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DIRECTION EXPLORATION PRODUCTION

# THERMODYNAMIC STUDY

# AND PHYSICAL PROPERTIES

# OF THE RESERVOIR FLUID

FROM WELL 1/3 - 3

Ø = 1/4"

ZONE : TEST 3 BIS

Direction Production

Division Recherches Expérimentations et Applications

DIRECTION PRODUCTION
DPRO / DREA / DRA - Gi / BSS
N° 84/2-41 - PhG/ET

Boussens, le 12 JUIL 1984



# THERMODYNAMIC STUDY
# AND PHYSICAL PROPERTIES
# OF THE RESERVOIR FLUID
# FROM WELL 1/3 - 3

Ø = 1/4"
ZONE : TEST 3 BIS

**SAMPLING DATE :** March, 03- 1983 **SAMPLING METHOD :** SURFACE

**CO-WORKERS :** PIZZAGALLI - LAPORTE - J. ESPINASSE -

**ACCOMPTABLE FOR THE STUDY :** **PVT ENGINEER :** P.O. **HEAD OF THE RESERVOIR SECTION :**

L. LABADIE Ph. GOLAZ A. SITBON

S.N.E.A.(P)
DIRECTION PRODUCTION
DREA BOUSSENS

# DIFFUSION DES RESULTATS D'ANALYSES "P.V.T."

## N O R V E G E

| | | | |
|---|---|---|---|
| DIG. EUROPE - Adjoint Production | PARIS | 1 | exemplaire |
| COORDONNATEUR Pays Norvege | PARIS | 1 | " |
| ELF NORGE | | 3 | " |
| DEPT. RECHERCHES ET APPLICATIONS GEOLOGIQUES | PARIS | 1 | " |
| DEPT. RECHERCHES ET APPLICATIONS GISEMENTS | PAU | 1 | " |
| DEPT. RECHERCHES ET APPLICATIONS GISEMENTS | BOUSSENS | 3 | " |
| DIVISION GISEMENTS | PARIS | 2 | " |
| DIVISION GISEMENTS | PAU | 2 | " |
| DIVISION EXPLOITATION | PARIS | 1 | " |
| DIVISION EXPLOITATION | PAU | 2 | " |
| DEPT. PROCEDES | PARIS | 1 | " |
| DIVISION REALISATIONS | PARIS | 1 | " |
| SERVICE INFORMATION ET DOCUMENTATION | BOUSSENS | 2 | " |

COUNTRY: NORWAY FIELD : 1/3 WELL : 1/3-3 RESERVOIR : T.3 BIS

## REMARKS ON THE SAMPLING AND THE PVT STUDY

This study was performed with separator samples taken by a DREA - BOUSSENS specialist on the well 1/3-3 - DST 3 Bis - March 13, 1983.

We can say that the flowing time through the separator was too short to be sure of the good representativeness of the samples (this often happens in the North Sea).

The recombination with a separator GOR of 188,77 m3/m3 gives an under saturated light oil reservoir fluid (SP = 276 abs. bars and B.H.P. = 606,3 abs.b.).

The average amount of water was determinated in the lab after a long period of decantation of separator oil.

We notice :

- a Pour point of the tank oil of - 6°C
- a Density at B.H.P. of 609,2 Kg/m3
- a Process B. of 1,7972
- a Total GOR/15°C = 260,00 m3/m3 with the Process Test.

S.N.E.A.(P)
DIRECTION PRODUCTION
DREA BOUSSENS

# DIFFUSION DES RESULTATS D'ANALYSES "P.V.T."

## N O R V E G E

| | | | |
|---|---|---|---|
| DIG. AFRIQUE - Adjoint Production | PARIS | 1 | exemplaire |
| COORDONNATEUR Pays Norvege | PARIS | 1 | " |
| ELF NORGE | | 3 | " |
| DEPT. RECHERCHES ET APPLICATIONS GEOLOGIQUES | PARIS | 1 | " |
| DEPT. RECHERCHES ET APPLICATIONS GISEMENTS | PAU | 1 | " |
| DEPT. RECHERCHES ET APPLICATIONS GISEMENTS | BOUSSENS | 3 | " |
| DIVISION GISEMENTS | PARIS | 2 | " |
| DIVISION GISEMENTS | PAU | 2 | " |
| DIVISION EXPLOITATION | PARIS | 1 | " |
| DIVISION EXPLOITATION | PAU | 2 | " |
| DEPT. PROCEDES | PARIS | 1 | " |
| DIVISION REALISATIONS | PARIS | 1 | " |
| SERVICE INFORMATION ET DOCUMENTATION | BOUSSENS | 2 | " |

# INDEX

# PVT STUDIES - COVENANTS

## GENERAL COVENANTS

- Pressures are expressed in absolute bars.
- Standard conditions (SC) are 15°C and 750 mm Hg.
- Values marked with an asterisk (*) are either computed or obtained by extrapolation from experimental values.
- In a surface study, the separator liquid flow rate is the flow rate determined from the storage flow rate as measured on site and the contraction factor measured in laboratory, or, in the absence of this information, the separator liquid flow rate directly measured on site.
- The term «contraction» applies only for storage fluid obtained in laboratory either from site separator fluid, or from its equivalent obtained in laboratory at the end of the test process.
- The term «shrinkage» applies only for the storage fluid obtained on site from the separator fluid.
- The residual liquid is the liquid obtained at atmospheric pressure, brought to 15°C, at the end of differentiel liberation.

## COVENANTS RELATING TO THE «MAIN RESULTS»

- Boi (Process). Volume factor at bottom hole pressure : volume occupied at bottom hole pressure per volume unit of contraction liquid obtained at the end of the test process, brought to 15° C.
- Bob (Differential). Volume factor at bubble point pressure : volume occupied at bubble point pressure per volume unit of residual liquid obtained at the end of differential liberation, brought to 15° C.
- Rsi (Process). Process dissolution GOR : total volume of standard gas dissolved at bottom hole pressure per contraction liquid volume unit obtained at the end of test process, brought to 15°C.
- Rsb (Differential). Differential dissolution GOR : total volume of standard gas dissolved at bubble point pressure per residual liquid unit, brought to 15° C.
- Bg : liberated gas volume factor : volume occupied at pressure P per gas volume unit measured at standard conditions.

# 1 - PRODUCTION DATA

- SAMPLING DATA

- CHRONOLOGY OF TEST OPERATION

- SURFACE INSTALLATION DIAGRAM

PVT STUDY N° 84/2 - 41

COUNTRY : NORWAY FIELD: 1/3 WELL: 1/3 - 3 RESERVOIR: T.3 BIS

## SAMPLING DATA

Sampling date March, 13 - 1983

Perforating depth (4202,2 - 4204,7) - (4205 - 4208) (4211 - 4214)

Mean perforating depth 4208,1 m/ Rotary Table

Measurement depth 4212 m / R.T.

Shut in pressure 605,3 rel. Bars

Pressure gradient -

Shut in temperature 165° C

Temperature gradient -

Flow time through separator with choke prior to : 1/4" = 2 hours

Flowing bottom hole pressure -

Flowing bottom hole temperature -

Tubing pressure 98,6 rel.bars

Tubing temperature 11,1

Separator pressure 23,5 rel.bars

Separator temperature 62,2° C

Atmospheric pressure -

Tank temperature 32° C

Mean differential pressure at the recording flow meter -

Separator gas flow at separator 27 100 m3/D at 15° C / 760 mm Hg

Separator liquid flow at separator P and T 166,4 m3/D (OIL + WATER)

146,4 m3/D (OIL ONLY)

Water flow TRACES

### REMARKS

- Bottom Hole Conditions were given by a Telex from Reservoir Dept of ELF NORGE (644), July 13, 1983.
- The separator liquid sampled is an emulsion of oil and water.

PVT STUDY N° 84/2-41

COUNTRY: NORWAY FIELD: 1/3 WELL: 1/3 - 3 RESERVOIR: T. 3 Bis

## CHRONOLOGY OF TEST OPERATIONS

March 7th : Rig down Tubing
Dummy Run Schlumberger (Several Tests)
Circulating

March 8th : Negative Tests With Dummy Run, Rig up Tubing

9th : Packer drilled + B.O.P. Tests

10th : Scraper from 4180 to 4227,5

11th : Perforations Test 3 Bis From 4211 to 4214 m
Tester in hole

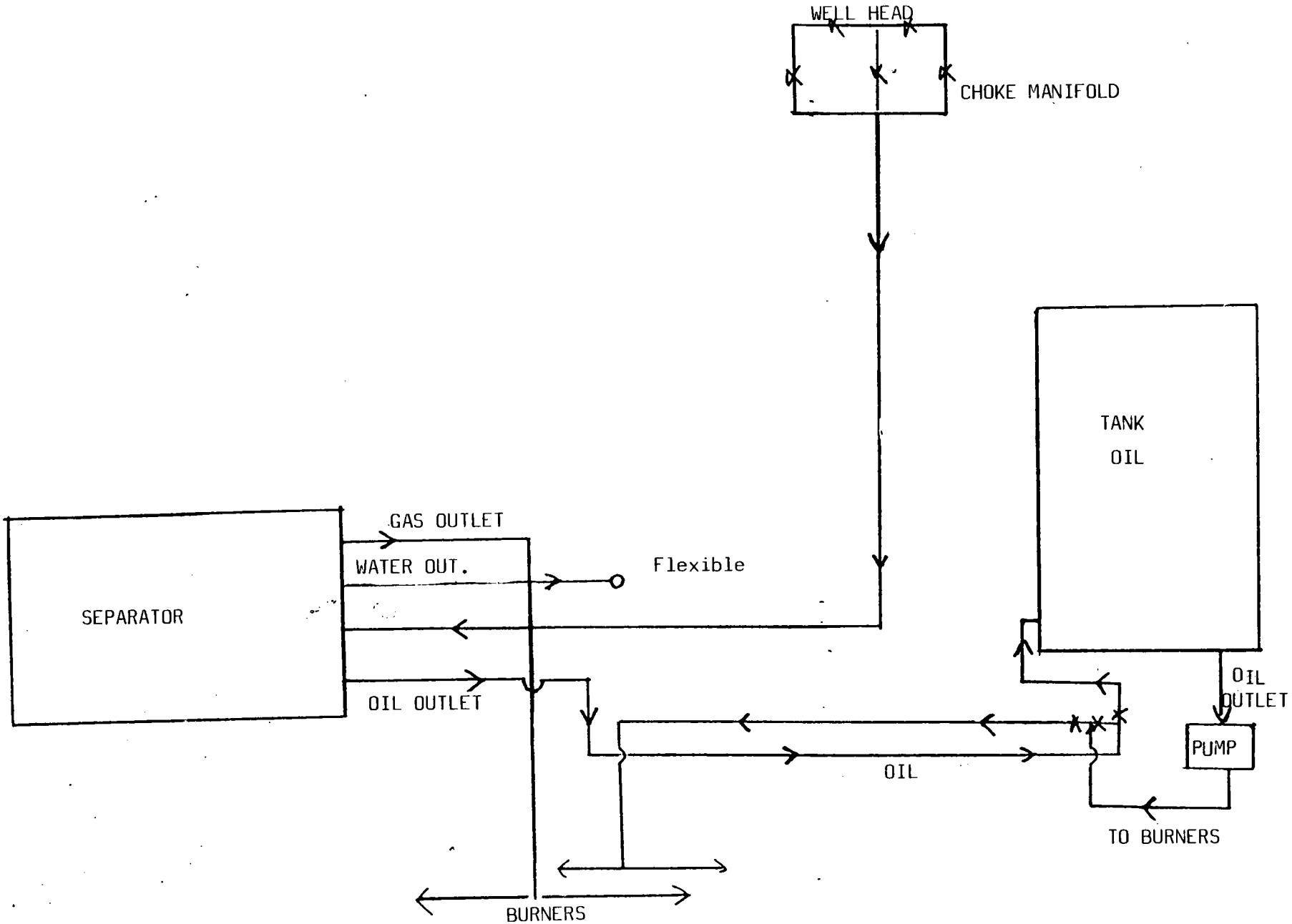
12th : Rig up Flowhead, Pressure tests of surface installation
Open Well For Prè-Flow, then one hour of Build up.
Open Well For Main Flow on choke 1/4" Fixed; 3/8 " Fixed; 1/2" Fixed; 1/4" Fixed.

13th : Surface sampling at 1/4" Fixed closed well for Build up.

14th : Reverse circulation

End of test 3 bis.

## SURFACE INSTALLATION DIAGRAM




COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 BIS

PVT STUDY N° 84/2-41

# 2 - MAIN RESULTS

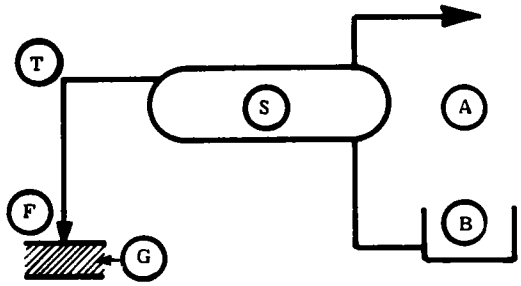
## OF SURFACE STUDY

### - RESERVOIR FLUID COMPOSITION

PVT STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

## MAIN RESULTS OF SURFACE STUDY

| SAMPLING POINT LOCATIONS | | PRESSURES abs Bars | TEMP. °C |
|---|---|---|---|
|  | G RESERVOIR (shut in) | 606,3 | 165 |
| | F BOTTOM HOLE (flowing) | - | - |
| | T WELL HEAD (flowing) | 99,6 | 11,1 |
| | S SEPARATOR | 24,5 | 62,2 |
| | B STOCK TANK | A.P. | 32 |
| | A AMBIENT | A.P. | 4,5 |



### MOLAR COMPOSITION

| COMPONENTS | SEPARATOR GAS | SEPARATOR LIQUID | RECOMBINED FLUID |
|---|---|---|---|
| $N_2$ | 1,505 | 0,122 | 0,939 |
| $CO_2$ | 2,770 | 0,459 | 1,824 |
| $SH_2$ | - | - | - |
| RSH | - | - | - |
| $C_1$ | 65,274 | 6,068 | 41,058 |
| $C_2$ | 18,099 | 6,325 | 13,282 |
| $C_3$ | 8,525 | 7,668 | 8,174 |
| $IC_4$ | 0,919 | 1,744 | 1,256 |
| $NC_4$ | 2,017 | 5,483 | 3,435 |
| $IC_5$ | 0,363 | 3,021 | 1,450 |
| $NC_5$ | 0,351 | 3,501 | 1,639 |
| $C_6$ | 0,152 | 8,212 | 3,449 |
| $C_7^+$ | 0,025 | 8,426 | 3,454 |
| $C_8$ | | 7,289 | 2,987 |
| $C_9$ | | 4,927 | 2,018 |
| $C_{10}$ | | 3,288 | 1,345 |
| $C_{11}^+$ | | 33,467 | 13,690 |

### PRODUCTION CHARACTERISTICS

CORRECTED SEPARATOR GAS FLOW RATE 27 636,6 m3/D

TANK LIQUID FLOW RATE m3/D

CONTRACTION $\frac{\text{Contr. liquid at tank P and T}}{\text{Sep. liquid at Sep P and T}}$ : 0,8603

SEPARATOR LIQUID FLOW RATE 146,4 m3/D

GOR $\frac{\text{Separator gas corrected at 15/750}}{\text{Separator liquid at Sep. P and T}}$ : 188,77 m3/m3

### RESERVOIR FLUID CHARACTERISTICS AT BOTTOM HOLE TEMP

SATURATION PRESSURE 276 bars

DENSITY : AT BOTTOM HOLE P 609,2 Kg/m3

: AT SATURATION P 537,8 Kg/m3

COMPRESSIBILITY : AT BOTTOM HOLE P 2,181 $10^{-4}$ m3/m3/bars

VISCOSITY : AT BOTTOM HOLE P 0,306 cPo

: AT SATURATION P 0,220 cPo

Boi (Process) : 1,7972 Rsi (Process) : 260,00

Bob (Diff) : 2,0163 Rsb (Diff) : 324,83

### CONTRACTION LIQUID OBTAINED FROM SEPARATOR LIQUID

DENSITY (15°) 813,0 kg/m3

viscosity AT 15° C 4,39 cPo

viscosity AT 32° C 3,20 cPo

### CHARACTERISTICS OF C 11+ OF THE CONTRACTION LIQUID

MOLECULAR WEIGHT 257,67

DENSITY (15°) 866,8 kg/m3

cPo

cPo

CODE STUDY : B 13353.*** et N 13353.***

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3B RESERVOIR FLUID CALCULATED

GROUPING RESULTS INTO 15 CUTS

| CUTS | MOLECULAR WEIGHTS | MOLE % | TC (DEG.K.) | PC (BARS) | OMEGA |
|---|---|---|---|---|---|
| N2 | 28.0100 | 0.9396 | 126.2000 | 33.0612 | 0.0400 |
| CO2 | 44.0100 | 1.8248 | 304.2000 | 71.8463 | 0.2250 |
| C1 | 16.0400 | 41.0507 | 190.6000 | 44.8053 | 0.0115 |
| C2 | 30.0700 | 13.2821 | 305.3999 | 47.5686 | 0.0908 |
| C3 | 44.1000 | 8.1749 | 369.8000 | 41.3511 | 0.1454 |
| IC4 | 58.1200 | 1.2568 | 408.1000 | 35.5284 | 0.1760 |
| NC4 | 58.1200 | 3.4355 | 425.2000 | 37.0088 | 0.1928 |
| IC5 | 71.9260 | 1.4508 | 465.1358 | 33.9292 | 0.2233 |
| NC5 | 72.1500 | 1.6398 | 469.5999 | 32.8638 | 0.2273 |
| C6 | 84.9504 | 3.4497 | 517.6158 | 32.7530 | 0.2603 |
| C7 | 98.2268 | 3.4548 | 552.6295 | 30.8945 | 0.2886 |
| C8 | 111.5748 | 2.9872 | 583.6931 | 27.8140 | 0.3226 |
| C9 | 125.9732 | 2.0183 | 607.3316 | 25.3192 | 0.3764 |
| C10 | 141.1096 | 1.3451 | 621.0479 | 22.5459 | 0.4074 |
| C11+ | 257.6664 | 13.6899 | 798.8820 | 15.2465 | 0.8043 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3B RESERVOIR FLUID CALCULATED

GROUPING RESULTS INTO 26 CUTS

| CUTS | MOLECULAR WEIGHTS | MOLE % | TC (DEG.K.) | PC (BARS) | OMEGA |
|---|---|---|---|---|---|
| N2 | 28.0100 | 0.9396 | 126.2000 | 33.0612 | 0.0400 |
| CO2 | 44.0100 | 1.8248 | 304.2000 | 71.8463 | 0.2250 |
| C1 | 16.0400 | 41.0507 | 190.6000 | 44.8053 | 0.0115 |
| C2 | 30.0700 | 13.2821 | 305.3999 | 47.5686 | 0.0908 |
| C3 | 44.1000 | 8.1749 | 369.8000 | 41.3511 | 0.1454 |
| IC4 | 58.1200 | 1.2568 | 408.1000 | 35.5284 | 0.1760 |
| NC4 | 58.1200 | 3.4355 | 425.2000 | 37.0088 | 0.1928 |
| IC5 | 72.1500 | 1.2891 | 460.3476 | 32.9590 | 0.2272 |
| NC5 | 72.1500 | 1.6398 | 469.5999 | 32.8638 | 0.2273 |
| CC5 | 70.1400 | 0.1617 | 511.5999 | 43.9170 | 0.1923 |
| PC6 | 86.1800 | 2.0705 | 503.4597 | 29.3309 | 0.2849 |
| CC6 | 84.1600 | 1.1387 | 543.4941 | 38.3386 | 0.2262 |
| AC6 | 78.1100 | 0.2406 | 562.0999 | 47.6673 | 0.2100 |
| PC7 | 100.2100 | 1.5700 | 536.4587 | 26.9033 | 0.3360 |
| CC7 | 98.1887 | 1.3819 | 564.2004 | 33.8024 | 0.2463 |
| AC7 | 92.1400 | 0.5029 | 591.7000 | 40.0681 | 0.2566 |
| PC8 | 114.2300 | 1.3467 | 564.2370 | 24.4475 | 0.3780 |
| CC8 | 112.2108 | 0.8855 | 592.6021 | 28.7755 | 0.2376 |
| AC8 | 106.1600 | 0.7634 | 619.5563 | 34.9264 | 0.3228 |
| PC9 | 128.2552 | 1.0712 | 590.2618 | 22.7589 | 0.4189 |
| CC9 | 126.2354 | 0.5126 | 622.5590 | 27.1586 | 0.2971 |
| AC9 | 120.1900 | 0.4541 | 645.0679 | 31.4938 | 0.3630 |
| PC10 | 142.2800 | 0.9850 | 610.8304 | 20.9199 | 0.4561 |
| CC10 | 140.2700 | 0.2844 | 662.4598 | 28.1742 | 0.2548 |
| AC10 | 134.2200 | 0.0479 | 650.0001 | 30.5939 | 0.3780 |
| C11+ | 257.6664 | 13.6899 | 798.8820 | 15.2465 | 0.8043 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3B RESERVOIR FLUID CALCULATED

| COMPONENTS | MOLE % |
|---|---|
| Azote | 0.9396 |
| Dioxyde de carbone | 1.8248 |
| Methane | 41.0507 |
| Ethane | 13.2821 |
| Propane | 8.1749 |
| Isobutane | 1.2568 |
| Normal butane | 3.4355 |
| 2-2 dimethylpropane | 0.0025 |
| Isopentane | 1.2866 |
| Normal pentane | 1.6398 |
| 2-2 dimethyl butane | 0.0246 |
| Cyclopentane | 0.1617 |
| 2-3 dimethylbutane | 0.0733 |
| 2 methyl pentane | 0.6124 |
| 3 methylpentane | 0.3419 |
| Normal hexane | 1.0184 |
| Methylcyclopentane | 0.5352 |
| 2-2 dimethylpentane | 0.0504 |
| Benzene | 0.2406 |
| 2-4 dimethylpentane | 0.0201 |
| 3-3 dimethylpentane | 0.0103 |
| Cyclohexane | 0.6035 |
| 2 methylhexane | 0.2743 |
| 1-1 dimethylcyclopentane | 0.0554 |
| 2-3 dimethylpentane | 0.0765 |
| 3 methylhexane | 0.2852 |
| 1 trans 3 dimethylcyclopentane | 0.0902 |
| 3 ethylpentane | 0.0178 |
| 1 cis 3 dimethylcyclopentane | 0.0896 |
| 1 trans 2 dimethylcyclopentane | 0.1345 |
| Normal heptane | 0.8354 |
| 1 cis 2 dimethylcyclopentane | 0.0133 |
| 2-2 dimethylhexane | 0.0212 |
| 1-1-3 trimethylcyclopentane | 0.0410 |
| Methylcyclohexane | 0.9550 |
| 2-5 dimethylhexane | 0.0443 |
| 2-4 dimethylhexane | 0.0443 |
| Ethylcyclopentane | 0.0394 |
| 2-2-3 trimethylpentane | 0.0028 |
| 1 t2 c4 trimethylcyclopentane | 0.0415 |
| 3-3 dimethylhexane | 0.0096 |
| Toluene | 0.5029 |
| 1 t2 c3 trimethylcyclopentane | 0.0434 |
| 2-3-4 trimethylpentane | 0.0052 |
| 2-3 dimethylhexane | 0.0297 |
| 2 methyl 3 ethylpentane | 0.0090 |
| 2 methylheptane | 0.2552 |
| 1-2-2 trimethylcyclopentane | 0.0124 |
| 4 methylheptane | 0.0780 |
| 3 methylheptane | 0.1883 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3B RESERVOIR FLUID CALCULATED

| COMPONENTS | MOLE % |
|---|---|
| 3-4 dimethylhexane | 0.0297 |
| 3 methyl 3 ethylpentane | 0.0033 |
| 3 ethylhexane | 0.0068 |
| 1 c2 c4 trimethylcyclopentane | 0.0102 |
| 1 cis 3 dimethylcyclohexane | 0.1398 |
| 1 trans 4 dimethylcyclohexane | 0.1398 |
| 1 methyl trans 3 ethylcyclopentane | 0.0415 |
| 1 methyl cis 3 ethylcyclopentane | 0.0129 |
| 1 methyl trans 2 ethylcyclopentane | 0.0129 |
| Cycloheptane | 0.0046 |
| Normal octane | 0.6193 |
| 1 trans 2 dimethylcyclohexane | 0.0087 |
| 1 trans 3 dimethylcyclohexane | 0.0960 |
| 1 cis 4 dimethylcyclohexane | 0.0614 |
| 2-3-5 trimethylhexane | 0.0044 |
| 2-2 dimethylheptane | 0.0194 |
| 2-4 dimethylheptane | 0.0334 |
| 1 methyl 4 ethylcyclopentane | 0.0083 |
| 2-6 dimethylheptane | 0.0593 |
| 1-1 dimethyl c3 ethylcyclopentane | 0.0070 |
| 2-5 dimethyl heptane | 0.0513 |
| Propylocyclopentane | 0.0294 |
| 3-5 dimethylheptane | 0.0177 |
| 3-3 dimethylheptane | 0.0063 |
| Ethylbenzene | 0.0939 |
| Ethylcyclohexane | 0.1764 |
| Dimethylcyclohexane | 0.0029 |
| 1-1-3 trimethylcyclohexane | 0.0545 |
| 1-1-4 trimethylcyclohexane | 0.0132 |
| 1 c3 c5 trimethylcyclohexane | 0.0052 |
| Divers naphtenes en c9 | 0.1968 |
| Para-xylene | 0.1068 |
| Meta-xylene | 0.4051 |
| 2-3 dimethylheptane | 0.0150 |
| 3-4 dimethylheptane | 0.0150 |
| 1 c3 t5 trimethylcyclohexane | 0.0139 |
| 4 methyl octane | 0.0791 |
| 2 methyl octane | 0.0997 |
| 3 ethylheptane | 0.0458 |
| 3 methyl octane | 0.1102 |
| Ortho-xylene | 0.1575 |
| 1 t2 c3 trimethylcyclohexane | 0.0058 |
| 1 t2 c4 trimethylcyclohexane | 0.0058 |
| 1-1-2 trimethylcyclohexane | 0.0181 |
| Isopropylcyclohexane | 0.0240 |
| 1 c2 c4 trimethylcyclohexane | 0.0135 |
| 1 methyl t4 ethylcyclohexane | 0.0293 |
| 1 methyl c3 ethylcyclohexane | 0.0890 |
| Normal nonane | 0.5146 |
| Cumene | 0.0594 |
| 1 methyl c2 ethylcyclohexane | 0.0055 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3B RESERVOIR FLUID CALCULATED

| COMPONENTS | | MOLE % |
|---|---|---|
| 1 methyl t2 ethylcyclohexane | | 0.0220 |
| 1 methyl 1 ethylcyclohexane | | 0.0161 |
| 3-3-5 trimethylheptane | | 0.0092 |
| 4-4 dimethyl octane | | 0.0586 |
| 2-5 dimethyl octane | | 0.0371 |
| Propylbenzene | | 0.0283 |
| 2-6 dimethyl octane | | 0.1103 |
| 2-3 dimethyl octane | | 0.0208 |
| 3-4 dimethyl octane | | 0.0079 |
| 4-5 dimethyl octane | | 0.0236 |
| 1-3 ethyl toluene | | 0.1042 |
| 1-4 ethyl toluene | | 0.0430 |
| Tetramethylcyclohexane | | 0.0121 |
| 5 methyl nonane | | 0.0087 |
| 1-2 ethyl toluene | | 0.0279 |
| 4 methyl nonane | | 0.0964 |
| 2 methyl nonane | | 0.1415 |
| 3 methyl nonane | | 0.0651 |
| 1-2-4 trimethylbenzene | | 0.1248 |
| Isobutylbenzene | | 0.0479 |
| Normal decane | | 0.4057 |
| 1-2-3 trimethylbenzene | | 0.0663 |
| Divers naphtenes en c10 | | 0.2723 |
| C11+ ********** | | 13.6899 |
| C11 | GPC | 2.5948 |
| C12/13 | GPC | 2.9981 |
| C14/15 | GPC | 1.8834 |
| C16/17 | GPC | 1.3241 |
| C18/19 | GPC | 1.0078 |
| C20/24 | GPC | 1.6060 |
| C25/29 | GPC | 0.8824 |
| C30/39 | GPC | 0.8710 |
| C40/49 | GPC | 0.3300 |
| C50/74 | GPC | 0.1767 |
| C74/99 | GPC | 0.0154 |

MOLECULAR WEIGHT = 69.58

C11+ MOLECULAR WEIGHT = 257.67

# 3 - SEPARATOR AND TANK FLUIDS STUDY

- SAMPLES CHECKLIST

- SEPARATOR GAS STUDY

- SEPARATOR FLUID STUDY

- CONTRACTION LIQUID COMPOSITION

- TANK LIQUID STUDY

# SAMPLES CHECKLIST

COUNTRY: NORWAY FIELD: 1/3 — PVT STUDY N° 84/2-41 — WELL: 1/3 - 3 — RESERVOIR: T. 3 Bis

| BOTTLE N° | CONTENTS | SAMPLING METHOD | PRESSURE BARS | | TEMPERATURES °C | | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | FIELD | LAB. | FIELD | LAB. | |
| A 4471 | Separator GAS | Surface | 24,5 | 24 | | 22 | |
| A 4463 | " " | Under vacuum | 24,5 | 24 | | 22 | |
| A 4472 | " " | | 24,5 | 24 | | 22 | |
| A 4470 | " " | | 24,5 | 24 | | 22 | |
| A 4469 | " " | | 24,5 | 24 | | 22 | |
| 2757/2 | Separator OIL | Equilibrum | 24,5 | 11 | | 21 | |
| 2757/4 | " " | " | 24,5 | 11 | | 21 | |

PVT STUDY N° 84/2-41

COUNTRY: NORWAY FIELD: 1/3 WELL: 1/3 - 3 RESERVOIR: T. 3 Bis

## SEPARATOR GAS STUDY

SEPARATOR PRESSURE 24,5 bars

SEPARATOR TEMPERATURE 62,2 °C

| COMPONENTS | MOLAR % |
|---|---|
| $N_2$ | 1,505 |
| $CO_2$ | 2,770 |
| $SH_2$ | - |
| RSH | - |
| $C_1$ | 65,274 |
| $C_2$ | 18,099 |
| $C_3$ | 8,525 |
| $IC_4$ | 0,919 |
| $NC_4$ | 2,017 |
| $IC_5$ | 0,363 |
| $NC_5$ | 0,351 |
| $C_6$ | 0,152 |
| $C_7$ + | 0,025 |

| PRESSURE BARS | Z * |
|---|---|
| 251 | 0,7891 |
| 201 | 0,7335 |
| 151 | 0,7120 |
| 101 | 0,7586 |
| 51 | 0,8712 |
| 31 | 0,9220 |
| 25 | 0,9372 |
| 24,5 | 0,9384 |

| | | |
|---|---|---|
| SPECIFIC GRAVITY (air = 1) | | 0,8180 * |
| DENSITY | at 15/750 Kg/m3 | 0,9889 * |
| | at 0/760 | 1,0571 |
| MOLECULAR WEIGHT | | 23,69 * |
| | | * |
| GROSS HEATING VALUE KJ/STD M3 | | 48896,27 * |
| $C_{3+}$ CONTENT g/m3 at 15/750 | | 256,294 |
| $C_{4+}$ | | 99,381 |
| $C_{5+}$ | | 28,131 |
| $C_{6+}$ | | 6,585 |

**REMARKS**

For calculation purposes,

the $C_7$ are assimilated with the $C_9$

COUNTRY : NORWAY FIELD : 1/3 PVT STUDY N° 84/2-41 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

## SEPARATOR GAS STUDY

SEPARATOR PRESSURE 24,5 bars

SEPARATOR TEMPERATURE 62,2 °C

MOLAR % COMPOSITION

| | BOTTLE N° | A 4472 | A 4470 | A 4469 | A 4471 | A 4463 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | EQUILIB. | EQUILIB. | EQUILIB. | EQUILIB. | EQUILIB. | | | | | | |
| COMPONENTS | $N_2$ | 1,504 | 1,502 | 1,503 | 1,508 | 1,506 | | | | | | |
| | $CO_2$ | 2,804 | 2,766 | 2,777 | 2,763 | 2,773 | | | | | | |
| | $SH_2$ | - | - | - | - | - | | | | | | |
| | RSH | - | - | - | - | - | | | | | | |
| | $C_1$ | 66,158 | 65,425 | 65,380 | 64,801 | 65,497 | | | | | | |
| | $C_2$ | 18,176 | 18,112 | 18,130 | 18,023 | 18,128 | | | | | | |
| | $C_3$ | 8,241 | 8,481 | 8,508 | 8,636 | 8,475 | | | | | | |
| | $IC_4$ | 0,815 | 0,907 | 0,905 | 0,969 | 0,895 | | | | | | |
| | $NC_4$ | 1,704 | 1,977 | 1,966 | 2,191 | 1,935 | | | | | | |
| | $IC_5$ | 0,263 | 0,347 | 0,341 | 0,432 | 0,331 | | | | | | |
| | $NC_5$ | 0,242 | 0,330 | 0,324 | 0,430 | 0,318 | | | | | | |
| | $C_6$ | 0,093 | 0,130 | 0,135 | 0,211 | 0,132 | | | | | | |
| | $C_{7+}$ | 0,000 | 0,023 | 0,031 | 0,036 | 0,010 | | | | | | |

REMARKS

PVT STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

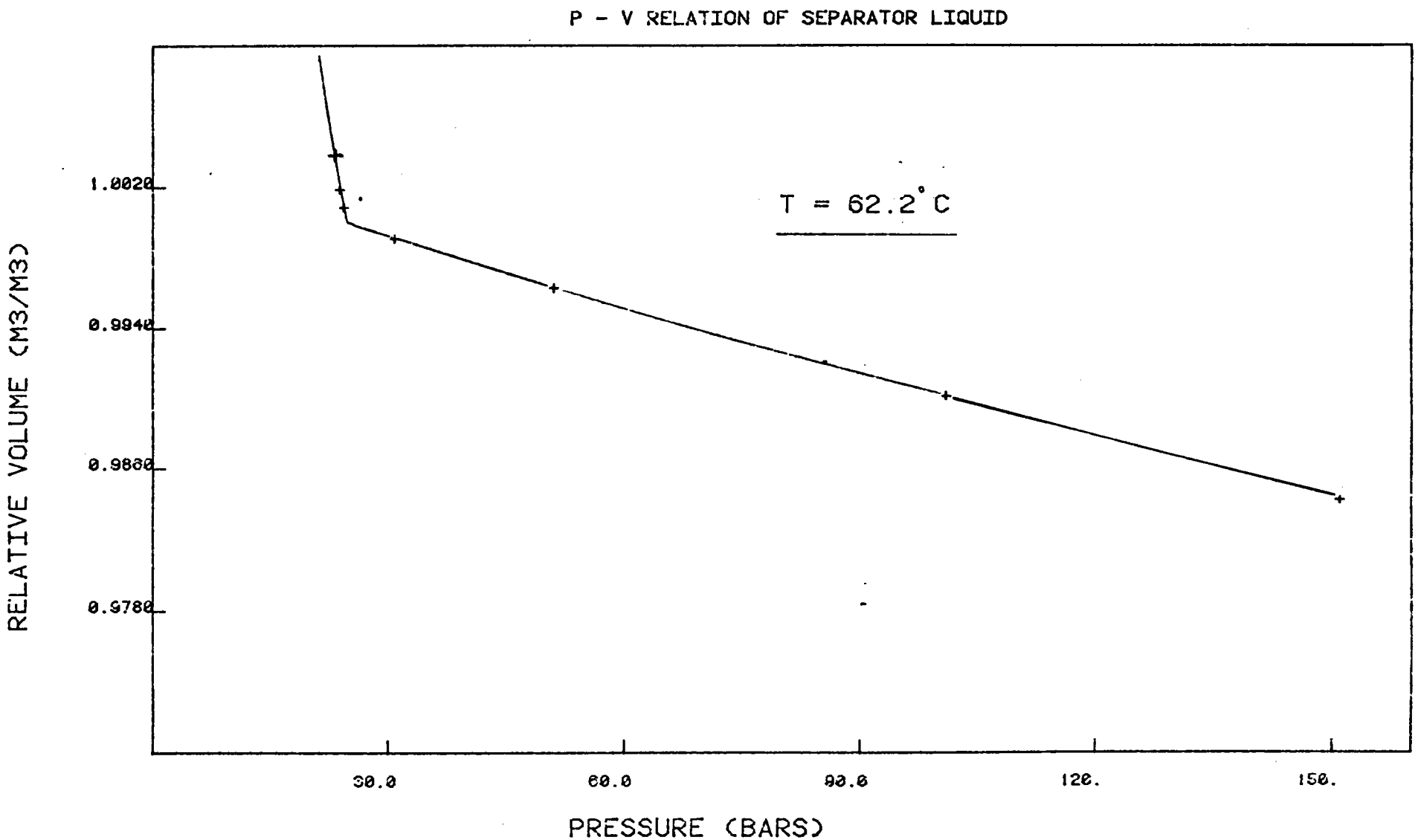
# PRESSURE - VOLUME RELATION OF SEPARATOR LIQUID

| TEMPERATURE 62,2°C | |
|---|---|
| PRESSURE BARS | RELATIVE VOLUME m3/m3 OIL AT SP |
| 351 | 0,9736 |
| 201 | 0,9786 |
| 151 | 0,9842 |
| 101 | 0,9901 |
| 51 | 0,9963 |
| 30,8 | 0,9991 |
| 24,5 P.S. | 1,0000 |
| 24,3 | 1,0009 |
| 23,8 | 1,0019 |
| 23,6 | 1,0039 |

| TEMPERATURE °C | |
|---|---|
| PRESSURE BARS | RELATIVE VOLUME m3/m3 OIL AT SP |
| | |

REMARKS

# 1_3_3 TEST 3BIS SURFACE STUDY



PVT STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

## SEPARATOR LIQUID STUDY

| | | |
|---|---|---|
| SEPARATOR PRESSURE | 24,5 | Bars |
| SEPARATOR TEMPERATURE | 62,2 | °C |

| | IN RELATION TO TANK LIQUID | |
|---|---|---|
| | AT TANK T° | AT 15 °C |
| CONTRACTION FACTOR | 0,8603 | 0,8479 |
| CONTRACTION GOR | 37,11 | 37,66 |

CHARACTERISTICS OF SEPARATOR FLUID

DENSITY CALCULATED BY MASS BALANCE

($Kg / m^3$) = 741,0 Kg/m3

THERMAL EXPANSION COEFFICIENT

($m^3 / m^3 / °C$) = 0,9097 $10^{-3}$

TOTAL MOLECULAR WEIGHT = 135,84

**P. V. T. STUDY N° 84/2-41**

**COUNTRY :** NORWAY **FIELD :** 1/3 **WELL :** 1/3 - 3 **RESERVOIR :** T. 3 Bis

1/3 - 3 TEST 3B GAZ CONTRACTION

| CONSTITUANTS | % MOLAIRES |
|---|---|
| N2 | 0.502 |
| CO2 | 1.881 |
| H2S | 0.000 |
| RSH | 0.000 |
| C1 | 24.840 |
| C2 | 25.045 |
| C3 | 25.638 |
| IC4 | 4.260 |
| NC4 | 10.714 |
| IC5 | 2.594 |
| NC5 | 2.586 |
| C6 | 1.292 |
| C7+ | 0.648 |

CARACTERISTIQUES PHYSIQUES

DENSITE (AIR=1) = 1.3137

MASSE VOLUMIQUE (KG/M3)
CONDITIONS STANDARDS : 1.5882
CONDITIONS NORMALES : 1.5978

MASSE MOLAIRE : 38.05

TENEURS (G/STD.M3)
C3+ = 1067.177
C4+ = 595.356
C5+ = 232.106
C6+ = 75.202

CHALEUR DE COMBUSTION (PCS) = 78660.69 KJ/STD.M3

**P. V. T. STUDY N° 84/2-41**

**COUNTRY :** NORWAY **FIELD :** 1/3 **WELL :** 1/3 - 3 **RESERVOIR :** T. 3 Bis

1 - 3 - 3 TEST 3B SURFACE HUILE CONTRACTION

| COMPO-NENTS | MOLE % | WEIGHT % | VOLUME % | MOLECULAR WEIGHTS | DENSITIES (KG/M3) |
|---|---|---|---|---|---|
| N2 | 0.000 | 0.000 | 0.000 | 28.01 | 345.0 |
| CO2 | 0.000 | 0.000 | 0.000 | 44.01 | 501.0 |
| H2S | 0.000 | 0.000 | 0.000 | 34.08 | 993.0 |
| RSH | 0.000 | 0.000 | 0.000 | 48.11 | 866.0 |
| C1 | 0.000 | 0.000 | 0.000 | 16.04 | 300.0 |
| C2 | 0.273 | 0.049 | 0.105 | 30.07 | 377.0 |
| C3 | 1.860 | 0.490 | 0.784 | 44.10 | 508.0 |
| IC4 | 0.930 | 0.323 | 0.466 | 58.12 | 563.0 |
| NC4 | 3.791 | 1.316 | 1.932 | 58.12 | 584.0 |
| IC5 | 3.159 | 1.355 | 1.715 | 71.82 | 642.3 |
| NC5 | 3.797 | 1.636 | 2.107 | 72.15 | 631.0 |
| C6 | 10.449 | 5.295 | 6.070 | 84.87 | 709.3 |
| C7 | 11.045 | 6.477 | 7.106 | 98.20 | 741.1 |
| C8 | 9.576 | 6.379 | 6.802 | 111.55 | 762.5 |
| C9 | 6.485 | 4.878 | 5.164 | 125.96 | 767.9 |
| C10 | 4.350 | 3.666 | 3.938 | 141.11 | 756.8 |
| C11+ | 44.285 | 68.136 | 63.911 | 257.67 | 866.8 |

DENSITIES (KG/M3) :
AT 15.0 C. DEGREES = 813.0
AT 32.0 C. DEGREES = 801.2

MOLECULAR WEIGHT : 167.46

VISCOSITIES (CPO) :
AT 15.0 C. DEGREES = 4,39
AT 32.0 C. DEGREES = 3,20

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3- 3 RESERVOIR : T. 3 Bis

1 - 3 - 3 TEST 3R SURFACE HUILE CONTRACTION

| COMPONENTS | MOLE % | WEIGHT % | VOLUME % |
|---|---|---|---|
| Ethane | 0.273 | 0.049 | 0.106 |
| Propane | 1.861 | 0.490 | 0.784 |
| Isobutane | 0.931 | 0.323 | 0.466 |
| Normal butane | 3.792 | 1.316 | 1.832 |
| Isopentane | 2.637 | 1.136 | 1.478 |
| Normal pentane | 3.797 | 1.636 | 2.108 |
| 2-2 dimethyl butane | 0.069 | 0.036 | 0.044 |
| Cyclopentane | 0.523 | 0.219 | 0.237 |
| 2-3 dimethylbutane | 0.237 | 0.122 | 0.149 |
| 2 methyl pentane | 1.648 | 0.848 | 1.048 |
| 3 methylpentane | 0.993 | 0.511 | 0.621 |
| Normal hexane | 3.041 | 1.565 | 1.916 |
| Methylcyclopentane | 1.731 | 0.870 | 0.939 |
| 2-2 dimethylpentane | 0.163 | 0.098 | 0.117 |
| Benzene | 0.778 | 0.363 | 0.334 |
| 2-4 dimethylpentane | 0.065 | 0.039 | 0.047 |
| 3-3 dimethylpentane | 0.033 | 0.020 | 0.023 |
| Cyclohexane | 1.952 | 0.981 | 1.019 |
| 2 methylhexane | 0.887 | 0.531 | 0.632 |
| 1-1 dimethylcyclopentane | 0.179 | 0.105 | 0.112 |
| 2-3 dimethylpentane | 0.247 | 0.148 | 0.172 |
| 3 methylhexane | 0.922 | 0.552 | 0.640 |
| 1 trans 3 dimethylcyclopentane | 0.292 | 0.171 | 0.185 |
| 3 ethylpentane | 0.057 | 0.034 | 0.040 |
| 1 cis 3 dimethylcyclopentane | 0.290 | 0.170 | 0.184 |
| 1 trans 2 dimethylcyclopentane | 0.435 | 0.255 | 0.274 |
| Normal heptane | 2.573 | 1.540 | 1.820 |
| 1 cis 2 dimethylcyclopentane | 0.043 | 0.025 | 0.026 |
| 2-2 dimethylhexane | 0.069 | 0.047 | 0.054 |
| 1-1-3 trimethylcyclopentane | 0.133 | 0.089 | 0.096 |
| Methylcyclohexane | 3.089 | 1.811 | 1.902 |
| 2-5 dimethylhexane | 0.143 | 0.098 | 0.114 |
| 2-4 dimethylhexane | 0.143 | 0.098 | 0.113 |
| Ethylcyclopentane | 0.127 | 0.075 | 0.079 |
| 2-2-3 trimethylpentane | 0.009 | 0.006 | 0.007 |
| 1 t2 c4 trimethylcyclopentane | 0.134 | 0.090 | 0.097 |
| 3-3 dimethylhexane | 0.031 | 0.021 | 0.024 |
| Toluene | 1.627 | 0.895 | 0.834 |
| 1 t2 c3 trimethylcyclopentane | 0.140 | 0.094 | 0.101 |
| 2-3-4 trimethylpentane | 0.017 | 0.011 | 0.013 |
| 2-3 dimethylhexane | 0.096 | 0.066 | 0.074 |
| 2 methyl 3 ethylpentane | 0.029 | 0.020 | 0.022 |
| 2 methylheptane | 0.825 | 0.563 | 0.652 |
| 1-2-2 trimethylcyclopentane | 0.040 | 0.027 | 0.028 |
| 4 methylheptane | 0.252 | 0.172 | 0.197 |
| 3 methylheptane | 0.609 | 0.415 | 0.476 |
| 3-4 dimethylhexane | 0.096 | 0.066 | 0.074 |
| 3 methyl 3 ethylpentane | 0.011 | 0.007 | 0.008 |
| 3 ethylhexane | 0.022 | 0.015 | 0.017 |
| 1 c2 c4 trimethylcyclopentane | 0.033 | 0.022 | 0.023 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1 - 3 - 3 TEST 3B SURFACE HUILE CONTRACTION

| COMPONENTS | MOLE % | WEIGHT % | VOLUME % |
|---|---|---|---|
| 1 cis 3 dimethylcyclohexane | 0.452 | 0.303 | 0.320 |
| 1 trans 4 dimethylcyclohexane | 0.452 | 0.303 | 0.321 |
| 1 methyl trans 3 ethylcyclopentane | 0.134 | 0.090 | 0.095 |
| 1 methyl cis 3 ethylcyclopentane | 0.042 | 0.028 | 0.030 |
| 1 methyl trans 2 ethylcyclopentane | 0.042 | 0.028 | 0.029 |
| Cycloheptane | 0.015 | 0.009 | 0.009 |
| Normal octane | 1.917 | 1.308 | 1.504 |
| 1 trans 2 dimethylcyclohexane | 0.028 | 0.019 | 0.020 |
| 1 trans 3 dimethylcyclohexane | 0.310 | 0.208 | 0.214 |
| 1 cis 4 dimethylcyclohexane | 0.198 | 0.133 | 0.138 |
| 2-3-5 trimethylhexane | 0.014 | 0.011 | 0.012 |
| 2-2 dimethylheptane | 0.063 | 0.048 | 0.055 |
| 2-4 dimethylheptane | 0.108 | 0.083 | 0.094 |
| 1 methyl 4 ethylcyclopentane | 0.027 | 0.018 | 0.019 |
| 2-6 dimethylheptane | 0.192 | 0.147 | 0.168 |
| 1-1 dimethyl c3 ethylcyclopentane | 0.023 | 0.015 | 0.016 |
| 2-5 dimethyl heptane | 0.166 | 0.127 | 0.143 |
| Propylocyclopentane | 0.095 | 0.064 | 0.066 |
| 3-5 dimethylheptane | 0.057 | 0.044 | 0.049 |
| 3-3 dimethylheptane | 0.020 | 0.016 | 0.018 |
| Ethylbenzene | 0.304 | 0.193 | 0.190 |
| Ethylcyclohexane | 0.571 | 0.382 | 0.393 |
| Dimethylcyclohexane | 0.009 | 0.006 | 0.007 |
| 1-1-3 trimethylcyclohexane | 0.176 | 0.133 | 0.136 |
| 1-1-4 trimethylcyclohexane | 0.043 | 0.032 | 0.033 |
| 1 c3 c5 trimethylcyclohexane | 0.017 | 0.013 | 0.013 |
| Divers naphtenes en c9 | 0.636 | 0.480 | 0.488 |
| Para-xylene | 0.345 | 0.219 | 0.206 |
| Meta-xylene | 1.310 | 0.831 | 0.777 |
| 2-3 dimethylheptane | 0.049 | 0.037 | 0.041 |
| 3-4 dimethylheptane | 0.049 | 0.037 | 0.041 |
| 1 c3 t5 trimethylcyclohexane | 0.045 | 0.034 | 0.035 |
| 4 methyl octane | 0.256 | 0.196 | 0.220 |
| 2 methyl octane | 0.322 | 0.247 | 0.280 |
| 3 ethylheptane | 0.149 | 0.113 | 0.126 |
| 3 methyl octane | 0.356 | 0.273 | 0.307 |
| Ortho-xylene | 0.509 | 0.323 | 0.297 |
| 1 t2 c3 trimethylcyclohexane | 0.019 | 0.014 | 0.015 |
| 1 t2 c4 trimethylcyclohexane | 0.019 | 0.014 | 0.014 |
| 1-1-2 trimethylcyclohexane | 0.059 | 0.044 | 0.045 |
| Isopropylcyclohexane | 0.077 | 0.058 | 0.062 |
| 1 c2 c4 trimethylcyclohexane | 0.044 | 0.033 | 0.033 |
| 1 methyl t4 ethylcyclohexane | 0.095 | 0.072 | 0.073 |
| 1 methyl c3 ethylcyclohexane | 0.288 | 0.217 | 0.221 |
| Normal nonane | 1.622 | 1.242 | 1.399 |
| Cumene | 0.192 | 0.138 | 0.130 |
| 1 methyl c2 ethylcyclohexane | 0.018 | 0.013 | 0.014 |
| 1 methyl t2 ethylcyclohexane | 0.071 | 0.054 | 0.055 |
| 1 methyl 1 ethylcyclohexane | 0.052 | 0.039 | 0.039 |
| 3-3-5 trimethylheptane | 0.030 | 0.025 | 0.028 |

**P.V.T. STUDY N° 84/2-41**

**COUNTRY :** NORWAY **FIELD :** 1/3 **WELL :** 1/3 - 3 **RESERVOIR :** T. 3 Bis

1 - 3 - 3 TEST 3B SURFACE HUILE CONTRACTION

| COMPONENTS | | MOLE % | WEIGHT % | VOLUME % |
|---|---|---|---|---|
| 4-4 dimethyl octane | | 0.189 | 0.161 | 0.177 |
| 2-5 dimethyl octane | | 0.120 | 0.102 | 0.114 |
| Propylbenzene | | 0.091 | 0.066 | 0.062 |
| 2-6 dimethyl octane | | 0.357 | 0.303 | 0.337 |
| 2-3 dimethyl octane | | 0.067 | 0.057 | 0.063 |
| 3-4 dimethyl octane | | 0.025 | 0.022 | 0.023 |
| 4-5 dimethyl octane | | 0.076 | 0.065 | 0.070 |
| 1-3 ethyl toluene | | 0.337 | 0.242 | 0.226 |
| 1-4 ethyl toluene | | 0.139 | 0.100 | 0.094 |
| Tetramethylcyclohexane | | 0.039 | 0.033 | 0.033 |
| 5 methyl nonane | | 0.028 | 0.024 | 0.026 |
| 1-2 ethyl toluene | | 0.090 | 0.065 | 0.060 |
| 4 methyl nonane | | 0.312 | 0.265 | 0.293 |
| 2 methyl nonane | | 0.458 | 0.389 | 0.433 |
| 3 methyl nonane | | 0.211 | 0.179 | 0.197 |
| 1-2-4 trimethylbenzene | | 0.404 | 0.290 | 0.268 |
| Isobutylbenzene | | 0.155 | 0.124 | 0.117 |
| Normal decane | | 1.312 | 1.115 | 1.235 |
| 1-2-3 trimethylbenzene | | 0.215 | 0.154 | 0.139 |
| Divers naphtenes en c10 | | 0.881 | 0.738 | 0.731 |
| C11+ | | 44.280 | 68.134 | 63.907 |
| C11 | GPC | 8.393 | 7.819 | |
| C12/13 | GPC | 9.697 | 10.250 | |
| C14/15 | GPC | 6.092 | 7.458 | |
| C16/17 | GPC | 4.283 | 5.959 | |
| C18/19 | GPC | 3.260 | 5.081 | |
| C20/24 | GPC | 5.195 | 9.617 | |
| C25/29 | GPC | 2.854 | 6.477 | |
| C30/39 | GPC | 2.817 | 8.159 | |
| C40/49 | GPC | 1.067 | 3.984 | |
| C50/74 | GPC | 0.572 | 2.969 | |
| C74/99 | GPC | 0.050 | 0.361 | |

DENSITIES (KG/M3) :
AT 15.0 C. DEGREES = 813.0
AT 32.0 C. DEGREES = 801.2
C11+ DENSITY = 866.8

MOLECULAR WEIGHT = 167.46
C11+ MOLECULAR WEIGHT = 257.67

VISCOSITIES (CPO) :
AT 15.0 C. DEGREES = 4,39
AT 32.0 C. DEGREES = 3,20

P. V. T. STUDY N° 84/2-31

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3/3 TEST 3B SEPARATOR OIL CALCULATED

FLUID 1 :
1 - 3 - 3 TEST 3B SURFACE HUILE CONTRACTION

FLUID 2 :
1/3 - 3 TEST 3B GAZ CONTRACTION

MOLAR GOR : 0.32329

| COMPONENTS | FLUID 1 | FLUID 2 | MIXTURE |
|---|---|---|---|
| N2 | 0.000 | 0.502 | 0.122 |
| CO2 | 0.000 | 1.891 | 0.459 |
| H2S | 0.000 | 0.000 | 0.000 |
| PSU | 0.000 | 0.000 | 0.000 |
| C1 | 0.000 | 24.840 | 6.068 |
| C2 | 0.273 | 25.045 | 6.325 |
| C3 | 1.860 | 25.638 | 7.668 |
| IC4 | 0.930 | 4.260 | 1.744 |
| NC4 | 3.791 | 10.714 | 5.483 |
| IC5 | 3.159 | 2.594 | 3.021 |
| NC5 | 3.797 | 2.586 | 3.501 |
| C6 | 10.449 | 1.382 | 8.212 |
| C7 | 11.045 | 0.324 | 8.426 |
| C8 | 9.576 | 0.216 | 7.289 |
| C9 | 6.485 | 0.108 | 4.927 |
| C10 | 4.350 | 0.000 | 3.288 |
| C11+ | 44.285 | 0.000 | 33.467 |

MIXTURE PROPERTIES

MIXTURE MOLECULAR WEIGHT : 135.94

**P. V. T. STUDY N° 84/2-41**

**COUNTRY :** NORWAY **FIELD :** 1/3 **WELL :** 1/3 - 3 **RESERVOIR :** T. 3 Bis

1/3/3 TEST 3B SEPARATOR OIL CALCULATED

FLUID 1 : 1 - 3 - 3 TEST 3B SURFACE HUILE CONTRACTION

FLUID 2 : 1/3 - 3 TEST 3B GAZ CONTRACTION

MOLAR GOR : 0.32329

| COMPONENTS | FLUID 1 | FLUID 2 | MIXTURE |
|---|---|---|---|
| Azote | 0.000 | 0.502 | 0.123 |
| Dioxyde de carbone | 0.000 | 1.881 | 0.460 |
| Methane | 0.000 | 24.841 | 6.069 |
| Ethane | 0.273 | 25.046 | 6.325 |
| Propane | 1.861 | 25.635 | 7.660 |
| Isobutane | 0.931 | 4.260 | 1.744 |
| Normal butane | 3.792 | 10.715 | 5.483 |
| 2-2 dimethylpropane | 0.000 | 0.025 | 0.006 |
| Isopentane | 2.637 | 2.569 | 2.620 |
| Normal pentane | 3.797 | 2.586 | 3.501 |
| 2-2 dimethyl butane | 0.069 | 0.025 | 0.059 |
| Cyclopentane | 0.523 | 0.000 | 0.395 |
| 2-3 dimethylbutane | 0.237 | 0.000 | 0.179 |
| 2 methyl pentane | 1.648 | 0.616 | 1.396 |
| 3 methylpentane | 0.993 | 0.211 | 0.802 |
| Normal hexane | 2.041 | 0.440 | 2.406 |
| Methylcyclopentane | 1.731 | 0.000 | 1.308 |
| 2-2 dimethylpentane | 0.163 | 0.000 | 0.123 |
| Benzene | 0.778 | 0.000 | 0.588 |
| 2-4 dimethylpentane | 0.065 | 0.000 | 0.049 |
| 3-3 dimethylpentane | 0.033 | 0.000 | 0.025 |
| Cyclohexane | 1.952 | 0.000 | 1.475 |
| 2 methylhexane | 0.887 | 0.000 | 0.671 |
| 1-1 dimethylcyclopentane | 0.179 | 0.000 | 0.135 |
| 2-3 dimethylpentane | 0.247 | 0.000 | 0.187 |
| 3 methylhexane | 0.922 | 0.000 | 0.697 |
| 1 trans 3 dimethylcyclopentane | 0.292 | 0.000 | 0.220 |
| 3 ethylpentane | 0.057 | 0.000 | 0.043 |
| 1 cis 3 dimethylcyclopentane | 0.290 | 0.000 | 0.219 |
| 1 trans 2 dimethylcyclopentane | 0.435 | 0.000 | 0.329 |
| Normal heptane | 2.573 | 0.324 | 2.024 |
| 1 cis 2 dimethylcyclopentane | 0.043 | 0.000 | 0.032 |
| 2-2 dimethylhexane | 0.069 | 0.000 | 0.052 |
| 1-1-3 trimethylcyclopentane | 0.133 | 0.000 | 0.100 |
| Methylcyclohexane | 3.089 | 0.000 | 2.334 |
| 2-5 dimethylhexane | 0.143 | 0.000 | 0.108 |
| 2-4 dimethylhexane | 0.143 | 0.000 | 0.108 |
| Ethylcyclopentane | 0.127 | 0.000 | 0.096 |
| 2-2-3 trimethylpentane | 0.009 | 0.000 | 0.007 |
| 1 t2 c4 trimethylcyclopentane | 0.134 | 0.000 | 0.102 |
| 3-3 dimethylhexane | 0.031 | 0.000 | 0.023 |
| Toluene | 1.627 | 0.000 | 1.229 |
| 1 t2 c3 trimethylcyclopentane | 0.140 | 0.000 | 0.106 |
| 2-3-4 trimethylpentane | 0.017 | 0.000 | 0.013 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3/3 TEST 3R SEPARATOR OIL CALCULATED

| COMPONENTS | FLUID 1 | FLUID 2 | MIXTURE |
|---|---|---|---|
| 2-3 dimethylhexane | 0.096 | 0.000 | 0.073 |
| 2 methyl 3 ethylpentane | 0.029 | 0.000 | 0.022 |
| 2 methylheptane | 0.825 | 0.000 | 0.624 |
| 1-2-2 trimethylcyclopentane | 0.040 | 0.000 | 0.030 |
| 4 methylheptane | 0.252 | 0.000 | 0.191 |
| 3 methylheptane | 0.609 | 0.000 | 0.460 |
| 3-4 dimethylhexane | 0.096 | 0.000 | 0.073 |
| 3 methyl 3 ethylpentane | 0.011 | 0.000 | 0.008 |
| 3 ethylhexane | 0.022 | 0.000 | 0.017 |
| 1 c2 c4 trimethylcyclopentane | 0.033 | 0.000 | 0.025 |
| 1 cis 3 dimethylcyclohexane | 0.452 | 0.000 | 0.342 |
| 1 trans 4 dimethylcyclohexane | 0.452 | 0.000 | 0.342 |
| 1 methyl trans 3 ethylcyclopentane | 0.134 | 0.000 | 0.101 |
| 1 methyl cis 3 ethylcyclopentane | 0.042 | 0.000 | 0.032 |
| 1 methyl trans 2 ethylcyclopentane | 0.042 | 0.000 | 0.032 |
| Cycloheptane | 0.015 | 0.000 | 0.011 |
| Normal octane | 1.917 | 0.216 | 1.502 |
| 1 trans 2 dimethylcyclohexane | 0.029 | 0.000 | 0.021 |
| 1 trans 3 dimethylcyclohexane | 0.310 | 0.000 | 0.235 |
| 1 cis 4 dimethylcyclohexane | 0.199 | 0.000 | 0.150 |
| 2-3-5 trimethylhexane | 0.014 | 0.000 | 0.011 |
| 2-2 dimethylheptane | 0.063 | 0.000 | 0.047 |
| 2-4 dimethylheptane | 0.108 | 0.000 | 0.082 |
| 1 methyl 4 ethylcyclopentane | 0.027 | 0.000 | 0.020 |
| 2-6 dimethylheptane | 0.192 | 0.000 | 0.145 |
| 1-1 dimethyl c3 ethylcyclopentane | 0.023 | 0.000 | 0.017 |
| 2-5 dimethyl heptane | 0.166 | 0.000 | 0.125 |
| Propylcyclopentane | 0.095 | 0.000 | 0.072 |
| 3-5 dimethylheptane | 0.057 | 0.000 | 0.043 |
| 3-3 dimethylheptane | 0.020 | 0.000 | 0.015 |
| Ethylbenzene | 0.304 | 0.000 | 0.230 |
| Ethylcyclohexane | 0.571 | 0.000 | 0.431 |
| Dimethylcyclohexane | 0.009 | 0.000 | 0.007 |
| 1-1-3 trimethylcyclohexane | 0.176 | 0.000 | 0.133 |
| 1-1-4 trimethylcyclohexane | 0.043 | 0.000 | 0.032 |
| 1 c3 c5 trimethylcyclohexane | 0.017 | 0.000 | 0.013 |
| Divers naphtenes en c9 | 0.636 | 0.000 | 0.481 |
| Para-xylene | 0.345 | 0.000 | 0.261 |
| Meta-xylene | 1.310 | 0.000 | 0.990 |
| 2-3 dimethylheptane | 0.049 | 0.000 | 0.037 |
| 3-4 dimethylheptane | 0.049 | 0.000 | 0.037 |
| 1 c3 t5 trimethylcyclohexane | 0.045 | 0.000 | 0.034 |
| 4 methyl octane | 0.256 | 0.000 | 0.193 |
| 2 methyl octane | 0.322 | 0.000 | 0.244 |
| 3 ethylheptane | 0.148 | 0.000 | 0.112 |
| 3 methyl octane | 0.356 | 0.000 | 0.269 |
| Ortho-xylene | 0.509 | 0.000 | 0.385 |
| 1 t2 c3 trimethylcyclohexane | 0.019 | 0.000 | 0.014 |
| 1 t2 c4 trimethylcyclohexane | 0.019 | 0.000 | 0.014 |
| 1-1-2 trimethylcyclohexane | 0.059 | 0.000 | 0.044 |
| Isopropylcyclohexane | 0.077 | 0.000 | 0.059 |

P.V.T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3/3 TEST 3B SEPARATOR OIL CALCULATED

| COMPONENTS | | FLUID 1 | FLUID 2 | MIXTURE |
|---|---|---|---|---|
| 1 c2 c4 trimethylcyclohexane | | 0.044 | 0.000 | 0.033 |
| 1 methyl t4 ethylcyclohexane | | 0.095 | 0.000 | 0.072 |
| 1 methyl c3 ethylcyclohexane | | 0.288 | 0.000 | 0.218 |
| Normal nonane | | 1.622 | 0.108 | 1.252 |
| Cumene | | 0.192 | 0.000 | 0.145 |
| 1 methyl c2 ethylcyclohexane | | 0.018 | 0.000 | 0.013 |
| 1 methyl t2 ethylcyclohexane | | 0.071 | 0.000 | 0.054 |
| 1 methyl 1 ethylcyclohexane | | 0.052 | 0.000 | 0.039 |
| 3-3-5 trimethylheptane | | 0.030 | 0.000 | 0.022 |
| 4-4 dimethyl octane | | 0.189 | 0.000 | 0.143 |
| 2-5 dimethyl octane | | 0.120 | 0.000 | 0.091 |
| Propylbenzene | | 0.091 | 0.000 | 0.069 |
| 2-6 dimethyl octane | | 0.357 | 0.000 | 0.269 |
| 2-3 dimethyl octane | | 0.067 | 0.000 | 0.051 |
| 3-4 dimethyl octane | | 0.025 | 0.000 | 0.019 |
| 4-5 dimethyl octane | | 0.076 | 0.000 | 0.058 |
| 1-3 ethyl toluene | | 0.337 | 0.000 | 0.255 |
| 1-4 ethyl toluene | | 0.139 | 0.000 | 0.105 |
| Tetramethylcyclohexane | | 0.039 | 0.000 | 0.030 |
| 5 methyl nonane | | 0.028 | 0.000 | 0.021 |
| 1-2 ethyl toluene | | 0.090 | 0.000 | 0.068 |
| 4 methyl nonane | | 0.312 | 0.000 | 0.236 |
| 2 methyl nonane | | 0.458 | 0.000 | 0.346 |
| 3 methyl nonane | | 0.211 | 0.000 | 0.159 |
| 1-2-4 trimethylbenzene | | 0.404 | 0.000 | 0.305 |
| Isobutylbenzene | | 0.155 | 0.000 | 0.117 |
| Normal decane | | 1.312 | 0.000 | 0.992 |
| 1-2-3 trimethylbenzene | | 0.215 | 0.000 | 0.162 |
| Divers naphtenes en c10 | | 0.881 | 0.000 | 0.666 |
| C11+ | | 44.280 | 0.000 | 33.462 |
| C11 | GPC | 8.393 | 0.000 | 6.342 |
| C12/13 | GPC | 9.697 | 0.000 | 7.328 |
| C14/15 | GPC | 6.092 | 0.000 | 4.604 |
| C16/17 | GPC | 4.283 | 0.000 | 3.237 |
| C18/19 | GPC | 3.260 | 0.000 | 2.463 |
| C20/24 | GPC | 5.195 | 0.000 | 3.926 |
| C25/29 | GPC | 2.854 | 0.000 | 2.157 |
| C30/39 | GPC | 2.817 | 0.000 | 2.129 |
| C40/49 | GPC | 1.067 | 0.000 | 0.807 |
| C50/74 | GPC | 0.572 | 0.000 | 0.432 |
| C74/99 | GPC | 0.050 | 0.000 | 0.038 |

MIXTURE PROPERTIES

MOLECULAR WEIGHT = 135.84

C11+ MOLECULAR WEIGHT = 257.67

PVT STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T: 3 Bis

## TANK LIQUID STUDY

ATMOSPHERIC PRESSURE 760 mm Hg

TANK TEMPERATURE 32 °C

| CHEMICAL DISTRIBUTION | % VOLUME ASTM NORM | % WEIGHT |
|---|---|---|
| PARAFFINES | | 58,65 |
| MONOCYCLOPARAFFINES | | 21,18 |
| ALKYLBENZENES | | 4,97 |
| DICYCLOPARAFFINES | | 9,39 |
| TRICYCLOPARAFFINES | | |
| INDANES | | 1,34 |
| NAPHTALENES | | 3,54 |
| BENZOTHIOPHENES | | 0,93 |

| DISTAM DISTILLATION | | |
|---|---|---|
| | CUMULATIVE VOLUME % | TEMPERATURE % |
| IP | 2,44 | 15 |
| | 5 | 43 |
| | 10 | 82 |
| | 20 | 121 |
| | 30 | 162 |
| | 40 | 217 |
| | 50 | 283 |
| FP | 59,07 | 375 |

### AVERAGE CHARACTERISTICS

**DENSITY**

| | | |
|---|---|---|
| At tank temp. | 802,3 | Kg / m³ |
| AT 15 °C | 814,1 | * Kg / m³ |

**MOLECULAR WEIGHT** 168,90

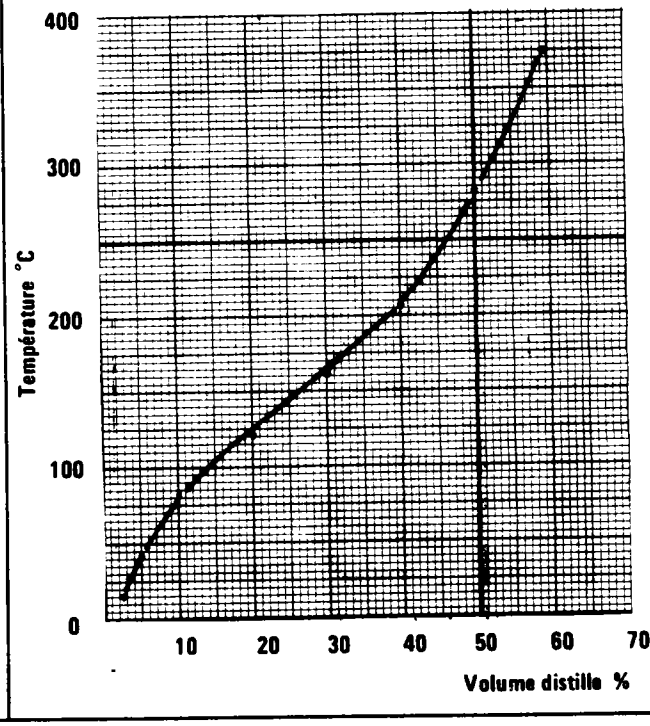
**VISCOSITY**

| | | |
|---|---|---|
| At tank temp. | 2,58 | CPo |
| AT 15 C | 3,42 | * CPo |

**C11+ CHARACTERISTICS**

| | | |
|---|---|---|
| DENSITY | 866,1 | * Kg / m³ |
| MOLECULAR WEIGHT | 256,58 | * |

### DISTILLATION CURVE




REMARKS

**P. V. T. STUDY N° 84/2-41**

**COUNTRY :** NORWAY **FIELD :** 1/3 **WELL :** 1/3 - 3 **RESERVOIR :** T. 3 Bis

1 - 3 - 3 TEST 3P SURFACE STORAGE OIL

| COMPO-NENTS | MOLE % | WEIGHT % | VOLUME % | MOLECULAR WEIGHTS | DENSITIES (KG/M3) |
|---|---|---|---|---|---|
| N2 | 0.000 | 0.000 | 0.000 | 28.01 | 345.0 |
| CO2 | 0.000 | 0.000 | 0.000 | 44.01 | 501.0 |
| H2S | 0.000 | 0.000 | 0.000 | 34.08 | 993.0 |
| RSH | 0.000 | 0.000 | 0.000 | 48.11 | 866.0 |
| C1 | 0.000 | 0.000 | 0.000 | 16.04 | 300.0 |
| C2 | 0.081 | 0.014 | 0.031 | 30.07 | 377.0 |
| C3 | 1.271 | 0.332 | 0.532 | 44.10 | 508.0 |
| IC4 | 0.880 | 0.303 | 0.438 | 58.12 | 563.0 |
| NC4 | 3.757 | 1.293 | 1.802 | 58.12 | 584.0 |
| IC5 | 3.261 | 1.387 | 1.759 | 71.83 | 641.0 |
| NC5 | 3.918 | 1.674 | 2.159 | 72.15 | 631.0 |
| C6 | 10.574 | 5.313 | 6.099 | 84.87 | 709.1 |
| C7 | 11.109 | 6.459 | 7.099 | 98.21 | 740.8 |
| C8 | 9.525 | 6.290 | 6.712 | 111.53 | 762.0 |
| C9 | 5.951 | 4.442 | 4.734 | 126.08 | 764.0 |
| C10 | 4.330 | 3.618 | 3.892 | 141.10 | 756.6 |
| C11+ | 45.343 | 68.875 | 64.743 | 256.58 | 866.1 |

DENSITIES (KG/M3) :
AT 15.0 C. DEGREES = 814.1
AT 32.0 C. DEGREES = 802.3

MOLECULAR WEIGHT : 168.90

VISCOSITIES (CPO) :
AT 15.0 C. DEGREES = 3,42
AT 32.0 C. DEGREES = 2,58

P.V.T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1 - 3 - 3 TEST 3B SURFACE STORAGE OIL

| COMPONENTS | MOLE % | WEIGHT % | VOLUME % |
|---|---|---|---|
| Ethane | 0.082 | 0.015 | 0.031 |
| Propane | 1.272 | 0.332 | 0.532 |
| Isobutane | 0.881 | 0.303 | 0.438 |
| Normal butane | 3.757 | 1.293 | 1.802 |
| Isopentane | 2.734 | 1.168 | 1.521 |
| Normal pentane | 3.919 | 1.674 | 2.160 |
| 2-2 dimethyl butane | 0.071 | 0.036 | 0.045 |
| Cyclopentane | 0.527 | 0.219 | 0.238 |
| 2-3 dimethylbutane | 0.239 | 0.122 | 0.149 |
| 2 methyl pentane | 1.680 | 0.857 | 1.060 |
| 3 methylpentane | 1.007 | 0.514 | 0.625 |
| Normal hexane | 3.081 | 1.572 | 1.927 |
| Methylcyclopentane | 1.744 | 0.869 | 0.940 |
| 2-2 dimethylpentane | 0.169 | 0.100 | 0.120 |
| Benzene | 0.791 | 0.366 | 0.337 |
| 2-4 dimethylpentane | 0.065 | 0.038 | 0.046 |
| 3-3 dimethylpentane | 0.034 | 0.020 | 0.023 |
| Cyclohexane | 1.961 | 0.977 | 1.016 |
| 2 methylhexane | 0.892 | 0.529 | 0.631 |
| 1-1 dimethylcyclopentane | 0.179 | 0.104 | 0.112 |
| 2-3 dimethylpentane | 0.248 | 0.147 | 0.171 |
| 3 methylhexane | 0.924 | 0.548 | 0.646 |
| 1 trans 3 dimethylcyclopentane | 0.291 | 0.169 | 0.183 |
| 3 ethylpentane | 0.056 | 0.033 | 0.039 |
| 1 cis 3 dimethylcyclopentane | 0.291 | 0.169 | 0.183 |
| 1 trans 2 dimethylcyclopentane | 0.435 | 0.253 | 0.272 |
| Normal heptane | 2.621 | 1.555 | 1.840 |
| 1 cis 2 dimethylcyclopentane | 0.043 | 0.025 | 0.026 |
| 2-2 dimethylhexane | 0.068 | 0.046 | 0.054 |
| 1-1-3 trimethylcyclopentane | 0.132 | 0.088 | 0.095 |
| Methylcyclohexane | 3.103 | 1.804 | 1.897 |
| 2-5 dimethylhexane | 0.144 | 0.097 | 0.113 |
| 2-4 dimethylhexane | 0.144 | 0.097 | 0.112 |
| Ethylcyclopentane | 0.128 | 0.074 | 0.079 |
| 1 t2 c4 trimethylcyclopentane | 0.135 | 0.090 | 0.097 |
| 3-3 dimethylhexane | 0.032 | 0.021 | 0.024 |
| Toluene | 1.633 | 0.891 | 0.832 |
| 1 t2 c3 trimethylcyclopentane | 0.146 | 0.097 | 0.104 |
| 2-3 dimethylhexane | 0.097 | 0.065 | 0.074 |
| 2 methylheptane | 0.827 | 0.559 | 0.648 |
| 1-2-2 trimethylcyclopentane | 0.040 | 0.027 | 0.028 |
| 4 methylheptane | 0.254 | 0.172 | 0.197 |
| 3 methylheptane | 0.610 | 0.413 | 0.473 |
| 3-4 dimethylhexane | 0.097 | 0.065 | 0.074 |
| 1 c2 c4 trimethylcyclopentane | 0.034 | 0.022 | 0.023 |
| 1 cis 3 dimethylcyclohexane | 0.454 | 0.301 | 0.319 |
| 1 trans 4 dimethylcyclohexane | 0.454 | 0.301 | 0.320 |
| 1 methyl trans 3 ethylcyclopentane | 0.135 | 0.090 | 0.095 |
| 1 methyl cis 3 ethylcyclopentane | 0.042 | 0.028 | 0.029 |
| 1 methyl trans 2 ethylcyclopentane | 0.042 | 0.028 | 0.029 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1 - 3 - 3 TEST 3B SURFACE STORAGE OIL

| COMPONENTS | MOLE % | WEIGHT % | VOLUME % |
|---|---|---|---|
| Normal octane | 1.921 | 1.299 | 1.496 |
| 1 trans 2 dimethylcyclohexane | 0.028 | 0.018 | 0.019 |
| 1 trans 3 dimethylcyclohexane | 0.312 | 0.207 | 0.214 |
| 1 cis 4 dimethylcyclohexane | 0.200 | 0.133 | 0.138 |
| 2-2 dimethylheptane | 0.057 | 0.043 | 0.049 |
| 2-4 dimethylheptane | 0.109 | 0.083 | 0.095 |
| 1 methyl 4 ethylcyclopentane | 0.027 | 0.018 | 0.019 |
| 2-6 dimethylheptane | 0.192 | 0.146 | 0.167 |
| 1-1 dimethyl c3 ethylcyclopentane | 0.022 | 0.015 | 0.016 |
| 2-5 dimethyl heptane | 0.167 | 0.127 | 0.143 |
| Propylocyclopentane | 0.096 | 0.064 | 0.066 |
| 3-5 dimethylheptane | 0.058 | 0.044 | 0.049 |
| 3-3 dimethylheptane | 0.022 | 0.016 | 0.019 |
| Ethylbenzene | 0.305 | 0.192 | 0.179 |
| Ethylcyclohexane | 0.574 | 0.381 | 0.392 |
| Dimethylcyclohexane | 0.010 | 0.007 | 0.007 |
| 1-1-3 trimethylcyclohexane | 0.178 | 0.133 | 0.137 |
| 1-1-4 trimethylcyclohexane | 0.042 | 0.031 | 0.032 |
| 1 c3 c5 trimethylcyclohexane | 0.019 | 0.014 | 0.014 |
| Divers naphtenes en c9 | 0.506 | 0.378 | 0.385 |
| Para-xylene | 0.348 | 0.219 | 0.206 |
| Meta-xylene | 1.314 | 0.826 | 0.774 |
| 2-3 dimethylheptane | 0.049 | 0.037 | 0.042 |
| 3-4 dimethylheptane | 0.049 | 0.037 | 0.041 |
| 1 c3 t5 trimethylcyclohexane | 0.045 | 0.034 | 0.035 |
| 4 methyl octane | 0.258 | 0.196 | 0.220 |
| 2 methyl octane | 0.324 | 0.246 | 0.279 |
| 3 ethylheptane | 0.149 | 0.113 | 0.126 |
| 3 methyl octane | 0.356 | 0.270 | 0.304 |
| Ortho-xylene | 0.511 | 0.321 | 0.295 |
| 1 t2 c3 trimethylcyclohexane | 0.013 | 0.009 | 0.010 |
| 1 t2 c4 trimethylcyclohexane | 0.013 | 0.009 | 0.010 |
| 1-1-2 trimethylcyclohexane | 0.028 | 0.021 | 0.021 |
| Isopropylcyclohexane | 0.050 | 0.038 | 0.040 |
| 1 c2 c4 trimethylcyclohexane | 0.013 | 0.010 | 0.010 |
| 1 methyl t4 ethylcyclohexane | 0.031 | 0.023 | 0.024 |
| 1 methyl c3 ethylcyclohexane | 0.241 | 0.180 | 0.184 |
| Normal nonane | 1.588 | 1.206 | 1.360 |
| Cumene | 0.177 | 0.126 | 0.118 |
| 1 methyl c2 ethylcyclohexane | 0.018 | 0.013 | 0.014 |
| 1 methyl t2 ethylcyclohexane | 0.076 | 0.057 | 0.058 |
| 1 methyl 1 ethylcyclohexane | 0.055 | 0.041 | 0.041 |
| 3-3-5 trimethylheptane | 0.030 | 0.025 | 0.028 |
| 4-4 dimethyl octane | 0.191 | 0.161 | 0.178 |
| 2-5 dimethyl octane | 0.121 | 0.102 | 0.114 |
| Propylbenzene | 0.090 | 0.064 | 0.060 |
| 2-6 dimethyl octane | 0.357 | 0.301 | 0.336 |
| 2-3 dimethyl octane | 0.067 | 0.056 | 0.062 |
| 3-4 dimethyl octane | 0.026 | 0.022 | 0.023 |
| 4-5 dimethyl octane | 0.076 | 0.064 | 0.070 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1 - 3 - 3 TEST 3B SURFACE STORAGE OIL

| COMPONENTS | | MOLE % | WEIGHT % | VOLUME % |
|---|---|---|---|---|
| 1-3 ethyl toluene | | 0.337 | 0.240 | 0.225 |
| 1-4 ethyl toluene | | 0.137 | 0.097 | 0.091 |
| Tetramethylcyclohexane | | 0.038 | 0.032 | 0.032 |
| 5 methyl nonane | | 0.027 | 0.023 | 0.025 |
| 1-2 ethyl toluene | | 0.093 | 0.066 | 0.061 |
| 4 methyl nonane | | 0.311 | 0.262 | 0.290 |
| 2 methyl nonane | | 0.462 | 0.389 | 0.433 |
| 3 methyl nonane | | 0.210 | 0.177 | 0.196 |
| 1-2-4 trimethylbenzene | | 0.402 | 0.286 | 0.265 |
| Isobutylbenzene | | 0.154 | 0.123 | 0.116 |
| Normal decane | | 1.300 | 1.095 | 1.214 |
| 1-2-3 trimethylbenzene | | 0.077 | 0.055 | 0.050 |
| Divers naphtenes en c10 | | 0.867 | 0.720 | 0.715 |
| C11+ ********** | | 45.337 | 68.873 | 64.730 |
| C11 | GPC | 8.635 | 7.975 | |
| C12-/13 | GPC | 10.068 | 10.551 | |
| C14/15 | GPC | 6.225 | 7.555 | |
| C16/17 | GPC | 4.393 | 6.061 | |
| C18/19 | GPC | 3.311 | 5.117 | |
| C20/24 | GPC | 5.257 | 9.649 | |
| C25/29 | GPC | 2.911 | 6.550 | |
| C30/39 | GPC | 2.861 | 8.216 | |
| C40/49 | GPC | 1.057 | 3.912 | |
| C50/74 | GPC | 0.564 | 2.906 | |
| C74/99 | GPC | 0.053 | 0.379 | |

DENSITIES (KG/M3) :
AT 15.0 C. DEGREES = 814.1
AT 32.0 C. DEGREES = 802.3
C11+ DENSITY = 866.1

MOLECULAR WEIGHT = 168.90
C11+ MOLECULAR WEIGHT = 256.58

VISCOSITIES (CPO) :
AT 15.0 C. DEGREES = 3,42
AT 32.0 C. DEGREES = 2,58

# 4 - SEPARATOR FLUIDS

## RECOMBINATION

PVT STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

## CALCULATION OF SEPARATOR FLUIDS RECOMBINATION

### I LIQUID FLOW

| | | | |
|---|---|---|---|
| Separator liquid flow (flowmeter) | | - | m3/day |
| Tank liquid flow at Tank P and T | | - | 3/day |
| Shrinkage factor | $\frac{\text{Tank liquid at tank P and T}}{\text{Separator liquid (flowmeter)}}$ | - | |
| Separator liquid flow at Separator P and T | | 146,4 | m3/day |
| Contraction factor | $\frac{\text{Tank liquid at tank P and T}}{\text{Separator liquid at Sep. P and T}}$ | 0,8603 | |

### II GAS FLOW

| VALUES | IN THE FIELD | CORRECTED IN THE LABORATORY $\sqrt{\frac{Z\ field}{Z\ lab.} \times \frac{d\ field}{d\ lab.}} = Ct.$ |
|---|---|---|
| Utilized Z | 0,9481 | 0,9384 |
| Utilized d | 0,820 | 0,818 |
| Calculated flow in m3/day at 15/750 | 27461,3 | 27636,6 |

### III SEPARATOR GOR

| MEASURED IN THE FIELD | | | CORRECTED IN THE LABORATORY | | |
|---|---|---|---|---|---|
| $\frac{\text{Sep. gas at } 15/750}{\text{Sep. liquid (flowmeter)}}$ | 187,58 | m3/m3 | $\frac{\text{Sep. gas at } 15/750}{\text{Sep. liquid at P and T}}$ | 188,77 | m3/m3 |

### IV VOLUMES INTRODUCED INTO CELL.

| | | |
|---|---|---|
| Liquid volume at separator P and Temp | 233,407 | cm3 |
| Equivalent gram-moles of liquid | 1,2732 | |
| Separator gas at 15/750 | 44060,239 | cm3 |
| Equivalent gram-moles of gas | 1,83885 | |
| Reservoir fluid at bottom hole P and T | 355,392 | cm3 |

### V RECAPITULATION

| STAGES | PRESSURE BARS | TEMP. °C | LIQUID VOLUME AT P AND T | VOLUME FACTOR | | GOR WITH RESPECT TO LIQUID | |
|---|---|---|---|---|---|---|---|
| | | | | | | STAGE | T. 15° C |
| Bottom hole cond. | 606,3 | 165 | 355,392 | 1,7699 | 1,7958 | | |
| Separator | 24,5 | 62,2 | 233,407 | 1,1624 | 1,1794 | 188,77 | 222,63 |
| Tank | AP | 32 | 200,800 | 1 | 1,0146 | 37,11 | |
| | AP | 15° C | 197,906 | 0,9856 | 1 | | 37,66 |
| | | | | | TOTAL GOR | | 260,29 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3B RESERVOIR FLUID CALCULATED

FLUID 1 :
1/3/3 TEST 3B SEPARATOR OIL CALCULATED

FLUID 2 :
1/3 - 3 TEST 3B GAZ SEPARATEUR MOYEN

MOLAR GOR : 1.44427

| COMPONENTS | FLUID 1 | FLUID 2 | MIXTURE |
|---|---|---|---|
| N2 | 0.122 | 1.505 | 0.939 |
| CO2 | 0.459 | 2.770 | 1.824 |
| H2S | 0.000 | 0.000 | 0.000 |
| RSH | 0.000 | 0.000 | 0.000 |
| C1 | 6.068 | 65.275 | 41.058 |
| C2 | 6.325 | 18.099 | 13.282 |
| C3 | 7.668 | 8.525 | 8.174 |
| IC4 | 1.744 | 0.919 | 1.256 |
| NC4 | 5.483 | 2.017 | 3.435 |
| IC5 | 3.021 | 0.363 | 1.450 |
| NC5 | 3.501 | 0.351 | 1.639 |
| C6 | 8.212 | 0.152 | 3.449 |
| C7 | 8.426 | 0.012 | 3.454 |
| C8 | 7.289 | 0.008 | 2.987 |
| C9 | 4.927 | 0.004 | 2.018 |
| C10 | 3.288 | 0.000 | 1.345 |
| C11+ | 33.467 | 0.000 | 13.690 |

MIXTURE PROPERTIES

MIXTURE MOLECULAR WEIGHT : 69.58

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3B RESERVOIR FLUID CALCULATED

FLUID 1 : 1/3/3 TEST 3B SEPARATOR OIL CALCULATED

FLUID 2 : 1/3 - 3 TEST 3B GAZ SEPARATEUR MOYEN

MOLAR GOR : 1.44427

| COMPONENTS | FLUID 1 | FLUID 2 | MIXTURE |
|---|---|---|---|
| Azote | 0.123 | 1.505 | 0.940 |
| Dioxyde de carbone | 0.460 | 2.770 | 1.825 |
| Methane | 6.069 | 65.272 | 41.051 |
| Ethane | 6.325 | 18.099 | 13.282 |
| Propane | 7.669 | 8.525 | 8.175 |
| Isobutane | 1.744 | 0.919 | 1.257 |
| Normal butane | 5.483 | 2.018 | 3.436 |
| 2-2 dimethylpropane | 0.006 | 0.000 | 0.003 |
| Isopentane | 2.620 | 0.363 | 1.287 |
| Normal pentane | 3.501 | 0.351 | 1.640 |
| 2-2 dimethyl butane | 0.059 | 0.001 | 0.025 |
| Cyclopentane | 0.395 | 0.000 | 0.162 |
| 2-3 dimethylbutane | 0.179 | 0.000 | 0.073 |
| 2 methyl pentane | 1.396 | 0.070 | 0.612 |
| 3 methylpentane | 0.802 | 0.023 | 0.342 |
| Normal hexane | 2.406 | 0.058 | 1.018 |
| Methylcyclopentane | 1.308 | 0.000 | 0.535 |
| 2-2 dimethylpentane | 0.123 | 0.000 | 0.050 |
| Benzene | 0.588 | 0.000 | 0.241 |
| 2-4 dimethylpentane | 0.049 | 0.000 | 0.020 |
| 3-3 dimethylpentane | 0.025 | 0.000 | 0.010 |
| Cyclohexane | 1.475 | 0.000 | 0.603 |
| 2 methylhexane | 0.671 | 0.000 | 0.274 |
| 1-1 dimethylcyclopentane | 0.135 | 0.000 | 0.055 |
| 2-3 dimethylpentane | 0.187 | 0.000 | 0.076 |
| 3 methylhexane | 0.697 | 0.000 | 0.285 |
| 1 trans 3 dimethylcyclopentane | 0.220 | 0.000 | 0.090 |
| 3 ethylpentane | 0.043 | 0.000 | 0.018 |
| 1 cis 3 dimethylcyclopentane | 0.219 | 0.000 | 0.090 |
| 1 trans 2 dimethylcyclopentane | 0.329 | 0.000 | 0.134 |
| Normal heptane | 2.024 | 0.012 | 0.835 |
| 1 cis 2 dimethylcyclopentane | 0.032 | 0.000 | 0.013 |
| 2-2 dimethylhexane | 0.052 | 0.000 | 0.021 |
| 1-1-3 trimethylcyclopentane | 0.100 | 0.000 | 0.041 |
| Methylcyclohexane | 2.334 | 0.000 | 0.955 |
| 2-5 dimethylhexane | 0.108 | 0.000 | 0.044 |
| 2-4 dimethylhexane | 0.108 | 0.000 | 0.044 |
| Ethylcyclopentane | 0.096 | 0.000 | 0.039 |
| 2-2-3 trimethylpentane | 0.007 | 0.000 | 0.003 |
| 1 t2 c4 trimethylcyclopentane | 0.102 | 0.000 | 0.042 |
| 3-3 dimethylhexane | 0.023 | 0.000 | 0.010 |
| Toluene | 1.229 | 0.000 | 0.503 |
| 1 t2 c3 trimethylcyclopentane | 0.106 | 0.000 | 0.043 |
| 2-3-4 trimethylpentane | 0.013 | 0.000 | 0.005 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3B RESERVOIR FLUID CALCULATED

| COMPONENTS | FLUID 1 | FLUID 2 | MIXTURE |
|---|---|---|---|
| 2-3 dimethylhexane | 0.073 | 0.000 | 0.030 |
| 2 methyl 3 ethylpentane | 0.022 | 0.000 | 0.009 |
| 2 methylheptane | 0.624 | 0.000 | 0.255 |
| 1-2-2 trimethylcyclopentane | 0.030 | 0.000 | 0.012 |
| 4 methylheptane | 0.191 | 0.000 | 0.078 |
| 3 methylheptane | 0.460 | 0.000 | 0.188 |
| 3-4 dimethylhexane | 0.073 | 0.000 | 0.030 |
| 3 methyl 3 ethylpentane | 0.008 | 0.000 | 0.003 |
| 3 ethylhexane | 0.017 | 0.000 | 0.007 |
| 1 c2 c4 trimethylcyclopentane | 0.025 | 0.000 | 0.010 |
| 1 cis 3 dimethylcyclohexane | 0.342 | 0.000 | 0.140 |
| 1 trans 4 dimethylcyclohexane | 0.342 | 0.000 | 0.140 |
| 1 methyl trans 3 ethylcyclopentane | 0.101 | 0.000 | 0.041 |
| 1 methyl cis 3 ethylcyclopentane | 0.032 | 0.000 | 0.013 |
| 1 methyl trans 2 ethylcyclopentane | 0.032 | 0.000 | 0.013 |
| Cycloheptane | 0.011 | 0.000 | 0.005 |
| Normal octane | 1.502 | 0.008 | 0.619 |
| 1 trans 2 dimethylcyclohexane | 0.021 | 0.000 | 0.009 |
| 1 trans 3 dimethylcyclohexane | 0.235 | 0.000 | 0.096 |
| 1 cis 4 dimethylcyclohexane | 0.150 | 0.000 | 0.061 |
| 2-3-5 trimethylhexane | 0.011 | 0.000 | 0.004 |
| 2-2 dimethylheptane | 0.047 | 0.000 | 0.019 |
| 2-4 dimethylheptane | 0.082 | 0.000 | 0.033 |
| 1 methyl 4 ethylcyclopentane | 0.020 | 0.000 | 0.008 |
| 2-6 dimethylheptane | 0.145 | 0.000 | 0.059 |
| 1-1 dimethyl c3 ethylcyclopentane | 0.017 | 0.000 | 0.007 |
| 2-5 dimethyl heptane | 0.125 | 0.000 | 0.051 |
| Propylocyclopentane | 0.072 | 0.000 | 0.029 |
| 3-5 dimethylheptane | 0.043 | 0.000 | 0.018 |
| 3-3 dimethylheptane | 0.015 | 0.000 | 0.006 |
| Ethylbenzene | 0.230 | 0.000 | 0.094 |
| Ethylcyclohexane | 0.431 | 0.000 | 0.176 |
| Dimethylcyclohexane | 0.007 | 0.000 | 0.003 |
| 1-1-3 trimethylcyclohexane | 0.133 | 0.000 | 0.055 |
| 1-1-4 trimethylcyclohexane | 0.032 | 0.000 | 0.013 |
| 1 c3 c5 trimethylcyclohexane | 0.013 | 0.000 | 0.005 |
| Divers naphtenes en c9 | 0.481 | 0.000 | 0.197 |
| Para-xylene | 0.261 | 0.000 | 0.107 |
| Meta-xylene | 0.990 | 0.000 | 0.405 |
| 2-3 dimethylheptane | 0.037 | 0.000 | 0.015 |
| 3-4 dimethylheptane | 0.037 | 0.000 | 0.015 |
| 1 c3 t5 trimethylcyclohexane | 0.034 | 0.000 | 0.014 |
| 4 methyl octane | 0.193 | 0.000 | 0.079 |
| 2 methyl octane | 0.244 | 0.000 | 0.100 |
| 3 ethylheptane | 0.112 | 0.000 | 0.046 |
| 3 methyl octane | 0.269 | 0.000 | 0.110 |
| Ortho-xylene | 0.385 | 0.000 | 0.158 |
| 1 t2 c3 trimethylcyclohexane | 0.014 | 0.000 | 0.006 |
| 1 t2 c4 trimethylcyclohexane | 0.014 | 0.000 | 0.006 |
| 1-1-2 trimethylcyclohexane | 0.044 | 0.000 | 0.018 |
| Isopropylcyclohexane | 0.059 | 0.000 | 0.024 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3B RESERVOIR FLUID CALCULATED

| COMPONENTS | | FLUID 1 | FLUID 2 | MIXTURE |
|---|---|---|---|---|
| 1 c2 c4 trimethylcyclohexane | | 0.033 | 0.000 | 0.014 |
| 1 methyl t4 ethylcyclohexane | | 0.072 | 0.000 | 0.029 |
| 1 methyl c3 ethylcyclohexane | | 0.218 | 0.000 | 0.089 |
| Normal nonane | | 1.252 | 0.004 | 0.515 |
| Cumene | | 0.145 | 0.000 | 0.059 |
| 1 methyl c2 ethylcyclohexane | | 0.013 | 0.000 | 0.005 |
| 1 methyl t2 ethylcyclohexane | | 0.054 | 0.000 | 0.022 |
| 1 methyl 1 ethylcyclohexane | | 0.039 | 0.000 | 0.016 |
| 3-3-5 trimethylheptane | | 0.022 | 0.000 | 0.009 |
| 4-4 dimethyl octane | | 0.143 | 0.000 | 0.059 |
| 2-5 dimethyl octane | | 0.091 | 0.000 | 0.037 |
| Propylbenzene | | 0.069 | 0.000 | 0.028 |
| 2-6 dimethyl octane | | 0.269 | 0.000 | 0.110 |
| .2-3 dimethyl octane | | 0.051 | 0.000 | 0.021 |
| 3-4 dimethyl octane | | 0.019 | 0.000 | 0.008 |
| 4-5 dimethyl octane | | 0.058 | 0.000 | 0.024 |
| 1-3 ethyl toluene | | 0.255 | 0.000 | 0.104 |
| 1-4 ethyl toluene | | 0.105 | 0.000 | 0.043 |
| Tetramethylcyclohexane | | 0.030 | 0.000 | 0.012 |
| 5 methyl nonane | | 0.021 | 0.000 | 0.009 |
| 1-2 ethyl toluene | | 0.068 | 0.000 | 0.028 |
| 4 methyl nonane | | 0.236 | 0.000 | 0.096 |
| 2 methyl nonane | | 0.346 | 0.000 | 0.142 |
| 3 methyl nonane | | 0.159 | 0.000 | 0.065 |
| 1-2-4 trimethylbenzene | | 0.305 | 0.000 | 0.125 |
| Isobutylbenzene | | 0.117 | 0.000 | 0.048 |
| Normal decane | | 0.992 | 0.000 | 0.406 |
| 1-2-3 trimethylbenzene | | 0.162 | 0.000 | 0.066 |
| Divers naphtenes en c10 | | 0.666 | 0.000 | 0.272 |
| C11+ ********** | | 33.462 | 0.000 | 13.690 |
| C11 | GPC | 6.342 | 0.000 | 2.595 |
| C12/13 | GPC | 7.328 | 0.000 | 2.998 |
| C14/15 | GPC | 4.604 | 0.000 | 1.883 |
| C16/17 | GPC | 3.237 | 0.000 | 1.324 |
| C18/19 | GPC | 2.463 | 0.000 | 1.008 |
| C20/24 | GPC | 3.926 | 0.000 | 1.606 |
| C25/29 | GPC | 2.157 | 0.000 | 0.882 |
| C30/39 | GPC | 2.129 | 0.000 | 0.871 |
| C40/49 | GPC | 0.807 | 0.000 | 0.330 |
| C50/74 | GPC | 0.432 | 0.000 | 0.177 |
| C74/99 | GPC | 0.038 | 0.000 | 0.015 |

MIXTURE PROPERTIES

MOLECULAR WEIGHT = 69.58

C11+ MOLECULAR WEIGHT = 257.67

# 5 - SEPARATION TEST

- PROCESS SEPARATION TEST

PVT STUDY N° 84/2-41

COUNTRY: NORWAY FIELD: 1/3 WELL: 1/3 - 3 RESERVOIR: T. 3 Bis

## REFERENCE SEPARATION TEST

| STAGES | PRESSURES BARS | TEMP. °C | OIL VOLUME AT P AND T | VOLUME FACTOR | | GOR WITH RESPECT TO OIL | |
|---|---|---|---|---|---|---|---|
| | | | | | | STAGE | 15° C |
| BOTTOM HOLE COND. | | | | | | | |
| ATMOSPHERE | | 15° C | | | 1 | | |

NOT PERFORMED

## PROCESS SEPARATION TEST

| STAGES | PRESSURES BARS | TEMP. °C | OIL VOLUME AT P AND T | VOLUME FACTOR | | GOR WITH RESPECT TO OIL | |
|---|---|---|---|---|---|---|---|
| | | | | | | STAGE | 15° C |
| BOTTOM HOLE COND. | 606,3 | 165 | 154,769 | 1,7291 | 1,7972 | | |
| HP SEPARATOR | 26 | 60 | 133,501 | 1,4915 | 1,5503 | 97,74 | 151,52 |
| LP SEPARATOR | 8 | 60 | 96,677 | 1,0801 | 1,1226 | 95,86 | 107,62 |
| TANK | AP<br>AP | 60<br>15° C | 89,509<br>86,115 | 1<br>0,9621 | 1,0394<br>1 | 0,83 | 0,86 |
| | | | | TOTAL GOR : | | | 260,00 |

PVT STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

## PROCESS SEPARATION TEST

GAS ANALYSIS % MOLAR COMPOSITION

| COMPONANTS | SEPARATOR GAS H.P | SEPARATOR GAS B.P. | STORAGE GAS |
|---|---|---|---|
| N2 | 1,456 | 0,940 | 0,040 |
| Co2 | 2,519 | 2,352 | 1,253 |
| SH2 | - | - | - |
| RSH | - | - | - |
| C1 | 68,271 | 45,850 | 12,092 |
| C2 | 16,525 | 24,786 | 25,080 |
| C3 | 7,531 | 16,424 | 34,000 |
| IC4 | 0,824 | 2,069 | 5,903 |
| NC4 | 1,835 | 4,710 | 14,384 |
| IC5 | 0,384 | 1,356 | 3,164 |
| NC5 | 0,393 | 1,222 | 2,816 |
| C6 | 0,211 | 0,117 | 0,758 |
| $C7^+$ | 0,051 | 0,174 | 0,510 |
| AVERAGE CHARACTERISTICS | | | |
| SPECIFIC GRAVITY (AIR = 1) | 0,7676 | 1,0164 | 1,4623 |
| DENSITY | | | |
| · AT 15 / 750 kg / $m^3$ | 0,9642 | 1,2288 | 1,7678 |
| · AT 0 / 760 kg / $m^3$ | 1,0307 | 1,3135 | 1,8897 |
| MOLECULAR WEIGHT | 23,10 | 29,44 | 42,36 |
| PCS KJ/STD M3 | 47984,93 | 60983,23 | 88010,70 |
| CONTENT g / $m^3$ at 15 / 750 | | | |
| $C3^+$ | 236,491 | 556,595 | 1348,559 |
| $C4^+$ | 97,872 | 254,289 | 722,832 |
| $C5^+$ | 33,361 | 89,830 | 230,717 |
| $C6^+$ | 9,936 | 11,376 | 49,513 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3 BIS PROCESS TEST OIL

| COMPO-NENTS | MOLE % | WEIGHT % | VOLUME % | MOLECULAR WEIGHTS | DENSITIES (KG/M3) |
|---|---|---|---|---|---|
| N2 | 0.000 | 0.000 | 0.000 | 28.01 | 345.0 |
| CO2 | 0.000 | 0.000 | 0.000 | 44.01 | 501.0 |
| H2S | 0.000 | 0.000 | 0.000 | 34.08 | 993.0 |
| RSH | 0.000 | 0.000 | 0.000 | 48.11 | 866.0 |
| C1 | 0.000 | 0.000 | 0.000 | 16.04 | 300.0 |
| C2 | 0.121 | 0.021 | 0.047 | 30.07 | 377.0 |
| C3 | 1.443 | 0.381 | 0.611 | 44.10 | 508.0 |
| IC4 | 0.859 | 0.299 | 0.432 | 58.12 | 563.0 |
| NC4 | 3.575 | 1.244 | 1.736 | 58.12 | 584.0 |
| IC5 | 3.100 | 1.333 | 1.690 | 71.81 | 642.6 |
| NC5 | 3.701 | 1.599 | 2.065 | 72.15 | 631.0 |
| C6 | 10.472 | 5.320 | 6.107 | 84.86 | 709.9 |
| C7 | 11.180 | 6.574 | 7.231 | 98.22 | 741.0 |
| C8 | 9.602 | 6.413 | 6.856 | 111.56 | 762.4 |
| C9 | 5.475 | 4.133 | 4.411 | 126.11 | 763.7 |
| C10 | 3.281 | 2.772 | 2.994 | 141.15 | 754.6 |
| C11+ | 47.191 | 69.911 | 65.820 | 247.46 | 865.7 |

DENSITIES (KG/M3) :
AT 15.0 C. DEGREES = 815.0
AT 60.0 C. DEGREES = 784.1

MOLECULAR WEIGHT : 167.03

VISCOSITIES (CPO) :
AT 15.0 C. DEGREES = 4,40
AT 60.0 C. DEGREES = 2,19

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3 BIS PROCESS TEST OIL

| COMPONENTS | MOLE % | WEIGHT % | VOLUME % |
|---|---|---|---|
| Ethane | 0.122 | 0.022 | 0.047 |
| Propane | 1.443 | 0.381 | 0.611 |
| Isobutane | 0.859 | 0.299 | 0.433 |
| Normal butane | 3.575 | 1.244 | 1.736 |
| Isopentane | 2.579 | 1.114 | 1.453 |
| Normal pentane | 3.702 | 1.599 | 2.065 |
| 2-2 dimethyl butane | 0.068 | 0.035 | 0.044 |
| Cyclopentane | 0.522 | 0.219 | 0.238 |
| 2-3 dimethylbutane | 0.231 | 0.119 | 0.146 |
| 2 methyl pentane | 1.628 | 0.840 | 1.040 |
| 3 methylpentane | 0.987 | 0.509 | 0.620 |
| Normal hexane | 3.026 | 1.561 | 1.916 |
| Methylcyclopentane | 1.760 | 0.887 | 0.960 |
| 2-2 dimethylpentane | 0.164 | 0.098 | 0.118 |
| Benzene | 0.774 | 0.362 | 0.334 |
| 2-4 dimethylpentane | 0.062 | 0.037 | 0.045 |
| 3-3 dimethylpentane | 0.033 | 0.020 | 0.023 |
| Cyclohexane | 1.999 | 1.007 | 1.048 |
| 2 methylhexane | 0.877 | 0.526 | 0.628 |
| 1-1 dimethylcyclopentane | 0.180 | 0.106 | 0.114 |
| 2-3 dimethylpentane | 0.245 | 0.147 | 0.171 |
| 3 methylhexane | 0.917 | 0.550 | 0.649 |
| 1 trans 3 dimethylcyclopentane | 0.296 | 0.174 | 0.188 |
| 3 ethylpentane | 0.053 | 0.032 | 0.037 |
| 1 cis 3 dimethylcyclopentane | 0.298 | 0.175 | 0.190 |
| 1 trans 2 dimethylcyclopentane | 0.446 | 0.262 | 0.282 |
| Normal heptane | 2.627 | 1.576 | 1.867 |
| 1 cis 2 dimethylcyclopentane | 0.041 | 0.024 | 0.026 |
| 2-2 dimethylhexane | 0.069 | 0.047 | 0.055 |
| 1-1-3 trimethylcyclopentane | 0.133 | 0.089 | 0.097 |
| Methylcyclohexane | 3.205 | 1.884 | 1.984 |
| 2-5 dimethylhexane | 0.141 | 0.096 | 0.112 |
| 2-4 dimethylhexane | 0.141 | 0.096 | 0.111 |
| Ethylcyclopentane | 0.130 | 0.076 | 0.081 |
| 1 t2 c4 trimethylcyclopentane | 0.136 | 0.091 | 0.099 |
| 3-3 dimethylhexane | 0.030 | 0.021 | 0.024 |
| Toluene | 1.606 | 0.886 | 0.828 |
| 1 t2 c3 trimethylcyclopentane | 0.159 | 0.107 | 0.115 |
| 2-3 dimethylhexane | 0.108 | 0.074 | 0.084 |
| 2 methyl 3 ethylpentane | 0.021 | 0.014 | 0.016 |
| 2 methylheptane | 0.853 | 0.583 | 0.677 |
| 4 methylheptane | 0.272 | 0.186 | 0.214 |
| 3 methylheptane | 0.601 | 0.411 | 0.472 |
| 3-4 dimethylhexane | 0.096 | 0.065 | 0.074 |
| 3 ethylhexane | 0.018 | 0.012 | 0.014 |
| 1 c2 c4 trimethylcyclopentane | 0.034 | 0.023 | 0.024 |
| 1 cis 3 dimethylcyclohexane | 0.464 | 0.312 | 0.330 |
| 1 trans 4 dimethylcyclohexane | 0.464 | 0.312 | 0.332 |
| 1 methyl trans 3 ethylcyclopentane | 0.155 | 0.104 | 0.110 |
| 1 methyl cis 3 ethylcyclopentane | 0.045 | 0.030 | 0.032 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3- 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3 BIS PROCESS TEST OIL

| COMPONENTS | MOLE % | WEIGHT % | VOLUME % |
|---|---|---|---|
| 1 methyl trans 2 ethylcyclopentane | 0.045 | 0.030 | 0.032 |
| Normal octane | 1.902 | 1.301 | 1.500 |
| 1 trans 2 dimethylcyclohexane | 0.024 | 0.016 | 0.017 |
| 1 trans 3 dimethylcyclohexane | 0.317 | 0.213 | 0.220 |
| 1 cis 4 dimethylcyclohexane | 0.205 | 0.138 | 0.144 |
| 2-2 dimethylheptane | 0.043 | 0.033 | 0.038 |
| 2-4 dimethylheptane | 0.104 | 0.080 | 0.091 |
| 1 methyl 4 ethylcyclopentane | 0.018 | 0.012 | 0.013 |
| 2-6 dimethylheptane | 0.172 | 0.132 | 0.151 |
| 1-1 dimethyl c3 ethylcyclopentane | 0.018 | 0.012 | 0.013 |
| 2-5 dimethyl heptane | 0.160 | 0.123 | 0.138 |
| Propylocyclopentane | 0.090 | 0.060 | 0.063 |
| 3-5 dimethylheptane | 0.064 | 0.049 | 0.055 |
| Ethylbenzene | 0.328 | 0.209 | 0.195 |
| Ethylcyclohexane | 0.617 | 0.414 | 0.426 |
| 1-1-3 trimethylcyclohexane | 0.191 | 0.144 | 0.148 |
| 1-1-4 trimethylcyclohexane | 0.044 | 0.033 | 0.034 |
| Divers naphtenes en c9 | 0.483 | 0.365 | 0.372 |
| Para-xylene | 0.321 | 0.204 | 0.192 |
| Meta-xylene | 1.293 | 0.821 | 0.770 |
| 2-3 dimethylheptane | 0.046 | 0.036 | 0.040 |
| 3-4 dimethylheptane | 0.046 | 0.036 | 0.039 |
| 1 c3 t5 trimethylcyclohexane | 0.044 | 0.033 | 0.034 |
| 4 methyl octane | 0.229 | 0.176 | 0.198 |
| 2 methyl octane | 0.310 | 0.238 | 0.271 |
| 3 ethylheptane | 0.152 | 0.116 | 0.130 |
| 3 methyl octane | 0.339 | 0.260 | 0.293 |
| Ortho-xylene | 0.503 | 0.320 | 0.295 |
| 1 t2 c3 trimethylcyclohexane | 0.009 | 0.007 | 0.007 |
| 1 t2 c4 trimethylcyclohexane | 0.009 | 0.007 | 0.007 |
| 1-1-2 trimethylcyclohexane | 0.024 | 0.018 | 0.018 |
| Isopropylcyclohexane | 0.048 | 0.037 | 0.039 |
| 1 c2 c4 trimethylcyclohexane | 0.011 | 0.008 | 0.008 |
| 1 methyl t4 ethylcyclohexane | 0.040 | 0.030 | 0.031 |
| 1 methyl c3 ethylcyclohexane | 0.236 | 0.178 | 0.182 |
| Normal nonane | 1.470 | 1.129 | 1.274 |
| Cumene | 0.231 | 0.166 | 0.156 |
| 1 methyl t2 ethylcyclohexane | 0.064 | 0.049 | 0.050 |
| 3-3-5 trimethylheptane | 0.013 | 0.011 | 0.012 |
| 4-4 dimethyl octane | 0.034 | 0.029 | 0.032 |
| 2-5 dimethyl octane | 0.109 | 0.093 | 0.104 |
| Propylbenzene | 0.080 | 0.057 | 0.054 |
| 2-6 dimethyl octane | 0.343 | 0.292 | 0.326 |
| 2-3 dimethyl octane | 0.058 | 0.050 | 0.055 |
| 4-5 dimethyl octane | 0.041 | 0.035 | 0.038 |
| 1-3 ethyl toluene | 0.260 | 0.187 | 0.175 |
| 1-4 ethyl toluene | 0.092 | 0.066 | 0.062 |
| Tetramethylcyclohexane | 0.021 | 0.018 | 0.018 |
| 1-2 ethyl toluene | 0.066 | 0.048 | 0.044 |
| 4 methyl nonane | 0.244 | 0.208 | 0.230 |

P. V. T. STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

1/3-3 TEST 3 BIS PROCESS TEST OIL

| COMPONENTS | | MOLE % | WEIGHT % | VOLUME % |
|---|---|---|---|---|
| 2 methyl nonane | | 0.343 | 0.292 | 0.326 |
| 3 methyl nonane | | 0.181 | 0.154 | 0.170 |
| 1-2-4 trimethylbenzene | | 0.323 | 0.232 | 0.215 |
| Isobutylbenzene | | 0.124 | 0.100 | 0.094 |
| Normal decane | | 1.112 | 0.947 | 1.052 |
| 1-2-3 trimethylbenzene | | 0.134 | 0.096 | 0.087 |
| Divers naphtenes en c10 | | 0.593 | 0.498 | 0.495 |
| C11+ ********** | | 47.188 | 69.908 | 65.816 |
| C11 | GPC | 9.335 | 8.718 | |
| C12/13 | GPC | 10.834 | 11.480 | |
| C14/15 | GPC | 6.847 | 8.404 | |
| C16/17 | GPC | 4.721 | 6.586 | |
| C18/19 | GPC | 3.548 | 5.544 | |
| C20/24 | GPC | 5.101 | 9.466 | |
| C25/29 | GPC | 2.846 | 6.474 | |
| C30/39 | GPC | 2.668 | 7.747 | |
| C40/49 | GPC | 0.865 | 3.237 | |
| C50/74 | GPC | 0.396 | 2.062 | |
| C74/99 | GPC | 0.026 | 0.189 | |

DENSITIES (KG/M3) :
AT 15.0 C. DEGREES = 815.0
AT 60.0 C. DEGREES = 784.1
C11+ DENSITY = 865.7

MOLECULAR WEIGHT = 167.03
C11+ MOLECULAR WEIGHT = 247.46

VISCOSITIES (CPO) :
AT 15.0 C. DEGREES = 4,40
AT 60.0 C. DEGREES = 2,19

# 6 - PRESSURE - VOLUME RELATIONS OF RESERVOIR FLUID

- AT BOTTOM TEMPERATURE

- AT BOTTOM TEMPERATURE MINUS 20°C

PVT STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

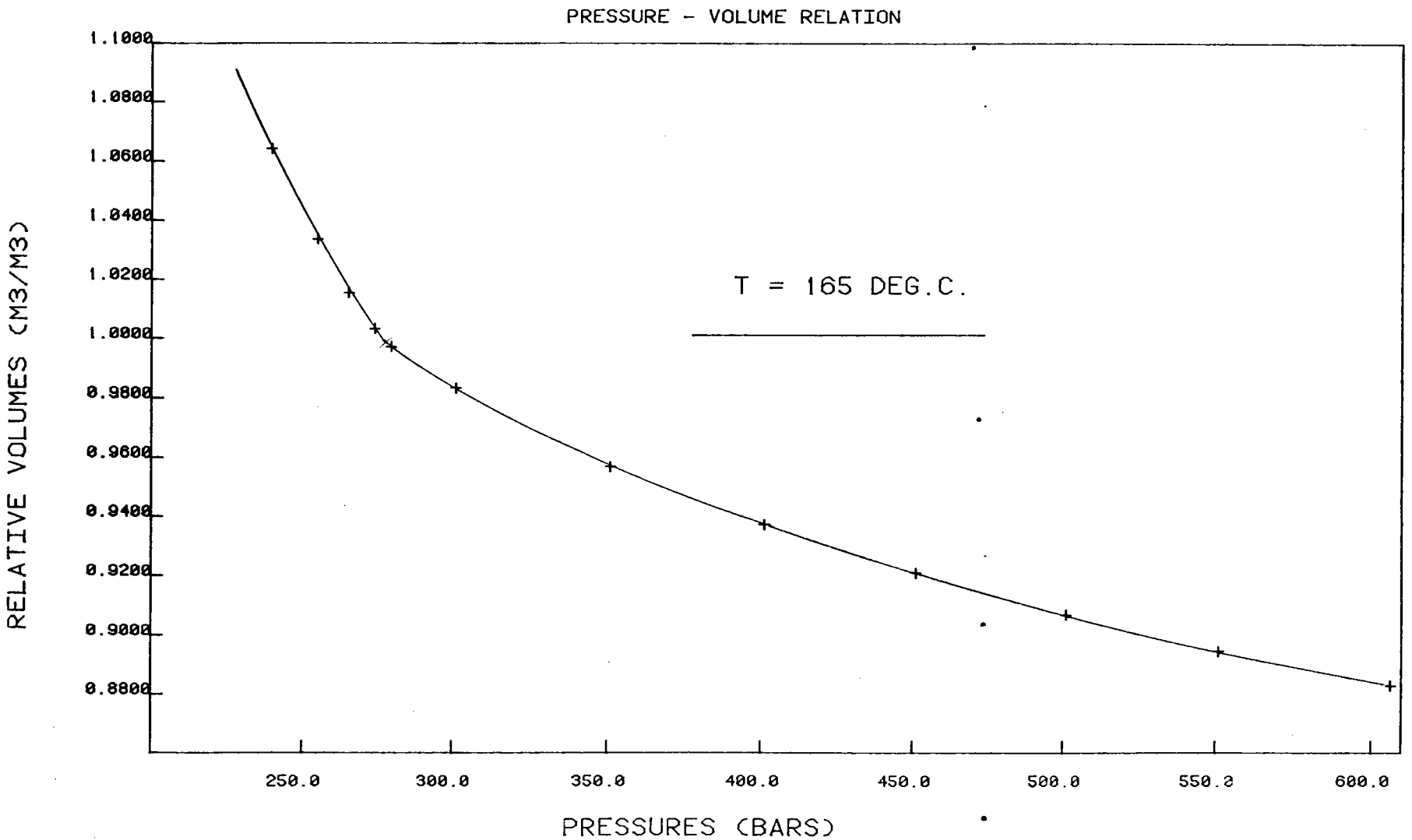
## PRESSURE - VOLUME RELATION OF RESERVOIR FLUID

TEMPERATURE 165 °C

| PRESSURES abs bars | RELATIVE VOL m3 m3 | | COMPRESSIBILITY FACTOR m3 m3 bars - $10^{-4}$ | CALCULATED DENSITY Kg m3 |
|---|---|---|---|---|
| | WITH RESPECT TO OIL AT SATURATION PRESSURE | WITH RESPECT TO SEPARATOR OIL FLASHED TO 15°C | | |
| 606,3 B.H.P. | 0,8829 | | 2,181 | 609,2 |
| 551 | 0,8946 | | 2,571 | 601,2 |
| 501 | 0,9069 | | 2,900 | 593,0 |
| 451 | 0,9209 | | 3,285 | 584,1 |
| 401 | 0,9372 | | 3,826 | 573,9 |
| 351 | 0,9568 | | 4,799 | 562,1 |
| 301 | 0,9833 | | | 547,0 |
| 279,5 | 0,9973 | | | 539,3 |
| 276 S.P. | 1,0000 | | | 537,9 |
| 273,8 | 1,0033 | | | |
| 265 | 1,0155 | | | |
| 254,7 | 1,0337 | | | |
| 239,5 | 1,0642 | | | |

RESERVOIR OIL VOLUME AT SP = 164,100 cm3

1/3-3 TEST 3BIS SURFACE



PVT STUDY N° 84/2-41

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

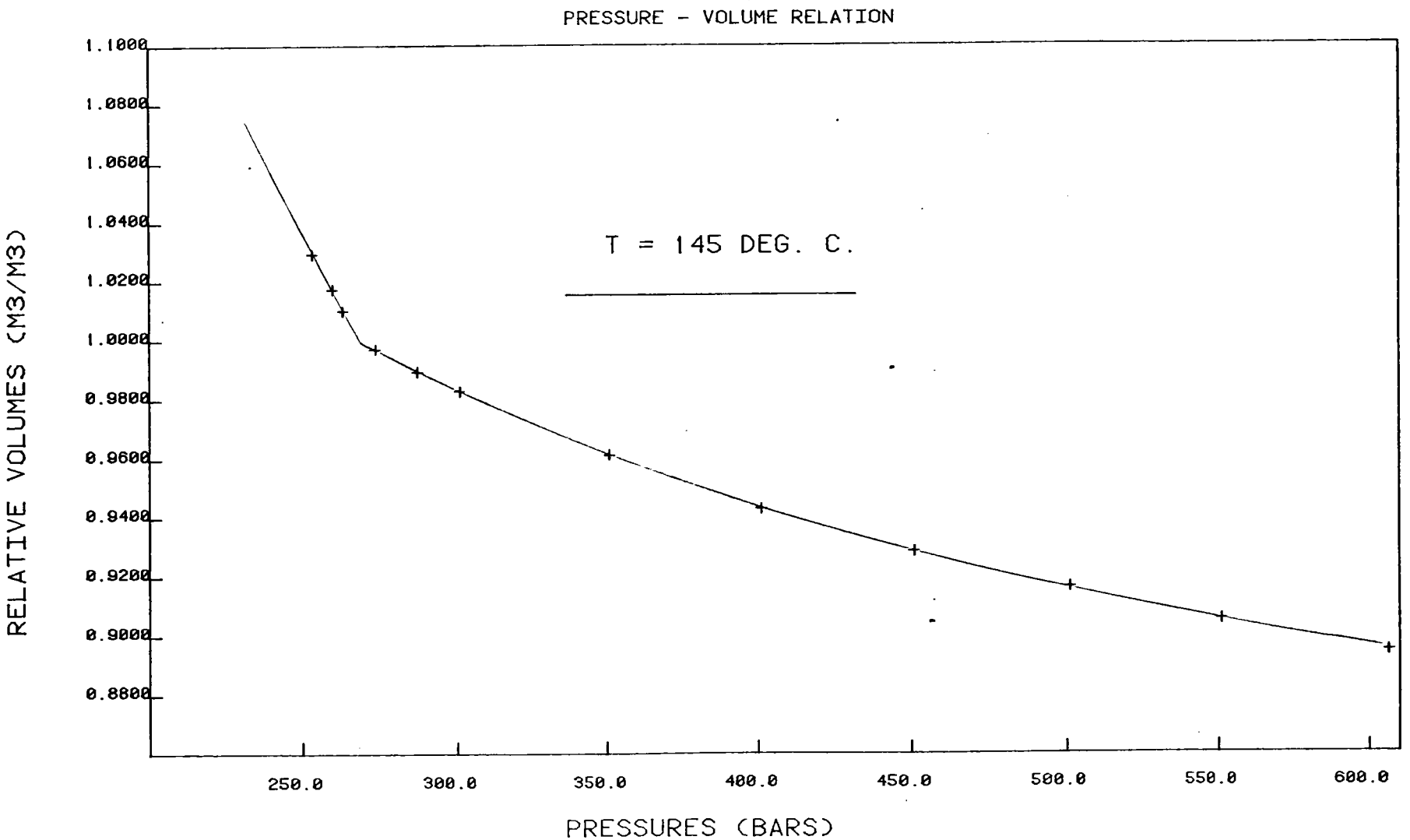
## PRESSURE - VOLUME RELATION OF RESERVOIR FLUID

TEMPERATURE 145 °C

| PRESSURES abs bars | RELATIVE VOL m3 m3 | | COMPRESSIBILITY FACTOR m3 m3 bars - $10^{-4}$ | CALCULATED DENSITY Kg m3 |
|---|---|---|---|---|
| | WITH RESPECT TO OIL AT SATURATION PRESSURE | WITH RESPECT TO SEPARATOR OIL FLASHED TO 15°C | | |
| 606,3 B.H.P. | 0,8946 | | 1,995 | 621,0 |
| 551 | 0,9053 | | 2,289 | 613,7 |
| 501 | 0,9163 | | 2,532 | 606,3 |
| 451 | 0,9285 | | 2,876 | 598,4 |
| 401 | 0,9430 | | 3,481 | 589,1 |
| 351 | 0,9614 | | 4,139 | 577,9 |
| 301 | 0,9829 | | 4,418 | 565,2 |
| 278,2 | 0,9895 | | | 561,4 |
| 273,7 | 0,9973 | | | 557,1 |
| 269 S.P. | 1,0000 | | | 555,6 |
| 263,5 | 1,0103 | | | |
| 260,0 | 1,0175 | | | |
| 253,5 | 1,0295 | | | |

RESERVOIR OIL VOLUME AT SP = 158,861 cm3

1/3-3 TEST 3BIS SURFACE



# 7 - DIFFERENTIAL LIBERATION

## DIFFERENTIAL LIBERATION

COUNTRY: NORWAY FIELD: 1/3 WELL: 1/3 - 3 RESERVOIR: T. 3 Bis

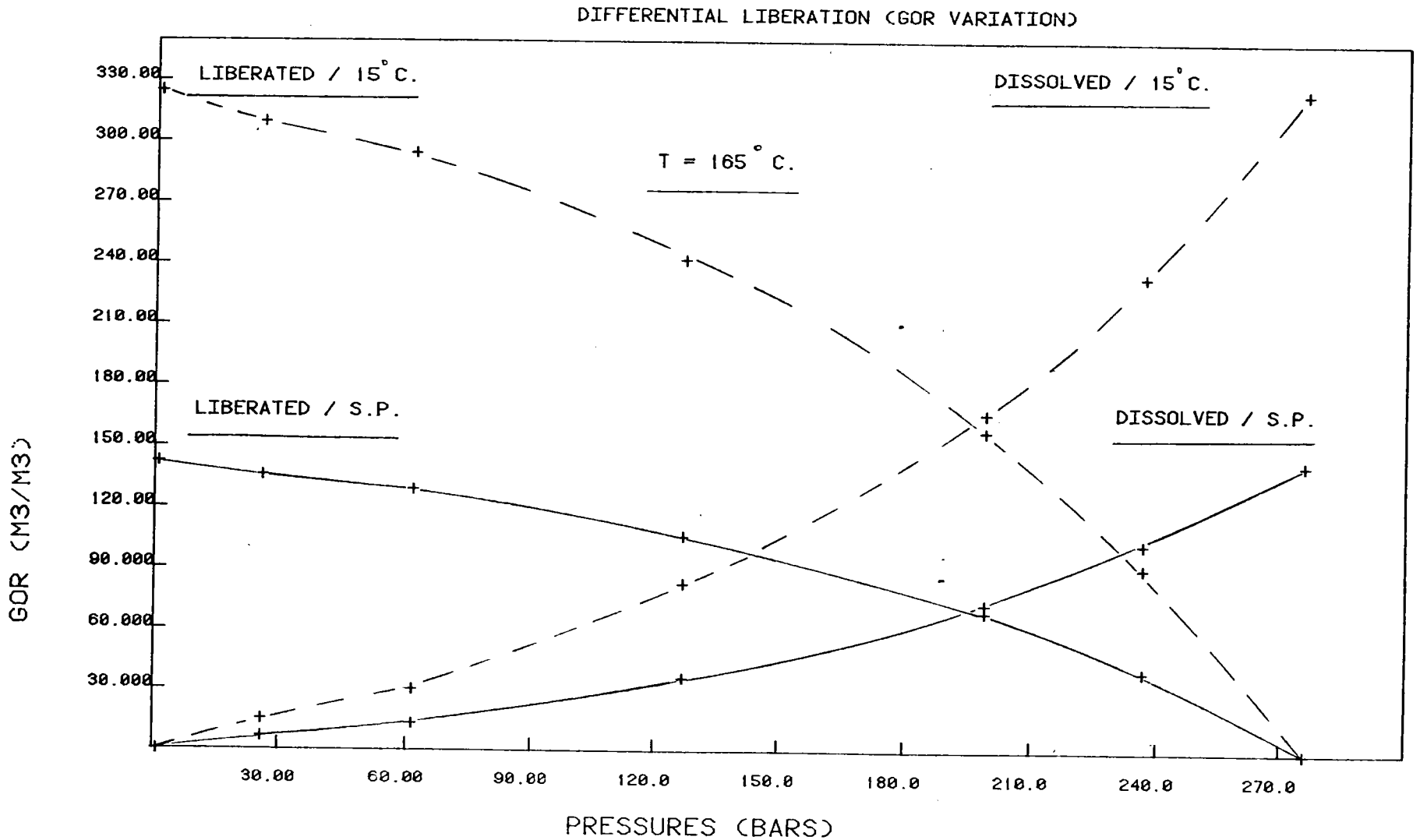
PVT STUDY N° 84/2-41

TEMPERATURE 165° C

| PRESSURE BARS | OIL RELATIVE VOLUMES | | OIL DENSITY | CUMULATIVE LIBERATED GAS | | TOTAL DISSOLVED GAS | |
|---|---|---|---|---|---|---|---|
| | m3/m3 OIL AT SP | m3/m3 RESIDUAL OIL AT 15°C | Kg/m3 | m3/m3 OIL AT SP | m3/m3 RESIDUAL OIL AT 15°C | m3/m3 OIL AT SP | m3/m3 RESIDUAL OIL AT 15°C |
| 606,3 BHP | 0,8829 | 2,0163 | 609,2 | 0,00 | 0,00 | 142,24 | 324,83 |
| 276,0 S.P. | 1,0000 | 2,2837 | 537,9 | 0,00 | 0,00 | 142,24 | 324,83 |
| 236,5 | 0,8422 | 1,9233 | 578,3 | 39,72 | 90,72 | 102,51 | 234,12 |
| 199 | 0,7361 | 1,6811 | 609,2 | 73,09 | 166,93 | 69,14 | 157,90 |
| 127 | 0,6283 | 1,4348 | 658,1 | 106,00 | 242,07 | 36,24 | 82,76 |
| 61,3 | 0,5463 | 1,2476 | 705,5 | 128,99 | 294,58 | 13,25 | 30,25 |
| 26 | 0,5034 | 1,1495 | 747,3 | 135,62 | 309,71 | 6,62 | 15,12 |
| 1 | 0,4671 | 1,0667 | 781,0 | 142,24 | - | 0,00 | - |
| 1 BAR/15°C | 0,4379 | 1,0000 | 833,1 | - | 324,83 | - | 0,00 |

| | | | | |
|---|---|---|---|---|
| RESERVOIR FLUID VOLUME AT SP | 164,100 | cm3 | RESIDUAL OIL VISCOSITY AT 165° C | 0,984 CPo |
| RESIDUAL OIL VOLUME AT 15°C | 71,857 | cm3 * | RESIDUAL OIL VISCOSITY AT 15°C | 5,41 CPo |
| DISSOLVED GAS TOTAL VOLUME AT SP | 23341,309 | cm3 | | |

# 1/3-3 TEST 3BIS SURFACE



## ANALYSIS OF GASES LIBERATED DURING DIFFERENTIAL STUDY

COUNTRY : NORWAY FIELD : 1/3 WELL : 1/3 - 3 RESERVOIR : T. 3 Bis

PVT STUDY N° 84/2-41

TEMPERATURE 165° C

| PRESSURE bars | MOLAR COMPOSITIONS | | | | | | | | | | | | | VOLUME FACTOR OF LIBERATED GAS m3/m3 × $10^2$ | CALCULATED DENSITY Kg/m3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $N_2$ | $CO_2$ | $SH_2$ | RSH | $C_1$ | $C_2$ | $C_3$ | $IC_4$ | $NC_4$ | $IC_5$ | $NC_5$ | $C_6$ | $C_{7+}$ | | |
| 263,5 | 1,463 | 2,185 | - | - | 61,175 | 10,375 | 7,512 | 2,959 | 3,655 | 2,752 | 2,902 | 2,032 | 2,990 | 0,556 | 1,279 |
| 199 | 0,991 | 2,318 | - | - | 61,871 | 14,956 | 8,762 | 2,040 | 2,705 | 1,799 | 1,930 | 1,068 | 1,560 | 0,669 | 1,158 |
| 127 | 0,333 | 2,462 | - | - | 61,770 | 19,452 | 9,416 | 1,106 | 2,758 | 0,784 | 0,895 | 0,524 | 0,500 | 1,077 | 1,063 |
| 61,3 | 0,005 | 2,455 | - | - | 56,859 | 18,531 | 10,370 | 1,375 | 3,459 | 1,913 | 2,020 | 1,213 | 1,800 | 2,267 | 1,219 |
| 26 | 0,000 | 2,290 | - | - | 41,879 | 22,172 | 15,417 | 3,230 | 6,754 | 2,564 | 2,701 | 1,293 | 1,700 | 5,512 | 1,402 |
| 1 | 0,000 | 1,853 | - | - | 26,472 | 24,117 | 18,301 | 6,297 | 9,718 | 3,375 | 3,370 | 2,597 | 3,900 | 151,524 | 1,712 |

# 8 - RESERVOIR FLUID VISCOSITY

PVT STUDY N° 84/2-41

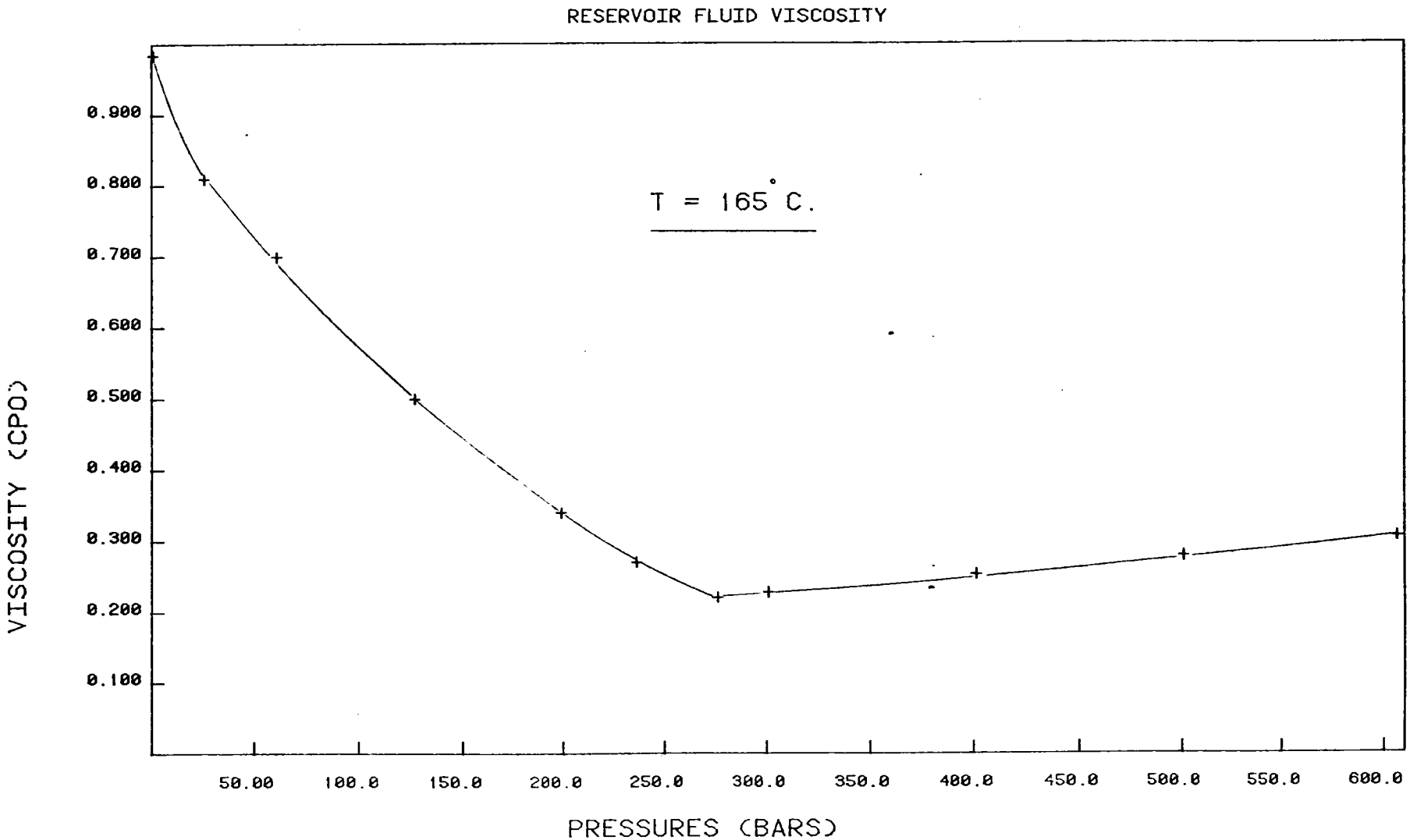
COUNTRY: NORWAY FIELD: 1/3 WELL: 1/3 - 3 RESERVOIR : T. 3 Bis

## RESERVOIR FLUID VISCOSITY

| TEMPERATURE 165 °C | | |
|---|---|---|
| PRESSURE BARS | VISCOSITY CPo HUILE | GAZ |
| 606,3 B.H.P. | 0,306 | |
| 501 | 0,278 | |
| 401 | 0,253 | |
| 301 | 0,227 | |
| 276 S.P. | 0,220 | |
| 236,5 | 0,270 | 0,02714 |
| 199 | 0,340 | 0,02235 |
| 127 | 0,500 | 0,01767 |
| 61,3 | 0,700 | 0,01538 |
| 26 | 0,810 | 0,01391 |
| 1 | 0,984 | 0,01253 |

VISCOSITY OF RESIDUAL OIL AT 150 ° C : 5,41 cPo

1/3-3 TEST 3BIS SURFACE



# 9 - SUMMARY REPORT

FOR RESERVOIR ENGINEERS

**PVT STUDY N° 84/2-41**

**COUNTRY** NORWAY **FIELD** 1/3 **WELL** 1/3 - 3 **RESERVOIR** T. 3 Bis

## CRUDE OIL P.V.T. ANALYSIS
## SUMMARY REPORT

This summary report is intended for the use of reservoir engineers and contains only those results of relevance to their field of activity

For further information, refer to the fuller version published separately

### 1 - SAMPLING CONDITIONS

Date March, 13 - 1983
Sampling method Surface
Perforating depths 4202,2 m / 4208 m / Measurement depths 4212 m } in relation to Rotary Table
Static bottom-hole pressure at measurement depth : 605,3 rel. bars
Static bottom-hole temperature at measurement depth : 165° C
Average flow during sampling : 146,4 m3/D of OIL
Bottom-hole pressure during sampling : -
Wellhead pressure during sampling : 96,3 rel. bars
Wellhead temperature during sampling : -
Separator pressure : 23,5 rel. bars
Separator temperature : 62,2 ° C
Separation GOR : 185,110 m3/m3
WOR :
Shrinkage GOR (field measurement) : -
Tank oil density (field measurement) : -

### 2 - STUDY CONDITIONS

Static pressure in reservoir environment : 605,3 rel bars
Static temperature in reservoir environment : 165° C

### 3 - MOLECULAR COMPOSITION

| | | | |
|---|---|---|---|
| $N_2$ | 0,939 | $iC_5$ | 1,450 |
| $CO_2$ | 1,824 | $nC_5$ | 1,639 |
| $SH_2$ | | $C_6$ | 3,449 |
| | | $C_7$ | 3,454 |
| $C_1$ | 41,058 | $C_8$ | 2,987 |
| $C_2$ | 13,282 | $C_9$ | 2,018 |
| $C_3$ | 8,174 | $C_{10}$ | 1,345 |
| $iC_4$ | 1,256 | $C_{11+}$ | 13,690 |
| $nC_4$ | 3,435 | $C_{12}$ | |

Characteristics of $C_{n+}$ : $C_{11}^{+}$

Molecular weight : 257,67

Density : 0,8668 g/cm3

## 4 - BEHAVIOUR OF OIL ABOVE BUBBLE POINT

Bubble point pressure 275 relative bars at 165 °C

| | PRESSURE (relative bars) | RELATIVE VOLUME (fraction) | COMPRESSIBILITY ($10^{-4}$ v/v/bar) | DENSITY (gr/c.c.) |
|---|---|---|---|---|
| | 605,3 B.H.P. | 0,8829 | 2,181 | 0,6092 |
| | 550 | 0,8946 | 2,571 | 0,6012 |
| | 500 | 0,9069 | 2,900 | 0,5930 |
| | 450 | 0,9209 | 3,285 | 0,5841 |
| | 400 | 0,9372 | 3,826 | 0,5739 |
| | 350 | 0,9568 | 4,799 | 0,5621 |
| | 300 | 0,9833 | | 0,5470 |
| Bp | 275 | 1000 | | 0,5379 |

## 5 - LIBERATION UNDER SURFACE CONDITIONS

Pressure + temperature conditions

| | | PRESSURE (relative bars) | TEMPERATURE (°C) |
|---|---|---|---|
| (1) | Reservoir | 605,3 | 165 |
| (2) | HP separator | 25 | 60 |
| (3) | LP separator | 7 | 60 |
| (4) | Tank | 0 bar | 15 °C |

Total GOR value $R_S = \frac{\text{Vol. gas (2 + 3 + 4)}}{\text{Vol. oil (4)}}$ = 260,00 m3/m3

Volume factor $B_o = \frac{\text{Vol. oil (1)}}{\text{Vol. oil (4)}}$ = 1,7972 m3/m3

Tank oil (4) characteristics

Density at 15°C 0,815 g/cm3

Viscosity at 15°C 4,40 cPo

at 60 °C 2,19 cPo

at __ °C

## 6 - DIFFERENTIAL LIBERATION IN BOTTOM-HOLE CONDITIONS (T = 165 °C)

| | PRESSURE P (rel. bars) | OIL | | | GAS | |
|---|---|---|---|---|---|---|
| | | VOLUME FACTOR $B_o$ m3/m3 | DISSOLUTION GOR $R_s$ m3/m3 | DENSITY $P_o$ gr/c.c. | VOLUME FACTOR $B_g$ $10^{-2}$ m3/m3 | DENSITY $P_g$ $10^{-3}$ gr/c.c. |
| BOTTOM-HOLE TEMPERATURE | 605,3 | 2,0163 | 324,83 | 0,6092 | | |
| | 275 S.P. | 2,2837 | 324,83 | 0,5379 | | |
| | 235,5 | 1,9233 | 234,12 | 0,5783 | 0,556 | 1,279 |
| | 198 | 1,6811 | 157,90 | 0,6092 | 0,669 | 1,158 |
| | 126 | 1,4348 | 82,76 | 0,6581 | 1,077 | 1,063 |
| | 60,3 | 1,2476 | 30,25 | 0,7055 | 2,267 | 1,219 |
| | 25 | 1,1495 | 15,12 | 0,7473 | 5,512 | 1,402 |
| | 0 bar | 1,0667 | 0 | 0,7810 | 151,524 | |
| 15°C | 0 bar | 1.000 | 0 | 0,8331 | 1.000 | 1,712 |
| | | oil at p / oil at 15 | gas 15/750 / oil at 15 | | gas at p / gas 15/750 | |

5.615

## 7 - OIL VISCOSITY IN BOTTOM-HOLE CONDITIONS (T = 165 °C)

35
6.3

| PRESSURE P relative bars | VISCOSITY o centipoises |
|---|---|
| 605,3 | 0,306 |
| 500 | 0,278 |
| 400 | 0,253 |
| 275 | 0,220 |
| 235,5 | 0,270 |

| PRESSURE P relative bars | VISCOSITY o centipoises |
|---|---|
| 198 | 0,340 |
| 126 | 0,500 |
| 60,3 | 0,700 |
| 25 | 0,810 |
| 0 | 0,984 |

## 8 - OBSERVATIONS