Study on the Effect of Ultrasonic Wave Amplitude on De-emulsification of Crude Oil to Enhance Production Process

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Introduction

- Performance of Ultrasonic Wave Application De-emulsification method in separating water in crude oil (W/O) emulsion and optimum parameter should be determined.
- Some of the offshore oil fields in the South China Sea are facing emulsion problem, which disrupts the production and involve costly remedial efforts.
- These crude oil has basic sediment and water (BS&W) between 2 to 11%.

Objectives

- To determine the optimum parameter for ultrasonic wave application for de-emulsification of stubborn W/O emulsion.
- To study the separation rate of crude oil emulsion.

Methodology

Identifying problem → Design Of Experiment (Design Expert Software) → Emulsification (High Speed Stirrer) → Ultrasonic Wave Deemulsification → Bottle Test - KF Titration - CPM → Response Surface Method Optimization

Results and Discussion

De-emulsification at Optimum Condition

Rag Layer Characteristics

Trend of De-emulsification

- High Temperature increased separation process by reducing the crude oil viscosity.
- Threshold of Amplitude provide the optimum cavitation effect.
- Cavitation caused formation of bubbles. Bursting of bubble induced shock wave and create a new interface formation.
- Optimum Temp. & Amp. enhance flocculation and coalescence process.

Rag Layer Water Droplet size

Conclusions

1. Optimum Parameter: 60°C at 40% Amp.
2. Crude oil and water Layers strongly affected by the change of amplitude.
3. Water content in Oil Layer after 8 hours of bottle test is 4.016%