Effect of Corrosion Inhibitors on Oil in Water Demulsification in Topside Separators

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Publication date:
2017

EFFECT OF CORROSION INHIBITORS ON OIL IN WATER DEMULSIFICATION IN TOPSIDE SEPARATORS

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Introduction

Corrosion inhibitors used in the Oil & Gas production end up in some extent in the topside separators, where they can result in stabilization of oil in water emulsion. The aim of the project is to study experimentally the separation kinetics of oil in water separation using different oil and brines, and how these interacts with corrosion inhibitors and demulsifiers.

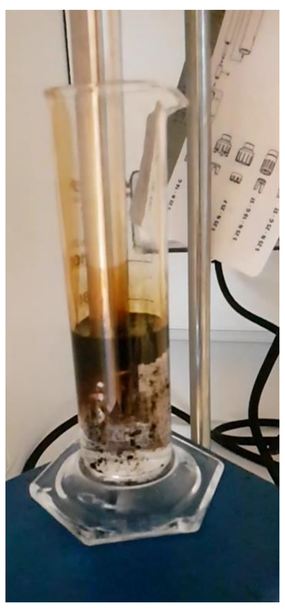
Objectives

- Evaluate the effect of offshore O&G corrosion inhibitors on the oil-in-water separation.
- Evaluate if and to what extent increased concentrations of corrosion inhibitors in topside separators can be tolerated.
- Evaluate how the above-mentioned points are influenced by the type of crude oil, the type of brine and the demulsifiers used in topside separators.

Materials and method

1. Water with different ionic composition, see table 1.
2. Oil in water dispersion (IKA Ultra Turrax @ 10000 RPM)
3. Gravimetric separation with a settling time span of 5 minutes using 100 mL separation funnels under ambient temperature and 50°C.
4. Extraction with n-hexane by an OSPAR inspired method.
5. Quantification by GC-FID. External standard calibration with the same oil used for the experiments.

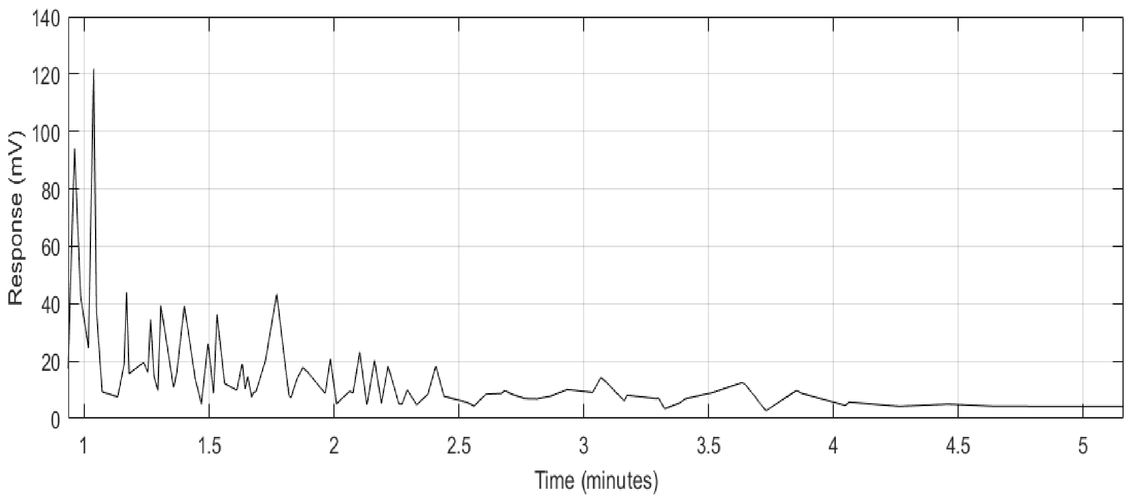
Oil/water ratio 0.2



Dispersion

Settling

Extraction



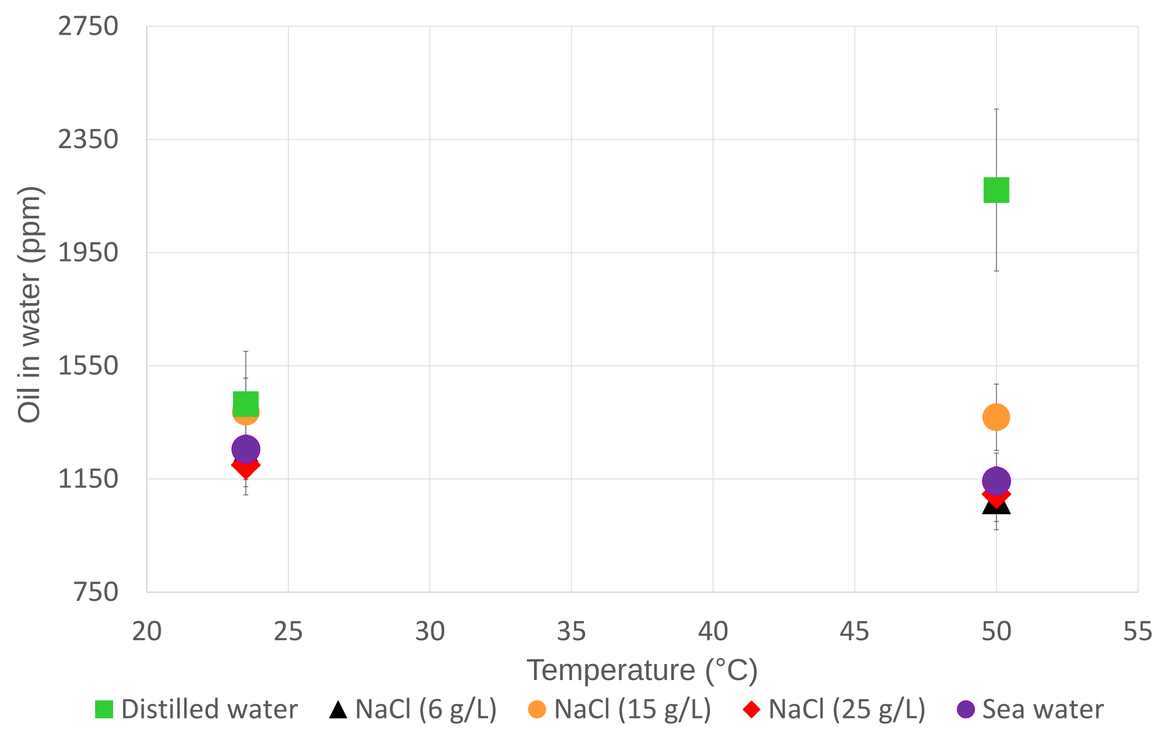
Example of GC-FID analysis of an oil sample.

Preliminary results and discussion

Preliminary results have been produced using five types of aqueous phases (distilled water, NaCl (6 g/L), NaCl (15 g/L), NaCl (25 g/L) and sea water) and one type of stock tank oil (Frederiksen A/S Crude Oil), at two different temperatures with five minutes of settling time.

Table 1: Types of aqueous phases prepared for the preliminary experiments

Water type	Concentration (g/L)	Ionic strength (M)
Distilled water	-	0
NaCl	6	0.1
NaCl	15	0.3
NaCl	25	0.4
Sea water	35	0.8

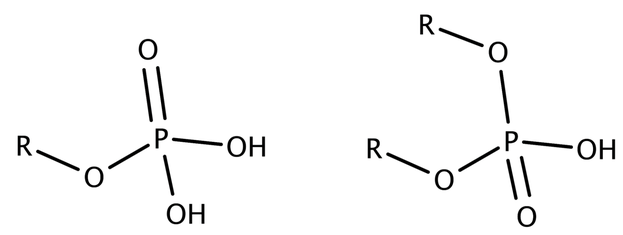


oil-in-water concentration vs. gravity settling temperature for 5 minutes of settling time. Data refer to five different types of aqueous phases. Each marker refer to the average of at least four repetitions.

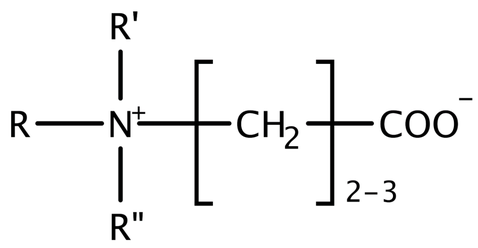
- The rate of separation decreases with temperature with distilled water. The opposite occurs in the presence of electrolytes.
- The variation with temperature of the rate of separation is more significant for distilled water.

Future work

- Two different film forming corrosion inhibitors (FFCI) will be investigated.
- One demulsiifier will be used in combination with the corrosion inhibitors.
- The effect of these, and different types of aqueous phases, will be studied for various settling times.



Structures of typical phosphate ester FFCI's



Zwitterionic betaine FFCI

Acknowledgements

The project is financially supported by the Danish Hydrocarbon Research and Technology Centre.

Center for Olie og Gas - DTU
The Danish Hydrocarbon Research and Technology Centre