In-situ droplet size measurements of water-in-crude oil emulsions in pipelines by focused beam reflectance method (FBRM)

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The focused beam reflectance method (FBRM) is a relatively new method. It was developed to perform particle/droplet size measurements for suspensions and emulsions in the range 0.25–1000 μm. The advantage of the FBRM method is the ability to carry out in-situ particle/droplet size measurements in real time, without the need for manual sampling or dilution. The particle/droplet size determined is given in terms of a chord length. The chord length is a straight line between any two points on the edge of particle/droplet (or particle agglomerate/droplet flocculate) [1].

Water-in-oil emulsions (w/o) are frequently encountered in the petroleum industry, form spontaneously during the crude oil production. They can also form during refining, storage and distribution processes. In these cases, the water content can attain high values and the emulsions can be stabilized by the presence of natural interfacial active substances (asphaltenes, resins) in crude oil [2].

In petroleum industry, good estimations of droplet size and droplet size distribution of water-in-crude oil emulsions are important for accurate characterization of crude oil emulsions. In this study, droplet sizes of water-in-crude oil emulsions were in-situ investigated using the focused beam reflectance method (FBRM) in a pipeline for laminar flow regimes at different aqueous phase volume fractions, flow rates and obtained results were discussed in detail.