

## Effect of Pour Point Depressants on Crude Oil from Western Onshore Field.

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### ABSTRACT

When crude oil is extracted out of a subterranean reservoir at high temperature and pressure, it is usually transported via a pipeline, where the crude oil experiences radical changes in its physical and chemical properties, instigating numerous complications. The pour point and the rheological properties of the crude oil can be improved by adding requisite amount of a pour point depressant. This study shows the influence of pour point depressants on the pour point of that crude oil sample from Western Onshore Field.

**Keywords:** Crude oil, Deposition, Pour Point, Pour point depressants, Transportation.

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### I. INTRODUCTION

Crude oil is a naturally occurring mixture of hydrocarbons, sulphur, nitrogen and metals (Yasin, et al., 2013). Crude oils are complex mixture of Paraffinic, Napthenic and Aromatic compounds (Wang et al., 1994). Crude oils contain all normal alkanes from C<sub>1</sub> to C<sub>120</sub> (Khanorkaret al., 1996). Waxy crude oils are difficult to handle at temperatures below the pour-point. Wax deposition is a crucial problem which should be resolved at the earliest to avoid flow assurance issues during transportation of crude oil through pipeline. Wax deposition in pipeline may lead to increased pressure, decreased flow rate or even to the total blockage of the pipeline. Factors affecting wax deposition in pipelines are flow conditions and thermal history of crude oil. Thus, it is necessary to solve this issue on priority. Pour point depressants are one of effective solutions to mitigate wax deposition issue. They are polymeric compounds which decrease the pour point of crude oil and assure easy transportation of crude oil at lower temperatures.



Figure – 1: Wax deposition in pipe line

### 1. Study of the effect of pour point depressants on the crude oil

#### 1.1 Material

The crude oil sample was collected from Western Onshore Field. The PPDs were obtained from different vendors. Toluene used is of laboratory grade.

#### 1.2 Characterisation of the crude oil sample

The parameters of crude oil were determined using standard procedure.

#### 1.3 Pour point test with PPD solutions

50 ml crude oil sample was taken in a beaker and heated to 60°C. At this temperature, PPD solution of desired concentration was added into the sample and continuously stirred for 5mins at 60°C. The solution is then taken in pour point tube and allowed to cool to 45°C. Once the temperature is achieved, tube is kept in pour point apparatus and the crude oil is checked at every 3°C drop in temperature for flowability of crude oil. The temperature at which crude oil ceases to flow is recorded. The pour point is 3°C higher than the temperature at which the crude oil ceases to flow.

### II. RESULTS AND DISCUSSION

The crude oil parameters are given in Table – 1.

Table – 1: Parameters of crude oil

Parameter	Result
Water content (%v/v)	Traces
Density (g/cc at 15 °C)	0.8321

Specific gravity (15 °C)	0.8325
API gravity	38.42
Pour point (°C)	33
Asphaltene content (% w/w)	0.54
Wax content (%w/w)	28.3

The effects of the different pour point depressants ( $\alpha$ ,  $\beta$  and  $\gamma$ ) on the pour point of crude oil sample were studied. PPD  $\alpha$  gave the best results, because its addition in the sample showed significant reduction in pour point. PPD  $\beta$  and PPD  $\gamma$  did not give an expected result. Table – 2 shows the changes in the pour point of crude oil by different PPDs.

Table – 2: Effect of PPDs on Pour point of Crude oil

Additive Code	Concentration of PPD (ppm)	Pour point of blank oil (°C)	Pour point of treated (°C)	Depression $\Delta T$ (°C)
$\alpha$	100	21	18	3
	200	21	15	6
	300	21	06	15
$\beta$	100	21	18	3
	200	21	24	-3
	300	21	24	-3
$\gamma$	100	21	30	-9
	200	21	36	-15
	300	21	30	-9

By these results it comes out that, the selection of the appropriate pour point depressant when looking for a chemical remedial method to reduce the pour point is an important phase and for that, laboratory experiment are a most.

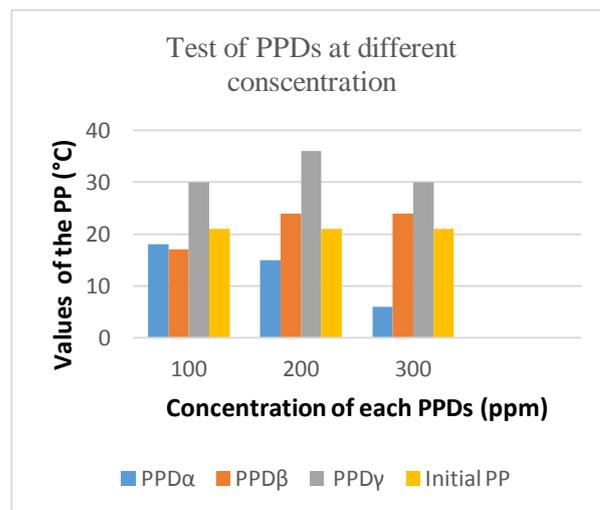


Figure – 2: Comparison of the changes caused by the PPDs at different concentration

### III. CONCLUSION

- The crude oil is collected from Western Onshore field.
- The density, specific gravity and API of crude oil was 0.8371g/ml, 0.8378 and 37.38° respectively which shows that this is light crude oil. The pour point of crude oil was 21°C.
- Out of three PPDs evaluated at different doses only PPD  $\alpha$  reduces the pour point of the crude sample from 21°C to 6°C at a dose of 300ppm; which is a good result since PPD is intended to reduce the pour point of crude oil or its derivative as low as possible to ease their transportation and storage. Other two PPDs, PPD  $\beta$  and PPD $\gamma$  did not show significant decrease in pour point of crude oil.

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