

Study of oil/water emulsions in horizontal production pipes

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The ability to predict performance of two-phase oil/water flow in pipes is essential for production operations from oil wells. Emulsions created between the flowing oil and water phases under turbulent conditions complicate the flow pattern and need to be further understood and characterized. Even when de-emulsifiers are used, turbulent emulsified flow cannot be avoided in certain sections of the pipe.

The objective of this study is to enhance the ability to predict flow in production pipes for Qatar oil producing wells on the basis of a comprehensive experimental and simulation study. For the simulation study, using the actual field data, a model was built with LedaFlow© software, which can simulate the flow of oil and water in horizontal pipes. In parallel, experimental setups (batch and flowing) were built in our laboratory to study various parameters affecting emulsification using actual oil and water samples from Qatar. This intends to better understand and characterize the oil and water properties, factors affecting emulsion formation and flow conditions that govern the emulsification. This work is funded by an 11th cycle Undergraduate Research Experience Program (UREP) project [UREP 11-128-2-045] as a collaboration between Texas A&M University at Qatar (TAMU-Q) and Total Research Center-Qatar (TRC-Q).

The results of the experimental work are very valuable in characterizing the conditions under which emulsions are formed, the types of emulsions created and the factors affecting it specifically for oil and water samples from Qatar wells. The work will continue in the future, to incorporate these experimental results in the simulation model and better match the field production data. The collaboration between TAMU-Q and TRC-Q was very beneficial in bringing in expertise from both institutions where academic research and industry experience and resources were combined to the benefit of the students, the researchers as well as the local industry.