesced drop size. The working hypothesis is the inlet mesh should have smaller pores than the outlet mesh. Smaller pores of the inlet mesh will be better for attracting the drops to be captured and coalesced. The pores of the outlet mesh should be larger to allow coalesced drops exit the mesh without breaking. But if the inlet mesh pores are too small the local fluid velocity becomes too large and will tend to strip drops away. If the outlet mesh pores are too large then the electric field will not be well distributed, and the coalescence will not be effective. Hence there should be optimum mesh sizes for the inlet and outlet mesh. This project will investigate the effects of mesh size by testing a range of mesh with varying pore sizes. Experiments will be conducted while varying the applied potential and flow rates to optimize the performance for each mesh combination.

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Mohamad is currently a 2nd-year Chemical Engineering Ph.D. student at the University of Akron. He holds a BSc degree in Chemical Engineering from the American University of Sharjah, UAE. Mohammad is interested in diesel fuel filtration and exploring the effect of electrowetting on liquid-liquid filtration.

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