

Denne rapport
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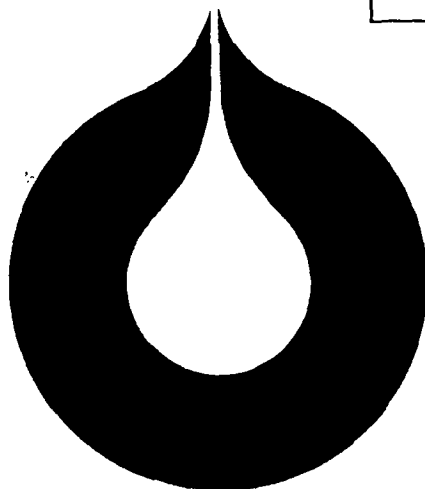
 **STATOIL**

L&U DOK. SENTER

L. NR. 12483220103

KODE Well 31/2-2 nr 45

Returneres etter bruk



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TRUE BOILING POINT DISTILLATION (TBP)

OF SAMPLE 31/2-2

Leif I. Rossemyr

STATOIL

EXPLORATION & PRODUCTION
LABORATORY

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| UND — ARKIVET |
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Den norske stats oljeselskap a.s



Classification

Requested by

A/S Norske Shell
Exploration and Production

Subtitle

True boiling point distillation of a crude oil sample from well 31/2-2.

Co-workers

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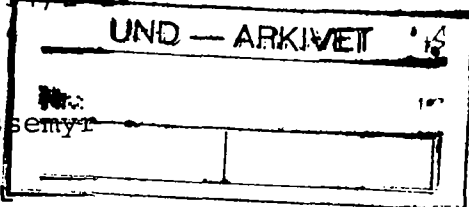
Title

TRUE BOILING POINT DISTILLATION (TBP)

OF SAMPLE 31/2-2

Leif I. Rossemyr

STATOIL
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LAB 81.20

Prepared

2/3-81

Approved

2/3-81

INTRODUCTION:

Statoil Production Laboratory (PRO-LAB) was asked to do a TBP-distillation of crude oil from well 31/2-2. The TBP-distillation includes a composition-analysis and chemical characterization of both the crude oil and the several fractions.

METHODS:

TBP-distillation is done according to method ASTM D-2892, and the fractions are collected according to the boiling point ranges of the various hydrocarbon groups. From IBP to 196°C the sample is fractionated at atmospheric pressure, and the heavier fractions are separated at reduced pressure (10 mmHg).

Density and molecular weight of each cut and of the crude oil were measured by a density measuring cell and by freezing point depression respectively.

The water content in the crude oil is determined by the method of Karl Fischer.

Salt content: Method ASTM D-3230.

The composition of the light-end fractions of the crude is determined by glass capillary gas chromatography.

RESULTS:

Crude oil analysis:

| | | |
|------------------|---|-------------|
| Density at 15°C | : | 0.9037 g/ml |
| Molecular weight | : | 269 |
| Water content | : | 0.86 % w/w |
| Salt content | : | 12.5 ± ppm |

Table 1. gives the composition of the whole crude oil from the TBP-distillation.

Fig. 1. gives the TBP-curve and calculated density of distillates at various cut-temperatures.

Table 2. gives the composition of the sample boiling below 36°C.

DISCUSSION:

This sample contains no gas.

Table 1. shows that only a few of the molecular weights of the cuts are measured. For later calculations the molecular weights of Katz and Firoozibadi (1) are used. It was not possible to measure a reasonable molecular weight of the C₂₁⁺-fraction, and this was calculated by using the molecular weight of the C₁₀⁺-fraction.

A survey of calculated and measured molecular weights and densities for cross-checking of the results is given in Table 3.

CONCLUSION:

We see that there is, within experimental limits of error, good agreements between calculated and measured molecular weights and densities.

REFERENCE:

- (1) Katz and Firoozibadi:
Journal of Petr. Techn; vol XXX, nov. 1978, p. 1650

Table 1:

Collected fractions and their densities and molecular weights.

| Hydrocarbon group | Boiling range (°C) | % by weight of charge | % by weight distilled | Density at 15°C/g/ml) | % by volume of charge | Mol. weight |
|---|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------|
| GAS | < 36 | 0.095 | 0.095 | 0.6447 | 0.134 | 73 |
| C ₆ | 36-69 | 0.325 | 0.420 | 0.7388 | 0.397 | 82 |
| C ₇ | 69-99 | 2.012 | 2.432 | 0.7509 | 2.422 | 90 |
| C ₈ | 99-126 | 2.206 | 4.638 | 0.7663 | 2.603 | - |
| C ₉ | 126-151 | 2.466 | 7.104 | 0.7985 | 2.790 | 115 |
| C ₁₀ (C ₁₀ ⁺) | 151-171 (>151) | 2.609 (99.75) | 9.713 | 0.8164 (0.9163) | 2.886 | - (305) |
| C ₁₁ | 175-196 | 2.354 | 12.066 | 0.8296 | 2.564 | 142 |
| C ₁₂ | 196-217 | 2.892 | 14.958 | 0.8473 | 3.085 | - |
| C ₁₃ | 217-236 | 3.592 | 18.550 | 0.8580 | 3.783 | 172 |
| C ₁₄ | 236-254 | 3.437 | 21.987 | 0.8642 | 3.94 | - |
| C ₁₅ | 254-271 | 3.986 | 25.973 | 0.8719 | 4.166 | - |
| C ₁₆ | 271-287 | 3.693 | 29.666 | 0.8806 | 3.756 | - |
| C ₁₇ | 287-303 | 3.503 | 33.169 | 0.8829 | 3.587 | - |
| C ₁₈ | 303-317 | 3.328 | 36.497 | 0.8846 | 3.400 | - |
| C ₁₉ | 317-331 | 3.476 | 39.973 | 0.8948 | 3.510 | - |
| C ₂₀ | 331-344 | 2.833 | 42.806 | 0.9065 | 2.825 | - |
| C ₂₁ ⁺ | > 344 | 55.623 | 98.430 | 0.9499 | 52.917 | - |
| Recovered | | 98.430 | | | | |
| Loss | | 1.57 | | | | |

Table 2:

Composition of the sample boiling lower than 36°C, determined by G.C. (weight % of charge: 0.095)

| <u>Hydrocarbon group</u> | <u>Weight % of charge</u> |
|------------------------------|-------------------------------|
| C ₃ | 1.10 ⁻³ |
| C ₄ | 28.10 ⁻³ |
| C ₅ | 24.10 ⁻³ |
| C ₆ | 21.10 ⁻³ |
| C ₇ ⁺ | 21.10 ⁻³ |

Table 3:

Cross-checking of measured molecular weights and densities.

| | Crude oil | C ₁₀ ⁺ | C ₂₁ ⁺ |
|---|--------------|------------------------------|------------------------------|
| Measured mol. weight | 269 | 305 | - |
| Calc. mol weight using C ₁₀ ⁺ -mol weight | 269.1 | - | 461 |
| Calc. mol weight using C ₂₁ ⁺ -mol weight | 268.7 | - | - |
| Measured density (g/ml) | 0.9037 | - | - |
| Calc. density (g/ml) | 0.9042 | - | - |

Fig. 1

Curve A : Boiling point vs. % by volume recovered.

Curve B : Calculated density of distillate $\rho = \frac{\text{cum. weight}}{\text{cum. volume}}$ vs. % by volume recovered.

