# RFT SUMMARY

| Depth mKB | Formation Pressure (bar) | |
|---|---|---|
| 3976 | 464.44 | + 1.013 |
| 3983 | 465.83 | " |
| 3987 | 465.00 | " |
| 3992 | 464.86 | " |
| 3998 | 465.20 | " |
| 4006 | 465.55 | " |
| 4011 | 466.03 | " |
| 4056.5 | 466.10 | " |
| 4057.5 | 466.58 | " |
| 4059 | 466.38 | " |
| 4062 | 466.45 | " |
| 4069 | 466.65 | " |
| 4077 | 466.93 | " |
| 4080 | 467.00 | " |
| 4090 | 467.34 | " |
| 4098 | 468.10 | " |
| 4077 | 467.41 | " |
| 4090 | 467.82 | " |
| 4188 | 471.00 | " |
| 4196 | 471.89 | " |
| 4200 | 471.96 | " |
| 4204.5 | 471.89 | " |
| 4210 | 471.96 | " |
| 4214 | 472.24 | " |
| 4217.5 | 472.42 | " |
| 4231 | 472.86 | " |
| 4233 | 472.93 | " |
| 4242 | 473.34 | " |
| 4252 | 473.76 | " |
| 4253.5 | 473.82 | " |
| 4256 | 473.89 | " |
| 4258.5 | 473.96 | " |
| 4276.5 | 481.20 | " |
| 4276 | 480.99 | " |
| 4300 | 482.03 | " |
| 4314.5 | 476.38 | " |
| 4335 | 483.13 | " |
| 4352 | 476.65 | " |
| 4353 | 476.86 | " |
| 4364.5 | 477.13 | " |
| 4369 | 477.41 | " |
| 4373 | 477.62 | " |

**DST RESULT SUMMARY:**

| DST | INTERVAL (m KB) | CHOKE (mm) | FLOW RATE CONDENSATE $Sm^3/d$ | FLOW RATE GAS $Sm^3/d$ | GOR $Sm^3/Sm^3$ | WHP (bar) | WHT ($C^o$) | $CO_2$ (%) | $H_2S$ (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 4504-4509 | Tight Fm. Produced ca. 0.26 $m^3$ (cushion). No. Fm. fluid came to surface. Max. circulation gas 10%. Estimated reservoir pressure 708 bar. | | | | | | | |
| 2 | 4351-4373 | 25.4 | 516.9 | 691,7 x $10^3$ | 1338 | 122.2 | 76.0 | 5.0 | 7.0 |
| 3 | 4291-4304 | Tight Fm. Max. production 49 $m^3/d$. (cushion). No Fm. fluid came to the surface. | | | | | | | |
| 4 | 4251-4261 | 23.8 | 620.2 | 603.1 x $10^3$ | 973 | 127.5 | 81.0 | | |
| 5 | 4203-4218 | 25.4 | 376.6 | 583.9 x $10^3$ | 1550 | 82.7 | 62.0 | 4.5 | 8.0 |
| 6 | 4095-4110 | Tight Fm. Max. production 16 $Sm^3/d$ (cushion). | | | | | | | |
| 7 | 3993-4011 | 31.8 | 511.0 | 727.4 x $10^3$ | 1424 | 83.1 | 77.0 | 5.6 | 6.5 |

# ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

## Drilling Mud Properties Record

MUD SYSTEM SPUD MUD

WELL NAME 6506/12-1 AREA NORTH SEA
OPERATOR STATOIL RIG. ROSS ISLE
ENGINEERS BLANCHARD/CHAVEZ/MARKEN

| Day No. | DATE 1984 | DEPTH FEET □ METERS ☒ | MUD PROPERTIES: DENSITY PPG □ SG ☒ | VISCOSITY: sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS 0 / 10 | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis: Cl⁻ ppm x1000 | Ca. ++ ppm | Pf | RETORT: % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16.8 | 281 | 1.1 | 100 | | | | | | | | | | | | | | | | | | | | |
| 2 | 17.8 | 348 | 1.0 | 100 | | | | | | | | 10 | | | | | | | | | | | | |
| 3 | 18.8 | 348 | 1.0 | 100 | | | | | | | | 10.5 | | | | | | | | | | | | |
| 4 | 19.8 | 471 | 1.08 | 48 | 24 | 7 | 34 | 29 / 65 | NC | | | 9.6 | | | .1 | | | | | | | | | |
| 5 | 20.8 | 891 | 1.08 | 58 | 38.5 | 7 | 63 | | NC | | | 10.0 | | | .1 | | | | | | | | | |
| 6 | 21.8 | 948 | 1.16 | 60 | 30.5 | 10 | 41 | 8 / 46 | NC | | | 10.0 | | | .1 | | | | | | | | | |
| 7 | 22.8 | 431 | 1.16 | 72 | 42.5 | 8 | 69 | 30 / 58 | NC | | | 10.0 | | | .1 | | | | | | | | | |
| 8 | 23.8 | 507 | 1.16 | 59 | 35 | 8 | 54 | 34 / 50 | NC | | | 10.0 | | | | | | | | | | | | |
| 9 | 24.8 | 818 | 1.16 | 59 | 35.5 | 8 | 55 | 33 / 57 | NC | | | 10.0 | | | | | | | | | | | | |
| 10 | 25.8 | 952 | 1.16 | 38 | 17 | 3 | 28 | 16 / 21 | NC | | | 10.0 | | | | | | | | | | | | |
| 11 | 26.8 | 958 | 1.16 | 46 | 26 | 6 | 40 | 26 / 30 | NC | | | 9.6 | | | | | | | | | | | | |
| 12 | 27.8 | 952 | 1.32 | 45 | 24.5 | 6 | 37 | 18 / 30 | | | | 9.6 | | | | | | | | | | | | |
| 13 | 28.8 | 952 | 1.05 | 80 | MIXING NEW MUD | | | | | | | | | | | | | | | | | | | |
| 14 | 29.8 | 952 | 1.10 | 37 | 11.5 | 6 | 11 | 12 / 26 | 36 | 3 | | 9.8 | 8.5 | 2000 | .05 | | 6 | | 15 | | | | | |

REMARKS

# ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

## Drilling Mud Properties Record

MUD SYSTEM GYP/CMC

WELL NAME 6506/12-1 AREA STATOIL

OPERATOR STATOIL RIG. ROSS ISLE

ENGINEERS BLANCHARD/VASTVEIT/CHAVEZ

| Day No. | DATE 1984 | DEPTH FEET ☒ METERS ☐ | MUD PROPERTIES | | | | | | | | | | | | | | | | | | | | | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DENSITY PPG ☐ SG ☒ | VISCOSITY sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS 0 / 10 | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis Cl⁻ ppm x1000 | Ca ++ ppm | Pf / mf | RETORT % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | |
| 15 | 30.8 | 905 | 1.10 | 42 | 14.5 | 6 | 17 | 7 / 9 | NC | | | 11.9 | 10.6 | 1320 | 1.0 / 1.2 | | 6 | TR | 14 | 4 | | | | |
| 16 | 31.8 | 949 | 1.10 | 44 | 16.5 | 5 | 23 | 8 / 9 | NC | | | 12 | 15.6 | 1400 | 2 / 2.5 | | 6 | TR | 14 | 3.5 | | | | |
| 17 | 1.9 | 1274 | 1.13 | 42 | 15.5 | 7 | 17 | 6 / 9 | 35 | | | 11.5 | 16.0 | 900 | 3 / .6 | | 6 | TR | 15 | 3.5 | | | | |
| 18 | 2.9 | 1806 | 1.17 | 45 | 14.5 | 7 | 15 | 12 / 35 | 23 | | | 10 | 14.0 | 2000 | .2 / .4 | | 16 | .25 | 20 | 4 | | | | |
| 19 | 3.9 | 2141 | 1.35 | 50 | 18.5 | 10 | 17 | 25 / 65 | 17 | | | 9.8 | 15.0 | 1800 | .15 / .4 | | 20 | .25 | 24 | 3.2 | | | | |
| 20 | 4.9 | 2200 | 1.40 | 45 | 18 | 11 | 14 | 17 / 50 | 20 | | | 10 | 16.0 | 1400 | .2 / .5 | | 21 | .25 | 26 | 3.0 | | | | |
| 21 | 5.9 | 2203 | 1.55 | 47 | 19 | 13 | 12 | 20 / 75 | 20 | 2 | | 9.8 | 10 | 1800 | .15 / .4 | 0 | 24 | .25 | 28 | 2.5 | | | | |
| 22 | 6.9 | 2203 | 1.55 | 46 | 19.5 | 13 | 13 | 20 / 80 | 19 | 3 | | 9.5 | 16 | 1800 | .15 / .5 | 0 | 26 | .25 | 23 | 2.5 | | | | |
| 23 | 7.9 | 2187 | 1.55 | 45 | 22 | 14 | 16 | 11 / 61 | 9 | 1 | | 10.6 | 16 | 2000 | .5 / .8 | 0 | 26 | .25 | 20 | 2.8 | | | | |
| 24 | 8.9 | 2206 | 1.60 | 40 | 16.5 | 15 | 9 | 5 / 41 | 22 | 2 | | 10 | 15 | 1800 | .15 / .5 | 0 | 26 | .25 | 1.75 | 2.8 | | | | |
| 25 | 9.9 | 2208 | 1.60 | 46 | 20 | 10 | 20 | 18 / 42 | 38 | 4 | | 11 | 15 | 1500 | .35 / .7 | 0 | 26 | .50 | 1.75 | 2.6 | | | | |
| 26 | 10.9 | 2575 | 1.60 | 48 | 22 | 17 | 10 | 3 / 29 | 10 | 2 | 25 | 10.6 | 15 | 1720 | .25 / .6 | 0 | 26 | .50 | 1.75 | 2.0 | | | | |
| 27 | 11.9 | 2737 | 1.66 | 51 | 27.5 | 20 | 15 | 18 / 58 | 10 | 2 | 30 | 10.5 | 16 | 1400 | .3 / .75 | 0 | 25 | .25 | 17.5 | 3.5 | | | | |
| 28 | 12.9 | 2763 | 1.65 | 55 | 20 | 21 | 18 | 28 / 62 | 10.2 | 2 | 30 | 10.0 | 16.8 | 1400 | .25 / .6 | 0 | 25 | .25 | 19 | 2.5 | | | | |

REMARKS

# ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

## Drilling Mud Properties Record

MUD SYSTEM GYP/LIGNO

WELL NAME 6506/12-1 AREA NORTH SEA
OPERATOR STATOIL RIG. ROSS ISLE
ENGINEERS CHAVEZ/MARKEN

| Day No. | DATE 1984 | DEPTH FEET ☐ METERS ☒ | MUD PROPERTIES: DENSITY PPG ☐ SG ☒ | VISCOSITY: sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS 0/10 | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis: Cl⁻ ppm x1000 | Ca. ++ ppm | Pf/mf | RETORT: % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 13.9 | 2919 | 1.65 | 48 | 27.5 | 18 | 19 | 6/62 | 12.0 | 2 | 31 | 11.0 | 15.5 | 1080 | .45/.7 | 0 | 25 | .25 | 20 | 3.2 | | | | |
| 30 | 14.9 | 2983 | 1.65 | 48 | 20 | 15 | 10 | 3/39 | 10.2 | 2 | 32 | 10.0 | 15.0 | 1400 | .25/.85 | 0 | 25 | .25 | 20 | 0 | | | | |
| 31 | 15.9 | 3100 | 1.65 | 48 | 25 | 18 | 14 | 9/76 | 10.2 | 2 | 36 | 10.7 | 16.5 | 1640 | .4/1.0 | 0 | 25 | .25 | 21 | 4.0 | | | | |
| 32 | 16.9 | 3119 | 1.65 | 48 | 26 | 18 | 16 | 10/66 | 9.8 | 2 | 36 | 10.7 | 16.0 | 1720 | .3/1.0 | 0 | 25 | .25 | 20 | 3.3 | | | | |
| 33 | 17.9 | 3212 | 1.65 | 56 | 27.5 | 19 | 17 | 21/89 | 10.6 | 2 | 37 | 10.8 | 16.0 | 1640 | .3/1.1 | 0 | 25 | TR | 20 | 3.0 | | | | |
| 34 | 18.9 | 3308 | 1.65 | 51 | 28.5 | 19 | 19 | 18/94 | 10.1 | 2 | 42 | 10.9 | 15.0 | 1480 | .3/1.2 | 0 | 25 | TR | 21 | 2.7 | | | | |
| 35 | 19.9 | 3395 | 1.65 | 53 | 30 | 19 | 22 | 20/95 | 9.8 | 2 | 35 | 10.9 | 16.0 | 1760 | .3/1.2 | 0 | 25 | TR | 21 | 2.7 | | | | |
| 36 | 20.9 | 3479 | 1.65 | 52 | 26.5 | 17 | 19 | 20/89 | 10.4 | 2 | 36 | 10.9 | 16.0 | 1600 | .3/1.1 | 0 | 25 | NIL | 20 | 2.6 | | | | |
| 37 | 21.9 | 3572 | 1.65 | 45 | 21.5 | 15 | 13 | 9/71 | 10.5 | 2 | 28 | 10.2 | 15.0 | 1720 | .2/.85 | 0 | 24 | NIL | 20 | 3.2 | | | | |
| 38 | 22.9 | 3654 | 1.68 | 46 | 23.5 | 17 | 13 | 6/59 | 8.6 | 2 | 27 | 10.6 | 15.5 | 1600 | .3/1.1 | 0 | 24 | NIL | 20 | 2.0 | | | | |
| 39 | 23.9 | 3654 | 1.68 | 51 | 23.5 | 17 | 13 | 6/54 | 8.4 | 1 | 27 | 10.1 | 15.5 | 1680 | .2/1.0 | 0 | 24 | .24 | 21 | 2.5 | | | | |
| 40 | 24.9 | 3654 | 1.68 | 60 | 28.5 | 21 | 15 | 7/57 | 8.0 | 1 | 28 | 10.4 | 15.0 | 2080 | .25/1.1 | 3 | 23 | .25 | 21 | 2.4 | | | | |
| 41 | 25.9 | 3654 | 1.68 | 57 | 27.5 | 21 | 13 | 5/51 | 7.2 | 1 | 23 | 10.1 | 14.5 | 1880 | .2/1.0 | 4 | 24 | .75 | 21 | 2.4 | | | | |
| 42 | 26.9 | 3654 | 1.72 | 60 | 30.5 | 22 | 17 | 12/63 | 7.5 | 1 | 25 | 10.0 | 16.0 | 1880 | .15/.9 | 3 | 24 | .75 | 22.5 | 1.9 | | | | |

REMARKS

# ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

## Drilling Mud Properties Record

MUD SYSTEM GYP/LIGNO

WELL NAME 6506/12-1 AREA NORTH SEA

OPERATOR STATOIL RIG ROSS ISLE

ENGINEERS TORGERSEN/MARKEN/KORSVOLD/CHAVEZ

| Day No. | DATE 1984 | DEPTH FEET ☐ METERS ☒ | MUD PROPERTIES | | | | | | | | | | | | | | | | | | | | | | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DENSITY PPG ☐ SG ☒ | VISCOSITY sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS 0 / 10 | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis Cl⁻ ppm x1000 | Ca ++ ppm | Pf / mf | RETORT % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | | |
| 43 | 27.9 | 3656 | 1.72 | 67 | 30.5 | 22 | 17 | 12/67 | 8.2 | 1 | 24 | 10.5 | 16 | 1840 | .3/1.2 | 3 | 25 | .50 | 22 | 2.7 | | | | | |
| 44 | 28.9 | 3712 | 1.72 | 57 | 29 | 21 | 16 | 10/61 | 9.5 | 1 | 26 | 10.2 | 17 | 1860 | .1/.8 | 3 | 25 | .25 | 24 | 4.3 | | | | | |
| 45 | 29.9 | 3743 | 1.72 | 54 | 27 | 20 | 14 | 9/58 | 9.0 | 1 | 27 | 10.3 | 17 | 1720 | .25/1.1 | 2 | 25 | TR | 22 | 2.6 | | | | | |
| 46 | 30.9 | 2797 | 1.72 | 54 | 27 | 21 | 12 | 7/44 | 9.0 | 2 | 27 | 10.3 | 18.5 | 1870 | .2/.9 | 2 | 26 | TR | 22.5 | 2.9 | | | | | |
| 47 | 1.10 | 3819 | 1.72 | 59 | 30 | 22 | 16 | 11/74 | 8.6 | 2 | 26 | 10.5 | 18 | 1800 | .2/1.1 | 2 | 26 | TR | 23 | 3.0 | | | | | |
| 48 | 2.10 | 3859 | 1.72 | 54 | 30.5 | 22 | 17 | 12/79 | 8.3 | 2 | 23 | 10.6 | 19 | 2020 | .25/1.1 | 2 | 26 | .25 | 22 | 4.0 | | | | | |
| 49 | 3.10 | 3885 | 1.72 | 55 | 29 | 21 | 16 | 7/62 | 7.4 | 1 | 24 | 10.3 | 19.5 | 1900 | .2/1.1 | 2 | 26 | .25 | 22 | 2.9 | | | | | |
| 50 | 4.10 | 3918 | 1.72 | 51 | 27.5 | 20 | 15 | 7/48 | 7.6 | 1 | 23 | 10.0 | 19.5 | 1880 | .15/1.1 | 2 | 26 | TR | 21 | 2.9 | | | | | |
| 51 | 5.10 | 3918 | 1.72 | 55 | 27 | 20 | 14 | 5/47 | 7.0 | 1 | | 9.8 | 19.5 | 1760 | .15/1.1 | 2 | 26 | TR | 22.5 | 2.9 | | | | | |
| 52 | 6.10 | 3918 | 1.72 | 53 | 27 | 20 | 14 | 7/51 | 6.2 | 1 | | 9.5 | 20 | 1840 | .1/1.4 | 2 | 26 | TR | 20 | 2.5 | | | | | |
| 53 | 7.10 | 3918 | 1.72 | 70 | 26.5 | 20 | 13 | 7/54 | 6.2 | 1 | | 9.3 | 19 | 1760 | .1/1.1 | 2 | 26 | TR | 20 | | | | | | |
| 54 | 8.10 | 3907 | 1.72 | 70 | 26.5 | 20 | 13 | 5/55 | 6.2 | 1 | | 9.1 | 19 | 1800 | .1/1.1 | 2 | 26 | TR | 20 | | | | | | |
| 55 | 9.10 | 3907 | 1.20 | 50 | 15.5 | 11 | 9 | 3/25 | 10.0 | 1 | | 9.9 | 9.5 | 1800 | .05/.5 | 0 | 8 | NIL | 12.5 | 0 | | | | | |
| 56 | 10.10 | 3938 | 1.20 | 51 | 18.5 | 13 | 11 | 3/29 | 5.8 | 1 | 20 | 10.6 | 13 | 800 | .15/.45 | 0 | 8 | TR | 16.25 | | | | | | |

REMARKS

# ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

## Drilling Mud Properties Record

MUD SYSTEM GEL/LIGNO

WELL NAME 6506/12-1 AREA NORTH SEA

OPERATOR STATOIL RIG ROSS ISLE

ENGINEERS CHAVEZ/KOPPERT/TORGERSEN

| Day No. | DATE 1984 | DEPTH FEET □ METERS ☒ | MUD PROPERTIES: DENSITY PPG □ SG ☒ | VISCOSITY: sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS 0/10 | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis: Cl⁻ ppm ×1000 | Ca ++ ppm | Pf/mf | RETORT: % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 57 | 11.10 | 3976 | 1.25 | 53 | 18 | 12 | 12 | 2/29 | 5.4 | 1 | 18 | 10.2 | 12 | 800 | .05/.4 | 0 | 8.5 | NIL | 15 | | | | | |
| 58 | 12.10 | 3993 | 1.25 | 53 | 19 | 14 | 10 | 3/22 | 5.5 | 1 | 20 | 10.6 | 13 | 700 | .15/.4 | 0 | 9.0 | NIL | 18 | | | | | |
| 59 | 13.10 | 4004 | 1.25 | 54 | 17 | 12 | 10 | 2/20 | 5.2 | 1 | 20 | 10.4 | 10.5 | 650 | .2/.45 | 0 | 9.0 | NIL | 18 | | | | | |
| 60 | 14.10 | 4067 | 1.25 | 54 | 16.5 | 12 | 9 | 2/18 | 5.4 | 1 | 18 | 10.6 | 10 | 500 | .3/.7 | 0 | 9 | NIL | 24 | | | | | |
| 61 | 15.10 | 4098 | 1.25 | 56 | 19 | 14 | 10 | 2/14 | 5.2 | 1 | 18 | 10.6 | 10 | 420 | .35/.75 | 0 | 10 | NIL | 22.5 | | | | | |
| 62 | 16.10 | 4098 | 1.25 | 57 | 19.5 | 15 | 9 | 2/15 | 5.0 | 1 | 18 | 10.6 | 11 | 280 | .3/.7 | 0 | 9.5 | NIL | 20 | | | | | |
| 63 | 17.10 | 4125 | 1.25 | 64 | 21 | 15 | 12 | 3/25 | 4.5 | 1 | 16 | 10.7 | 11.5 | 240 | .4/.9 | 0 | 9.5 | NIL | 22 | | | | | |
| 64 | 18.10 | 4150 | 1.25 | 59 | 18.5 | 13 | 11 | 2/15 | 5.0 | 1 | 15 | 10.4 | 12.5 | 320 | .3/.7 | 0 | 10 | NIL | 20 | | | | | |
| 65 | 19.10 | 4190 | 1.25 | 57 | 20 | 14 | 12 | 3/13 | 5.2 | 1 | 16 | 10.2 | 13 | 200 | .25/.8 | 0 | 10 | TR | 19 | | | | | |
| 66 | 20.10 | 4206 | 1.25 | 55 | 18.5 | 13 | 11 | 3/12 | 5.0 | 1 | 17 | 10.1 | 13 | 180 | .25/.8 | 0 | 10 | TR | 17.5 | | | | | |
| 67 | 21.10 | 4226 | 1.26 | 54 | 18.5 | 13 | 11 | 3/11 | 5.3 | 1 | 16 | 10.3 | 14 | 160 | .3/.9 | 0 | 10 | TR | 17 | | | | | |
| 68 | 22.10 | 4231 | 1.25 | 59 | 18.5 | 13 | 11 | 3/12 | 5.2 | 1 | 16 | 10.2 | 14 | 200 | .25/.9 | | 10 | TR | 17 | | | | | |
| 69 | 23.10 | 4252 | 1.25 | 61 | 18.5 | 13 | 11 | 3/13 | 5.3 | 1 | 17 | 10.1 | 14 | 200 | .2/.8 | | 10 | TR | 17 | | | | | |
| 70 | 24.10 | 4276 | 1.25 | 58 | 19 | 13 | 12 | 3/11 | 5.8 | 1 | 17.5 | 10.0 | 14 | 200 | .2/.8 | | 10.5 | TR | 17.5 | | | | | |

REMARKS

# ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

## Drilling Mud Properties Record

WELL NAME 6506/12-1 AREA NORTH SEA

OPERATOR STATOIL RIG ROSS ISLE

MUD SYSTEM GEL/LIGNOSULPHONATE ENGINEERS TORGERSEN/KOPPERT/KORSVOLD/ALISON

| Day No. | DATE 1984 | DEPTH FEET ☐ METERS ☒ | MUD PROPERTIES: DENSITY PPG ☐ SG ☒ | VISCOSITY: sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS 0/10 | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis: Cl⁻ ppm x1000 | Ca ++ ppm | Pf/mf | RETORT: % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 71 | 25.10 | 4291 | 1.25 | 54 | 19 | 13 | 12 | 3/13 | 6.0 | 1 | 20 | 10.3 | 14.5 | 160 | .25/.9 | | 10.5 | TR | 17.5 | | | | | | |
| 72 | 26.10 | 4307 | 1.25 | 53 | 19.5 | 14 | 11 | 2/16 | 6.3 | 1 | 18 | 10.4 | 15 | 140 | .25/.75 | | 10 | TR | 17 | | | | | | |
| 73 | 27.10 | 4374 | 1.25 | 52 | 20 | 14 | 12 | 2/18 | 6.0 | 1 | 17.5 | 10.7 | 15.5 | 140 | .25/.9 | | 11 | TR | 17.5 | | | | | | |
| 74 | 28.10 | 4463 | 1.25 | 60 | 21.5 | 15 | 13 | 3/21 | 6.0 | 1 | 18 | 10.0 | 15 | 160 | .2/1.0 | | 12 | TR | 17.5 | | | | | | |
| 75 | 29.10 | 4554 | 1.28 | 58 | 23 | 17 | 12 | 2/22 | 5.9 | 1 | 17.5 | 9.9 | 16 | 200 | .15/1.0 | | 14 | TR | 17.5 | | | | | | |
| 76 | 30.10 | 4554 | 1.28 | 62 | 21.5 | 16 | 11 | 3/11 | 5.7 | 1 | 17.5 | 10.5 | 16 | 160 | .3/1.0 | | 12 | TR | 17.5 | | | | | | |
| 77 | 31.10 | 4554 | 1.28 | 64 | 21.5 | 16 | 11 | 3/21 | 5.3 | 1 | 17 | 10.1 | 16 | 160 | .25/1.0 | | 12 | TR | 17.5 | | | | | | |
| 79 | 2.11 | 4554 | 1.31 | 64 | 23.5 | 18 | 11 | 3/20 | 6.4 | 1 | 18 | 9.9 | 18 | 300 | .2/1.0 | | 13 | TR | 17.5 | | | | | | |
| 80 | 3.11 | 4554 | 1.31 | 58 | 21.5 | 17 | 9 | 3/18 | 6.6 | 1 | 18 | 9.5 | 18 | 480 | .4/1.4 | | 14 | TR | 17 | | | | | | |
| 81 | 4.11 | 4554 | 1.31 | 53 | 21 | 16 | 10 | 2/24 | 8.6 | 1 | 20 | 11.5 | 19 | 520 | .9/1.7 | | 13 | 0.25 | 17.5 | | | | | | |
| 82 | 5.11 | 4438 | 1.31 | 31 | 22 | 17 | 10 | 3/23 | 8.0 | 1 | 24 | 11.5 | 19 | 320 | .8/2.0 | | 14 | .25 | 17.5 | | | | | | |
| 83 | 6.11 | 4554 | 1.31 | 58 | 24 | 18 | 12 | 3/16 | 6.9 | 1 | 19 | 11.2 | 19 | 160 | 1.5/2.3 | | 14 | TR | 20 | | | | | | |
| 84 | 7.11 | 4554 | 1.31 | 62 | 23.5 | 19 | 9 | 3/19 | 7.0 | 1 | 20 | 11.0 | 20 | 240 | .8/1.6 | | 14 | TR | 20 | | | | | | |
| | | | | | | | | / | | | | | | | | | | | | | | | | | |

REMARKS

# ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

## Drilling Mud Properties Record

WELL NAME 6506/12-1 AREA NORTH SEA

OPERATOR STATOIL RIG ROSS ISLE

MUD SYSTEM GEL/LIGNOSULPHONATE ENGINEERS ALISON/KORSVOLD/SUNDE/FOLKVORD

| Day No. | DATE 1984 | DEPTH FEET ○ METERS ☒ | MUD PROPERTIES: DENSITY PPG □ SG ☒ | VISCOSITY: sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS 0 / 10 minutes | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis: Cl⁻ ppm x1000 | Ca ++ ppm | Pf / mf | RETORT: % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 85 | 8.11 | 4554 | 1.31 | 62 | 22 | 18 | 8 | 2 / 14 | 8.1 | 1 | 21 | 11.2 | 19 | 140 | .8 / 1.6 | 0 | 14 | TR | 20 | | | | | |
| 86 | 9.11 | 4554 | 1.31 | 72 | 22.5 | 17 | 11 | 6 / 7.7 | 7.7 | 1 | | 11.4 | 16.5 | 460 | .8 / 1.6 | 0 | 14 | .25 | 20 | | | | | |
| 87 | 10.11 | 4557 | 1.31 | 69 | 30 | 25 | 10 | 2 / 15 | 7.1 | 1 | 21 | 11.6 | 18.5 | 300 | 2.9 / 4.5 | 0 | 15 | .25 | 20 | | | | | |
| 88 | 11.11 | 4582 | 1.31 | 73 | 73 | 27 | 10 | 2 / 20 | 5.1 | 1 | 18 | 11.3 | 19 | 280 | 1.9 / 3.5 | 0 | 14 | TR | 20 | | | | | |
| 89 | 12.11 | 4598 | 1.31 | 78 | 24 | 19 | 10 | 2 / 20 | 6.4 | 1 | 19 | 11.0 | 19 | 300 | 1.2 / 2.6 | 0 | 14 | TR | 20 | | | | | |
| 90 | 13.11 | 4681 | 1.31 | 53 | 18 | 15 | 6 | 2 / 10 | 7.4 | 1 | 20 | 11.3 | 19 | 540 | 1.0 / 2.4 | 0 | 14 | TR | 18 | | | | | |
| 91 | 14.11 | 4728 | 1.36 | 58 | 21 | 17 | 8 | 2 / 14 | 8.0 | 1 | 24 | 11.3 | 19 | 440 | 0.9 / 2.5 | 0 | 16 | TR | 20 | | | | | |
| 92 | 15.11 | 4757 | 1.40 | 51 | 20.5 | 15 | 9 | 2 / 17 | 8 | 1 | 22 | 11.3 | 18 | 160 | .85 / 1.7 | 0 | 16 | TR | 17.5 | | | | | |
| 93 | 16.11 | 4830 | 1.40 | 57 | 25 | 20 | 10 | 4 / 24 | 8 | 1 | 23 | 11.2 | 21.5 | 140 | .85 / 2.4 | 0 | 16 | TR | 17 | | | | | |
| 94 | 17.11 | 4868 | 1.45 | 54 | 25.5 | 20 | 11 | 4 / 28 | 8 | 1 | 11 | 10.9 | 22 | 160 | .65 / 2.1 | 0 | 17 | TR | 17 | | | | | |
| 95 | 18.11 | 4924 | 1.53 | 50 | 28.5 | 23 | 11 | 4 / 31 | 8.8 | 2 | 25 | 10.1 | 24 | 400 | .3 / 1.9 | 0 | 20 | TR | 17 | | | | | |
| 96 | 19.11 | 4924 | 1.58 | 52 | 26 | 21 | 10 | 4 / 27 | 8 | 1 | 23 | 9.8 | 26 | 440 | .3 / 1.3 | 0 | 22 | TR | 16 | | | | | |
| 97 | 20.11 | 4924 | 1.58 | 58 | 27.5 | 22 | 11 | 4 / 30 | 8.5 | 2 | 25 | 9.8 | 26.5 | 480 | .25 / 1.2 | 0 | 23 | TR | 16 | | | | | |
| 98 | 21.11 | 4924 | 1.58 | 59 | 29.5 | 18 | 9 | 4 / 25 | 8.8 | 2 | 25 | 9.2 | 29.5 | 240 | .15 / 1.3 | 0 | 23 | TR | 15 | | | | | |

REMARKS

# ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

## Drilling Mud Properties Record

MUD SYSTEM GEL/LIGNO

WELL NAME 6506/12-1 AREA NORTH SEA

OPERATOR STATOIL RIG. ROSS ISLE

ENGINEERS FOLKVORD/SMITH

| Day No. | DATE 1984 | DEPTH FEET □ METERS X | MUD PROPERTIES: DENSITY PPG □ SG X | VISCOSITY: sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS 0 / 10 | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis: Cl⁻ ppm x1000 | Ca ++ ppm | Pf / mf | RETORT: % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99 | 22.11 | 4924 | 1.63 | 62 | 27.5 | 22 | 11 | 5/32 | 8.2 | 1 | 24 | 9.3 | 30.5 | 240 | .25/1.4 | 0 | 24 | TR | 17 | | | | | |
| 100 | 23.11 | 4924 | 1.63 | 62 | 29 | 23 | 12 | 5/34 | 7.8 | 1 | 22 | 9.4 | 31 | 200 | .3/1.4 | 0 | 24 | TR | 17 | | | | | |
| 101 | 24.1 | 4924 | 1.63 | 63 | 28.5 | 23 | 11 | 5/33 | 8 | 2 | 22 | 9.5 | 31 | 200 | .25/1.2 | 0 | 24 | TR | 16 | | | | | |
| 102 | 25.11 | 4924 | 1.68 | 68 | 29.5 | 24 | 11 | 8/50 | 11 | 3 | 24 | 11.8 | 33 | 600 | .95/2 | 0 | 25 | TR | 15 | | | | | |
| 103 | 26.1 | 4924 | 1.52 | 54 | 18.5 | 15 | 9 | 4/35 | 12 | 2 | 30 | 12 | 24 | 280 | 1.45/2.5 | 0 | 22 | TR | 18 | | | | | |
| 104 | 27.11 | 4924 | 1.35 | 46 | 16.5 | 12 | 9 | 3/26 | 9 | 2 | 25 | 10.5 | 20 | 240 | .5/1.0 | 0 | 18 | TR | 18 | | | | | |
| 105 | 28.11 | 4523 | 1.35 | 48 | 17 | 12 | 10 | 4/28 | 10 | 2 | 24 | 10.2 | 20 | 230 | .4/1.1 | 0 | 13 | TR | 18 | | | | | |
| 106 | 29.11 | 4523 | 1.35 | 48 | 15 | 11 | 8 | 3/23 | 8 | 1 | 20 | 10.5 | 18 | 320 | .4/1.6 | 0 | 13 | TR | 20 | | | | | |
| 107 | 30.11 | 4523 | 1.35 | 47 | 13.5 | 10 | 7 | 2/18 | 10 | 2 | 24 | 10.5 | 17.5 | 360 | .35/1.0 | · | 10 | TR | 20 | | | | | |
| 108 | 1.12 | 4523 | 1.35 | 48 | 13.5 | 10 | 7 | 2/19 | 10 | 2 | 23 | 10.8 | 18 | 360 | .4/1.2 | | 10 | TR | 20 | | | | | |
| 109 | 2.12 | 4523 | 1.35 | 63 | 63 | 12 | 8 | 2/16 | 9.5 | 2 | 22 | 10.5 | 18 | 240 | .45/1.4 | | 10 | TR | 20 | | | | | |
| 110 | 3.12 | 4423 | 1.35 | 58 | 17 | 13 | 8 | 2/16 | 9 | 2 | 18 | 11.0 | 18 | 360 | .45/1.35 | | 10 | TR | 22 | | | | | |
| 111 | 4.12 | 4423 | 1.35 | 56 | 16.5 | 13 | 17 | 2/16 | 9 | 2 | 17 | 11.3 | 18 | 320 | .55/1.6 | | 12 | TR | 20 | | | | | |
| 112 | 5.12 | 4423 | 1.35 | 58 | 15.5 | 12 | 7 | 2/17 | 8.5 | 2 | 17 | 11.1 | 18 | 300 | .45/1.45 | | 12 | TR | 20 | | | | | |

REMARKS

# ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

## Drilling Mud Properties Record

WELL NAME 6506/12-1 AREA NORTH SEA
OPERATOR STATOIL RIG ROSS ISLE
MUD SYSTEM GEL/LIGNO ENGINEERS SMITH/CHAVEZ

| Day No. | DATE 1984 | DEPTH FEET ○ METERS ☒ | MUD PROPERTIES: DENSITY PPG ☐ SG ☒ | VISCOSITY: sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS 0/10 | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis: Cl⁻ ppm x1000 | Ca ++ ppm | mf/Pf | RETORT: % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 113 | 6.12 | 4423 | 1.35 | 56 | 14.5 | 9 | 7 | 2/15 | 8.8 | 2 | 16.5 | 11.2 | 18 | 360 | .4/1.45 | | 10 | TR | 18 | | | | | |
| 114 | 7.12 | 4418 | 1.35 | 53 | 15 | 12 | 6 | 2/14 | 8.5 | 2 | 17 | 11 | 18 | 400 | .3/.9 | | 10 | TR | 18 | | | | | |
| 115 | 8.12 | 4418 | 1.35 | 54 | 19.5 | 15 | 9 | 1/16 | 8.0 | 2 | 14 | 11.3 | 16.5 | 200 | .5/1.1 | TR | 11 | NIL | 20 | | | | | |
| 116 | 9.12 | 4418 | 1.35 | 54 | 16 | 12 | 8 | 1/14 | 8.4 | 2 | 16 | 11.2 | 17.5 | 360 | .45/1.0 | TR | 10 | NIL | 18 | | | | | |
| 117 | 10.12 | 4418 | 1.35 | 52 | 16 | 12 | 8 | 1/15 | 8.4 | 2 | 17 | 11.0 | 17.5 | 400 | .4/.9 | TR | 10 | NIL | 18 | | | | | |
| 118 | 11.12 | 4418 | 1.35 | 61 | 21 | 16 | 10 | 1/15 | 8.0 | 2 | 18 | 10.7 | 18.0 | 400 | .3/.9 | TR | 10 | NIL | 16 | | | | | |
| 119 | 12.12 | 4418 | 1.35 | 59 | 19.5 | 15 | 9 | 1/15 | 8.2 | 2 | 18 | 10.7 | 18.0 | 400 | .3/.9 | TR | 10 | NIL | 16 | | | | | |
| 120 | 13.12 | 4418 | 1.35 | 54 | 18.5 | 14 | 9 | 2/15 | 7.5 | 2 | 16 | 10.8 | 17.5 | 400 | .3/.9 | TR | 10.5 | NIL | 20 | | | | | |
| 121 | 14.12 | 4316 | 1.35 | 52 | 20.5 | 15 | 11 | 2/21 | 6.8 | 2 | 15 | 11.3 | 18 | 360 | .5/1.1 | TR | 10 | NIL | 18 | | | | | |
| 122 | 15.12 | 3600 | 1.35 | 52 | 20.5 | 15 | 11 | 2/18 | 6.5 | 2 | 16 | 11.2 | 18 | 540 | .4/1.0 | TR | 10 | NIL | 18 | | | | | |
| 123 | 16.12 | 3600 | 1.35 | 50 | 19.5 | 15 | 9 | 1/12 | 7.2 | 2 | 18 | 11.5 | 17.5 | 520 | .6/1.1 | TR | 10 | NIL | 16 | | | | | |
| 124 | 17.12 | 3600 | 1.35 | 50 | 19.5 | 15 | 9 | 1/15 | 7.2 | 2 | 18 | 11.3 | 17.0 | 520 | .55/1.1 | TR | 10 | TR | 16 | | | | | |
| 125 | 18.12 | 3600 | 1.35 | 60 | 18 | 14 | 8 | 1/15 | 7.2 | 2 | 18 | 11.3 | 17.5 | 560 | .55/1.1 | TR | 10 | TR | 16 | | | | | |
| 126 | 19.12 | 3600 | 1.35 | 57 | 22 | 16 | 12 | 2/18 | 6.2 | 2 | 14 | 10.5 | 17.5 | 360 | .15/.6 | TR | 10 | TR | 18 | | | | | |

REMARKS

# ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

## Drilling Mud Properties Record

WELL NAME 6506/12-1 AREA HALTENBANKEN
OPERATOR STATOIL RIG. ROSS ISLE
MUD SYSTEM LIGNOSULPHONATE ENGINEERS CHAVEZ/PARSONS

| Day No. | DATE 1984 1985 | DEPTH FEET □ METERS ☒ | MUD PROPERTIES: DENSITY PPG □ SG ☒ | VISCOSITY: sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS 0 / 10 | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis: Cl⁻ ppm x1000 | Ca ++ ppm | Pf / mf | RETORT: % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 127 | 20.12 | 4316 | 1.35 | 57 | 20.5 | 15 | 11 | 2/24 | 0 | 2 | 18 | 10.8 | 14 | 240 | .5/1.1 | TR | 11 | .25 | 20 | | | | | |
| 128 | 21.12 | 4316 | 1.35 | 61 | 21 | 16 | 10 | 2/26 | 9 | 2 | 18 | 10.9 | 15 | 280 | .6/1.2 | TR | 12 | TR | 21 | | | | | |
| 129 | 22.12 | 4316 | 1.35 | 59 | 19.5 | 15 | 9 | 2/21 | 9 | 2 | 19 | 11.2 | 16 | 360 | .6/1.1 | TR | 12 | TR | 20 | | | | | |
| 130 | 23.12 | 4316 | 1.35 | 54 | 20.5 | 15 | 11 | 2/18 | 8 | 2 | 17 | 11.3 | 16 | 350 | .5/1.4 | TR | 12 | TR | 20 | | | | | |
| 131 | 24.12 | 4316 | 1.35 | 58 | 16.5 | 12 | 9 | 5/28 | 9 | 2 | 19 | 10.8 | 17 | 360 | .4/1.2 | TR | 12 | TR | 20 | | | | | |
| 132 | 25.12 | 4316 | 1.35 | 57 | 20 | 15 | 10 | 2/21 | 8 | 2 | 18 | 10.8 | 17 | 360 | .5/1.2 | TR | 12 | | 20 | | | | | |
| 133 | 26.12 | 4316 | 1.35 | 67 | 24 | 18 | 12 | 4/38 | 8 | 2 | 19 | 10.7 | 17 | 320 | .4/1.1 | TR | 12 | | 20 | | | | | |
| 134 | 27.12 | 4316 | 1.35 | 51 | 19 | 14 | 10 | 2/21 | 8 | 2 | 19 | 10.5 | 16 | 320 | .4/1.1 | TR | 12 | | 20 | | | | | |
| 135 | 28.12 | 4316 | 1.35 | 54 | 16 | 12 | 8 | 2/19 | 8 | 2 | 19 | 10.6 | 16 | 320 | .3/.9 | TR | 12 | | 20 | | | | | |
| 136 | 29.12 | 4316 | 1.35 | 54 | 18.5 | 15 | 9 | 2/18 | 7 | 2 | 17 | 10.9 | 15.5 | 280 | .14/.9 | TR | 12 | | 22.5 | | | | | |
| 137 | 30.12 | 4316 | 1.35 | 53 | 21 | 16 | 10 | 3/21 | 9 | 2 | 17 | 10.8 | 16 | 280 | .4/.9 | TR | 13 | | 22.5 | | | | | |
| 138 | 31.12 | 4316 | 1.35 | 49 | 18.5 | 14 | 9 | 2/18 | 9 | 2 | 18 | 10.0 | 16 | 320 | .4/.9 | TR | 13 | | 22.5 | | | | | |
| 139 | 1.1 | 4316 | 1.35 | 47 | 18 | 14 | 8 | 2/18 | 9 | 2 | 19 | 10.8 | 16 | 320 | .5/1.0 | TR | 13 | | 20 | | | | | |
| 140 | 2.4 | 4316 | 1.35 | 61 | 21 | 16 | 10 | 2/19 | 8 | 2 | 19 | 10.6 | 16 | 280 | .3/.9 | TR | 13 | | 20 | | | | | |

REMARKS

# ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

## Drilling Mud Properties Record

WELL NAME 6506/12-1 AREA NORTH SEA
OPERATOR STATOIL RIG. ROSS ISLE
MUD SYSTEM LIGNO ENGINEERS CHAVEZ

| Day No. | DATE 1985 | DEPTH FEET ☐ METERS ☒ | MUD PROPERTIES: DENSITY PPG ☐ SG ☒ | VISCOSITY: sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS: 0 / 10 | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis: Cl⁻ ppm x1000 | Ca ++ ppm | Pf / mf | RETORT: % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 141 | 3.1 | 4229 | 1.35 | 61 | 20.5 | 15 | 11 | 3/19 | 10 | 2 | 19 | 11.2 | 16 | 360 | .7/1.3 | TR | 13 | NIL | 20 | | | | | |
| 142 | 4.1 | 4183 | 1.35 | 62 | 20.5 | 15 | 11 | 2/21 | 10 | 2 | 18 | 11.0 | 16 | 360 | .6/1.2 | TR | 12 | NIL | 20 | | | | | |
| 143 | 5.1 | 4183 | 1.35 | 68 | 20 | 14 | 12 | 3/30 | 8 | 2 | 17 | 10.2 | 14 | 360 | .15/.5 | TR | 13 | NIL | 20 | | | | | |
| 144 | 6.1 | 4183 | 1.35 | 54 | 18 | 13 | 10 | 3/26 | 9.5 | 2 | 18 | 10.5 | 11 | 450 | .4/.8 | NIL | 12 | .25 | 21 | | | | | |
| 145 | 7.1 | 4183 | 1.35 | 50 | 18 | 13 | 10 | 3/27 | 10 | 2 | 20 | 10.4 | 11 | 360 | .3/.8 | NIL | 12 | .25 | 22.5 | | | | | |
| 146 | 8.1 | 4183 | 1.35 | 50 | 18 | 13 | 10 | 3/25 | 10 | 2 | 20 | 10.2 | 11 | 420 | .2/1.0 | TR | 12 | .25 | 22.5 | | | | | |
| 147 | 9.1 | 4183 | 1.35 | 52 | 17.5 | 13 | 9 | 2/24 | 8 | 2 | 16 | 11.0 | 10 | 280 | .5/1.0 | TR | 12 | .25 | 20 | | | | | |
| 148 | 10.1 | 4183 | 1.35 | 54 | 18 | 13 | 10 | 2/25 | 9 | 2 | 18 | 10.6 | 11 | 280 | .35/.8 | TR | 12 | .25 | 20 | | | | | |
| 149 | 11.1 | 4183 | 1.35 | 66 | 21.5 | 15 | 13 | 2/35 | 6.5 | 2 | 17 | 10.5 | 11.2 | 320 | .3/.8 | TR | 12 | NIL | 20 | | | | | |
| 150 | 12.1 | 4165 | 1.35 | 52 | 17.5 | 13 | 9 | 2/24 | 8.0 | 2 | 17 | 10.3 | 12 | 360 | .25/.75 | TR | 12 | .25 | 20 | | | | | |
| 151 | 13.1 | 4165 | 1.35 | 72 | 22.5 | 16 | 13 | 3/35 | 6 | 2 | 16 | 10.8 | 10 | 160 | .4/1.0 | TR | 12 | .25 | 17.5 | | | | | |
| 153 | 14.1 | 4165 | 1.35 | 78 | 22.5 | 16 | 13 | 3/38 | 6.5 | 2 | 18 | 10.5 | 12 | 160 | .4/1.0 | TR | 12 | .25 | 17.5 | | | | | |
| 153 | 15.1 | 4165 | 1.35 | 65 | 19 | 14 | 10 | 2/27 | 7.5 | 2 | 18 | 10.5 | 11.5 | 120 | .4/1.0 | TR | 12 | .25 | 18 | | | | | |
| 154 | 16.1 | 4165 | 1.35 | 60 | 20.5 | 15 | 11 | 2/19 | 7 | 2 | 19 | 10.3 | 10 | 280 | .25/.85 | 1 | 13 | .25 | 20 | | | | | |

REMARKS

# ANCHOR DRILLING FLUIDS AS
OSLO – STAVANGER

## Drilling Mud Properties Record

WELL NAME 6506/12-1 AREA ROSS ISLE

OPERATOR STATOIL RIG. HALTENBANKEN

MUD SYSTEM LIGNO/RESINEX ENGINEERS KORSVOLD

| Day No. | DATE 1985 | DEPTH FEET / METERS | MUD PROPERTIES: DENSITY PPG / SG | VISCOSITY: sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS 0 / 10 | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis: Cl⁻ ppm x1000 | Ca ++ ppm | Pf / mf | RETORT: % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 155 | 17.1 | | 1.35 | 60 | 20.5 | 15 | 11 | 2 / 19 | 7,0 | 2 | 19 | 10.2 | 12 | 260 | 12 | TR | 12 | .25 | 17.5 | | | | | |
| 156 | 18.1 | | + 1.34 | 69 | 23,5 | 20 | 7 | 3 / 15 | 5,0 | 1 | | 12 | 6,5 | 150 | 17 | TR | 13 | .75 | 20 | | | | | |
| 157 | 19.1 | | 1.35 | 80 | 28,5 | 24 | 9 | 6 / 37 | 6.3 | 1 | 22 | 11.7 | 9.5 | 280 | .35 | TR | 13 | .50 | 21.5 | | | | | |
| 158 | 20.1 | | 1.35 | 87 | 24,5 | 21 | 7 | 5 / 24 | 6,2 | 1 | 22 | 11.7 | 9.7 | 260 | .35 | TR | 13 | .50 | 21.5 | | | | | |
| 159 | 21.1 | 4058 | 1.35 | 82 | 30 | 26 | 8 | 5 / 24 | 6.2 | 1 | 22 | 11.0 | 9.8 | 240 | .35 | TR | 13 | .25 | 23 | | | | | |
| 160 | 22.1 | 4058 | 1.35 | +100 | 31 | 27 | 8 | 5 / 37 | 5.0 | 1 | 17 | 11.6 | 9.6 | 300 | .25 | TR | 13 | .25 | 22.5 | | | | | |
| 161 | 23.1 | 4058 | 1.35 | +100 | 35,3 | 30 | 11 | 13 / 51 | 4.0 | 1 | 17 | 11.7 | 9.0 | 300 | .4 | TR | 13 | .25 | 22.5 | | | | | |
| 162 | 24.1 | 4058 | 1.35 | +100 | 38.5 | 33 | 11 | 6 / 43 | 4.0 | 1 | 17 | 11.4 | 9.0 | 320 | .3 | | 13 | .25 | 22.5 | | | | | |
| 163 | 25.1 | 4058 | 1.35 | +100 | 41 | 36 | 10 | 7 / 54 | 4.0 | 1 | 17 | 11.4 | 9.0 | 320 | .3 | | 13 | .25 | 22.5 | | | | | |
| 164 | 26.1 | 4058 | 1.35 | +100 | 41 | 36 | 10 | 7 / 54 | 4.0 | 1 | 17 | 11.4 | 9.0 | 320 | .3 | | 13 | .25 | 22.5 | | | | | |
| 165 | 27.1 | 4058 | 1.35 | +100 | 41 | 36 | 10 | 7 / 54 | 4.0 | 1 | 17 | 11.4 | 9.0 | 320 | .3 | | 13 | .25 | 22.5 | | | | | |
| 166 | 28.1 | 4058 | 1.35 | +100 | 41 | 36 | 10 | 7 / 54 | 4.0 | 1 | 17 | 11.4 | 9.0 | 320 | .3 | | 13 | .25 | 22.5 | | | | | |
| 167 | 29.1 | 4058 | 1.35 | +100 | 40 | 34 | 12 | 7 / 53 | 5 | 1 | 14 | 10.7 | 7.5 | 240 | .2 | | 14 | .50 | 23.5 | | | | | |
| 168 | 30.1 | 4058 | 1.35 | +100 | 40 | 34 | 12 | 7 / 53 | 5 | 1 | 14 | 10.7 | 7.5 | 240 | .2 | | 14 | .50 | 23.5 | | | | | |

REMARKS

# ANCHOR DRILLING FLUIDS AS
OSLO – STAVANGER

## Drilling Mud Properties Record

MUD SYSTEM: LIGNO

WELL NAME: 6506/12- AREA: NORTH SEA

OPERATOR: STATOIL RIG: ROSS ISLE

ENGINEERS: CHAVEZ

| Day No. | DATE | DEPTH FEET □ METERS □ X | MUD PROPERTIES: DENSITY PPG □ SG ☒ | VISCOSITY: sec/qt | A.V. cps | P.V. cps | Y.P. #/100 sq.ft. | GELS 0 / 10 | FLUID LOSS 30 Min cc's | CAKE 32 nds | H.T.H.P. cc's | pH | Filtrate Analysis: Cl⁻ ppm ×1000 | Ca ++ ppm | Pf / mf | RETORT: % OIL | % SOLIDS | % SAND | BENTONITE #/BBL | POTASH #/BBL | POLYMER #/BBL | "N" | "K" | OPERATION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1985 | | | | | | | | | | | | | | | | | | | | | | | |
| 169 | 31.1 | 2300 | 1.71 | 105 | 40.5 | 36 | 9 | 6/60 | 7.5 | 2 | 20 | 11.5 | 9 | 400 | .4/1.2 | TR | 27 | 1 | 21 | | | | | |
| 170 | 1.2 | 2020 | 1.71 | 100 | 40.5 | 36 | 9 | 6/58 | 7.0 | 2 | | 11.5 | 10 | 640 | .5/1.1 | TR | 27 | NIL | 21 | | | | | |
| 171 | 2.2 | 2020 | 1.55 | 72 | 41 | 36 | 10 | 7/55 | 8.0 | 2 | | 10.5 | 12 | 640 | .2/1.1 | TR | 14 | .50 | 17.5 | | | | | |
| 172 | 3.2 | 880 | 1.55 | 62 | 41.5 | 34 | 15 | 6/42 | 10.5 | 2 | | 11.3 | 12 | 230 | .5/1.3 | TR | 14 | .50 | 17.5 | | | | | |
| 173 | 4.2 | 400 | 1.55 | 60 | 38 | 32 | 12 | 2/29 | 12 | 2 | | 11.0 | 14 | 420 | .4/1.0 | TR | 15 | TR | 15 | | | | | |
| 174 | 5.2 | | 1.55 | 60 | | | MUD STORED IN SURFACE PITS | | | | | | | | | | | | | | | | | |
| 175 | 6.2 | | | | | | MUD DUMPED | | | | | | | | | | | | | | | | | |

REMARKS

OPERATOR STATOIL

WELL NO. 6506/12-1

# MATERIAL CONSUMPTION & COST ANALYSIS

36" HOLE DRILLED TO 348 Meters 30 CASING SET AT 347 Meters

ACTUAL AMOUNT OF HOLE DRILLED 76 Meters DAYS ON INTERVAL 3

DRILLING FLUID SYSTEM SPUD MUD

| MATERIAL | UNIT SIZE | UNIT PRICE | CONSUMPTION | US$ COST |
|---|---|---|---|---|
| WYOMING BENTONITE | M/T | 380.- | 45 | 17,100.- |
| CAUSTIC SODA | 25 KG | 20.- | 31 | 620.- |
| SODA ASH | 50 KG | 21.- | 21 | 441.- |
| ANCOBAR | M/T | 148.- | 27 | 3,996.- |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

COST/DAY US$ 7,385.67 COST FOR INTERVAL US$ 22,157.-

COST/M US$ 291.54

OPERATOR STATOIL

WELL NO. 6506/12-1

# MATERIAL CONSUMPTION & COST ANALYSIS

26" HOLE DRILLED TO 948 Meters ~~Feet~~ 20" CASING SET AT 931 Meters ~~Feet~~

ACTUAL AMOUNT OF HOLE DRILLED 602 Meters ~~Feet~~ DAYS ON INTERVAL 10

DRILLING FLUID SYSTEM BENTONITE/SEAWATER

| MATERIAL | UNIT SIZE | UNIT PRICE | CONSUMPTION | US$ COST |
|---|---|---|---|---|
| ANCOBAR | M/T | 148.- | 283 | 41,884.- |
| ANCO DETERGENT | 200 L DR. | 495.- | 3 | 1,485.- |
| CAUSTIC SODA | 25 KG | 20.- | 149 | 29.80 |
| SODA ASH | 50 KG | 21.- | 7 | 147.- |
| SPERCELL C | 25 KG | 19.50 | 38 | 741.- |
| WYOMING BENTONITE | M/T | 380.- | 32 | 12,160.- |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

COST/DAY US$ 5,939.70 COST FOR INTERVAL US$ 59,397.-

COST/ M US$ 98.67

OPERATOR STATOIL

WELL NO. 6506/12-1

# MATERIAL CONSUMPTION & COST ANALYSIS

17 1/2" HOLE DRILLED TO 2203 Meters / Feet 13 5/8" CASING SET AT 2187 Meters / ~~Feet~~

ACTUAL AMOUNT OF HOLE DRILLED 1255 Meters / ~~Feet~~ DAYS ON INTERVAL 10

DRILLING FLUID SYSTEM GYP/CMC

| MATERIAL | UNIT SIZE | UNIT PRICE | CONSUMPTION | US$ COST |
|---|---|---|---|---|
| ANCOBAR | M/T | 148.- | 584 | 86,432.- |
| WYOMING BENTONITE | M/T | 380.- | 25 | 9,500.- |
| SPERCELL C | 25 KG | 19.50 | 215 | 4,192.50 |
| CAUSTIC SODA | 25 KG | 20.00 | 188 | 3,760.- |
| SODIUM BICARBONATE | 50 KG | 24.00 | 44 | 1,056.- |
| GYPSUM | 40 KG | 10.56 | 832 | 8,785.92 |
| CMC LOVIS | 25 KG | 65.- | 450 | 29,250.- |
| CMC HIVIS | 25 KG | 67.- | 13 | 871.- |
| DESCO | 25 LBS | 38.- | 47 | 1,786.- |
| SODA ASH | 50 KG | 21.- | 15 | 315.- |
| ANCONOL DEFOAMER | 25 L | 118.- | 2 | 236.- |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

COST/DAY US$ 14,184.42 COST FOR INTERVAL US$ 146,184.42

COST/M US$ 116.48

OPERATOR STATOIL

WELL NO. 6506/12-1

# MATERIAL CONSUMPTION & COST ANALYSIS

12 1/4" HOLE DRILLED TO 3918 Meters Feet 9 3/8" CASING SET AT 3907 Meters ~~Feet~~

ACTUAL AMOUNT OF HOLE DRILLED 1734 Meters ~~Feet~~ DAYS ON INTERVAL 31

DRILLING FLUID SYSTEM GYP/LIGNO

| MATERIAL | UNIT SIZE | UNIT PRICE | CONSUMPTION | COST |
|---|---|---|---|---|
| ANCOBAR | M/T | 148 | 1003 | 148,444.- |
| WYOMING BENTONITE | M/T | 380 | 10 | 3,800.- |
| WYOMING BENTONITE | 50 KG | 18 | 90 | 1,620.- |
| GYPSUM | 40 KG | 10.56 | 1011 | 10,676.16 |
| SPERCELL C | 25 KG | 19.5 | 848 | 16,536.- |
| DESCO | 25 LBS | 38.- | 164 | 6,232.- |
| ANCO LIC C | 25 KG | 32.- | 80 | 2,560.- |
| ANCO RESIN | 25 KG | 96.25 | 32 | 3,080.- |
| CMC LOVIS | 25 KG | 65.- | 314 | 20,410.- |
| CMC HIVIS | 25 KG | 67.- | 88 | 5,896.- |
| SODA ASH | 50 KG | 21.- | 3 | 63.- |
| SODIUM BICARBONATE | 50 KG | 24.- | 72 | 1,728.- |
| CAUSTIC SODA | 25 KG | 20.- | 446.- | 8,920.- |
| ALUMINIUM STEARATE | 25 KG | 89.- | 12.- | 1,068.- |
| ANCONOL DEFOAMER | 25 L | 118.- | 4.- | 472.- |
| ANCO DETERGENT | 200 L | 495.- | 2.- | 990.- |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

COST/DAY US$ 7,500.17 COST FOR INTERVAL US$ 232,495.16

COST/ m US$ 134.09

OPERATOR STATOIL

WELL NO. 6506/12-1

# MATERIAL CONSUMPTION & COST ANALYSIS

8 1/2" HOLE DRILLED TO 4554 Meters ~~Feet~~ 7" LINER ~~CASING~~ SET AT 3757 TO 4553 Meters ~~Feet~~

ACTUAL AMOUNT OF HOLE DRILLED 636 Meters ~~Feet~~ DAYS ON INTERVAL 32

DRILLING FLUID SYSTEM GEL/LIGNOSULPHONATE

| MATERIAL | UNIT SIZE | UNIT PRICE | CONSUMPTION | US$COST |
|---|---|---|---|---|
| ANCOBAR | M/T | 148.- | 82 | 12,136.- |
| WYOMING BENTONITE | M/T | 380.- | 35 | 13,300.- |
| ~~WYOMING BENTONITE~~ | ~~50 KG~~ | ~~18.-~~ | ~~80~~ | ~~1,440.-~~ |
| SPERCELL C | 25 KG | 19.50 | 152 | 2,964.- |
| ANCO LIC C | 25 KG | 32.- | 93 | 2,976.- |
| DESCO | 25 LBS | 38.- | 50 | 1,900.- |
| ANCO RESIN | 25 KG | 25.- | 120 | 11,550.- |
| CMC LOVIS | 25 KG | 65.- | 103 | 6,695.- |
| CMC HIVIS | 25 KG | 67.- | 68 | 4,556.- |
| XC POLYMER | 50 LBS | 395.- | 27 | 10,665.- |
| DRISPAC REGULAR | 50 LBS | 154.- | 16 | 2,464.- |
| SODA ASH | 50 KG | 21.- | 6 | 126.- |
| SODIUM BICARBONATE | 50 KG | 24.- | 70 | 1,680.- |
| CAUSTIC SODA | 25 KG | 20.- | 132 | 2,640.- |
| ANCONOL DEFOAMER | 25 L | 118.- | 2 | 236.- |
| DRISPAC SUPERLO | 50 LBS | 165.- | 2 | 330.- |
| | | | | |
| | | | | |
| COST INCLUDES CHEMICALS USED FOR CEMENT JOBS. | | | | |
| | | | | |

COST/DAY US$ 2,364.31 COST FOR INTERVAL US$ 75,658.-

COST/ M US$ 118.96

OPERATOR STATOIL

WELL NO. 6506/12-1

# MATERIAL CONSUMPTION & COST ANALYSIS

6" HOLE DRILLED TO 4924 Meters ~~Feet~~ XX – CASING SET AT – Meters ~~Feet~~

ACTUAL AMOUNT OF HOLE DRILLED 370 Meters ~~Feet~~ XXX DAYS ON INTERVAL 16

DRILLING FLUID SYSTEM GEL/LIGNOSULPHONATE/LIGNITE

| MATERIAL | UNIT SIZE | UNIT PRICE | CONSUMPTION | US$ COST |
|---|---|---|---|---|
| ANCOBAR | M/T | 148.- | 332 | 49,136.- |
| WYOMING BENTONITE | M/T | 380.- | 11 | 4,180.- |
| SPERCELL C | 25 KG | 19.50 | 91 | 1,774.50 |
| ANCO LIG C | 25 KG | 32.- | 143 | 4,576.- |
| DESCO | 25 LBS | 38.- | 159 | 6,042.- |
| ANCO RESIN | 25 KG | 96.25 | 165 | 15,881.25 |
| DRISPAC REGULAR | 50 LBS | 154.- | 2 | 308.- |
| DRISPAC SUPERLO | 50 LBS | 165.- | 60 | 9,900.- |
| SODA ASH | 50 KG | 21.- | 29 | 609.- |
| SODIUM BICARBONATE | 50 KG | 24.- | 119 | 2,856.- |
| ANCONOL DEFOAMER | 25 L | 118.- | 2 | 236.- |
| CMC LOVIS | 25 KG | 67.- | 15 | 1,005.- |
| CAUSTIC SODA | 25 KG | 20.- | 12 | 240.- |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

COST/DAY US$ 6,046.49 COST FOR INTERVAL US$ 96,743.75

COST/ M US$ 261.47

OPERATOR STATOIL

WELL NO. 6506/12-1

# MATERIAL CONSUMPTION & COST ANALYSIS

TESTING

HOLE DRILLED TO Meters / Feet

CASING SET AT Meters / Feet

ACTUAL AMOUNT OF HOLE DRILLED Meters / Feet

DAYS ON INTERVAL 73

DRILLING FLUID SYSTEM GEL/LIGNO

| MATERIAL | UNIT SIZE | UNIT PRICE | CONSUMPTION | US$ COST |
|---|---|---|---|---|
| ANCOBAR | M/T | 148.- | 393 | 58,164.- |
| WYOMING BENTONITE | M/T | 380.- | 75 | 28,500.- |
| WYOMING BENTONITE | 50 KG | 18.- | 24 | 432.- |
| SPERCELL C | 25 KG | 19.50 | 250 | 4,875.- |
| ANCO LIG C | 25 KG | 32.- | 176 | 5,632.- |
| DESCO | 25 LBS | 38.- | 34 | 2,242.- |
| ANCO RESIN | 25 KG | 96.25 | 129 | 12,416.25 |
| CMC LV | 25 KG | 65.- | 32 | 2,080.- |
| XC POLYMER | 50 LBS | 395.- | 7 | 2,765.- |
| DRISPAC REGULAR | 50 LBS | 154.- | 8 | 1,232.- |
| DRISPAC SUPERLO | 50 LBS | 165.- | 15 | 2,475.- |
| SODA ASH | 50 KG | 21.- | 29 | 609.- |
| SODIUM BICARBONATE | 50 KG | 24.- | 33 | 792.- |
| CAUSTIC SODA | 25 KG | 20.- | 60 | 1,200.- |
| ANCONOL DEFOAMER | 25 L | 118.- | 4 | 472.- |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

COST/DAY US$ 1,697.07

COST FOR INTERVAL US$ 123,886.25

COST/

OPERATOR STATOIL

WELL NO. 6506/12-1

# TOTAL CONSUMPTION & COST ANALYSIS

TOTAL DEPTH 4924 Meters ~~Feet~~x

TOTAL HOLE DRILLED 4652 Meters ~~Feet~~x

TOTAL DAYS 175 including 73 days of testing

| MATERIAL | UNIT SIZE | UNIT PRICE | CONSUMPTION | US$COST |
|---|---|---|---|---|
| ANCOBAR | M/T | 148.- | 2704 | 400,192.- |
| WYOMING BENTONITE | M/T | 380.- | 233 | 88,540.- |
| WYOMING BENTONITE | 50 KG | 18.- | 194 | 3,492.- |
| GYPSUM | 40 KG | 10.56 | 1843 | 19,462.- |
| SPERCELL C | 25 KG | 19.50 | 1594 | 31,083.- |
| ANCO LIG C | 25 KG | 32.- | 492 | 15,744.- |
| DESCO | 25 LBS | 38.- | 479 | 18,202.- |
| ANCO RESIN | 25 KG | 96.25 | 446 | 42,927.50 |
| CMC LV | 25 KG | 65.- | 914 | 59,410.- |
| CMC HV | 25 KG | 67.- | 169 | 11,323.- |
| XC POLYMER | 50 LBS | 395.- | 34 | 13,430.- |
| DRISPAC REGULAR | 50 LBS | 154.- | 26 | 4,004.- |
| DRISPAC SUPERLO | 50 LBS | 165.- | 77 | 12,705.- |
| SODA ASH | 50 KG | 21.- | 110 | 2,310.- |
| SODIUM BICARBONATE | 50 KG | 24.- | 338 | 8,112.- |
| CAUSTIC SODA | 25 KG | 20.- | 1018 | 20,360.- |
| ANCO DETERGENT | 200 L | 495.- | 5 | 2,475.- |
| ANCONOL DEFOAMER | 25 L | 118.- | 14 | 1,652.- |
| ALUMINIUM STEARATE | 25 KG | 89.- | 12 | 1,068.- |
| | | | | |
| | | | | |

COST/DAY US$ 4,322.80

TOTAL CHEMICAL COSTS US$ 756,491.50

COST/ M US$162.62

TOTAL ENGINEERING CHARGES

TOTAL DRILLING FLUID RELATED COSTS

# GEOCHEMICAL DATA REPORT


**GEOLAB NOR AS**
PO Box 5740 Fossegrenda
N-7002 Trondheim
Norway

Tel: (47) 73 964000
Fax: (47) 73 96 59 74
Tlx: 65706 geono n

Internet: firmapost@geolab-nor.telemax no
X.400: S=firmapost, O=geolab-nor, A=telemax, C=no


CLIENT

**STATOIL**



REF(S)
Richard Patience
ORDER NO: G96-23
CONTRACT NO: DTJ020215

TITLE

## Geochemical Analysis of Gas and Condensate Samples from two Smørbukk Wells

AUTHOR(S)

Henning Jensen

| GEOLAB PROJECT NO. | DATE |
|---|---|
| 62326 | 27.01.97 |
| PROJECT MANAGER: Henning Jensen, Snr. Scientist | QA RESPONSIBLE: Peter B. Hall, Snr. Scientist |
| REPORT NO./FILE | PAGE: 1 of 1 |

GEOLAB NOR

# TABLE 1. ANALYTICAL PROGRAM - OIL AND GAS SAMPLES

| Sample Depth & Type<br>c= Cutt<br>s= SWC<br>p= Conv core/ plug<br>m= Mud<br><br>R= Reservoir<br>S= Source | Fraction | HS & Occ Gas | Gas Isotope | Rock Eval | Therm Ext GC | Pyrolysis GC | Extraction | MPLC & Deasp | Iatroscan | Whole oil GC | Sat GC Quan. | Aro GC | Sat GCMS Quan. | Aro GCMS | Bulk C Isot | Topping | API Gravity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4674.0 m | 0001B | | X | | | | | X | X | X | X | X | X | X | X | X | X |

Table 8a: MPLC Bulk Composition: Weight of Oil and Fraction for Statoil, Norsk Sektor, Norske Havet



| Well | Description | Whole oil (mg) | Light (mg) | Topped (mg) | Sat (mg) | Aro (mg) | Asph (mg) | NSO (mg) | HC (mg) | Non-HC (mg) | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 153.12 | 21.72 | 131.4 | 118.0 | 11.2 | 0.4 | 1.9 | 129.1 | 2.3 | 045/0001 |

Table 8b: MPLC Bulk Composition: Oil fraction (%) for Statoil, Norsk Sektor, Norske Havet



| Well | Description | Sat T.Oil | Aro T.Oil | Asph T.Oil | NSO T.Oil | HC T.Oil | Non-HC T.Oil | Sat Aro | HC Non-HC | Sample |
|---|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 89.78 | 8.50 | 0.30 | 1.42 | 98.28 | 1.72 | 1056.25 | 5710.45 | 045/0001 |

Table 8f: Iatroscan TLC Bulk Composition: Rel. percentages of sep. fractions for Statoil, Norsk Sektor, Norske Havet

| Well | Description | Sat HC | Aro HC | Resins | Asp | Tot HC | Tot Pol | Sample |
|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 81.34 | 13.71 | 4.64 | 0.30 | 95.06 | 4.94 | 045/0001 |

Table 9A: Quantitative Analysis of Saturated Fraction for well NOCS 6506/11-5S.

| sample | nC15 mg/g sat | nC16 mg/g sat | iC18 mg/g sat | nC17 mg/g sat | Pr mg/g sat | nC18 mg/g sat | Ph mg/g sat | nC19 mg/g sat | nC20 mg/g sat | nC21 mg/g sat | nC22 mg/g sat | nC23 mg/g sat | nC24 mg/g sat | nC25 mg/g sat | nC26 mg/g sat | nC27 mg/g sat | nC28 mg/g sat | nC29 mg/g sat | nC30 mg/g sat | nC31 mg/g sat | nC32 mg/g sat | nC33 mg/g sat | nC34 mg/g sat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4674 | 16.39 | 14.85 | 4.57 | 12.48 | 7.88 | 11.39 | 5.08 | 8.77 | 7.80 | 6.49 | 5.75 | 4.97 | 4.60 | 4.02 | 3.53 | 2.98 | 2.58 | 2.03 | 1.66 | 1.27 | 0.84 | 0.56 | 0.85 |

Table 9B: Saturated Hydrocarbon Ratios (peak area) for Statoil, Norsk Sektor, Norske Havet



| Well | Description | Pristane / nC17 | Pristane / Phytane | Pristane/nC17 / Phytane/nC18 | Phytane / nC18 | CPI1 | nC17 / nC17+nC27 | Sample |
|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 0.63 | 1.55 | 1.41 | 0.45 | 1.01 | 0.81 | 045/0001 |

Table 9Ca: Aromatic Hydrocarbon Ratios (peak area) for Statoil, Norsk Sektor, Norske Havet



| Well | Description | MNR | DMNR | BPhR | 2/1MP | MPI1 | MPI2 | Rc | DBT/P | 4/1MDBT | (3+2) /1MDBT | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 1.88 | 2.62 | 0.62 | 1.22 | 0.83 | 0.99 | 0.90 | - | 18.59 | 4.59 | 045/0001 |

Table 9Cb: Aromatic Hydrocarbon Ratios (peak area) for Statoil, Norsk Sektor, Norske Havet



| Well | Description | F1 | F2 | Sample |
|---|---|---|---|---|
| 6506/11-5S | MDT | 0.48 | 0.29 | 045/0001 |

Table 10A: Tabulation of carbon isotope data on oils for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | Whole oil | Topped oil | Saturated | Aromatic | NSO | Asphaltenes | Sample |
|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | -28.12 | - | -28.05 | -26.91 | -29.63 | - | 045/0001 |

Table 10B: Tabulation of cv values from carbon isotope data for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | Saturated | Aromatic | cv value | Sample |
|---|---|---|---|---|---|
| 6506/11-5S | MDT | -28.05 | -26.91 | -0.42 | 045/0001 |

Table 11a: Variation in Triterpane Distribution (peak height) SIR for Statoil, Norsk Sektor, Norske Havet 

| Well | Descript. | Ratio1 | Ratio2 | Ratio3 | Ratio4 | Ratio5 | Ratio6 | Ratio7 | Ratio8 | Ratio9 | Rat.10 | Rat.11 | Rat.12 | Rat.13 | Rat.14 | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 0.29 | 0.22 | 0.20 | 0.75 | 0.43 | 0.45 | 0.11 | 0.15 | 0.10 | 0.52 | 0.89 | 0.42 | 0.11 | 57.95 | O45/0001 |

List of Triterpane Distribution Ratios

Ratio 1: 27Tm / 27Ts

Ratio 2: 27Tm / 27Tm+27Ts

Ratio 3: 27Tm / 27Tm+30aß+30ßa

Ratio 4: 29aß / 30aß

Ratio 5: 29aß / 29aß+30aß

Ratio 6: 30d / 30aß

Ratio 7: 28aß / 30aß

Ratio 8: 28aß / 29aß

Ratio 9: 28aß / 28aß+30aß

Ratio 10: 24/3 / 30aß

Ratio 11: 30aß / 30aß+30ßa

Ratio 12: 29aß+29ßa / 29aß+29ßa+30aß+30ßa

Ratio 13: 29ßa+30ßa / 29aß+30aß

Ratio 14: 32aßS / 32aßS+32aßR (%)

Table 11b: Variation in Sterane Distribution (peak height) SIR for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | Ratio1 | Ratio2 | Ratio3 | Ratio4 | Ratio5 | Ratio6 | Ratio7 | Ratio8 | Ratio9 | Ratio10 | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 0.74 | 48.72 | 78.17 | 1.07 | 0.79 | 0.46 | 0.33 | 0.64 | 0.95 | 3.49 | 045/0001 |

List of Sterane Distribution Ratios

Ratio 1: 27dßS / 27dßS+27aaR

Ratio 2: 29aaS / 29aaS+29aaR (%)

Ratio 3: 2*(29ßßR+29ßßS) / (29aaS+29aaR + 2*(29ßßR+29ßßS)) (%)

Ratio 4: 27dßS+27dßR+27daR+27daS / 29dßS+29dßR+29daR+29daS

Ratio 5: 29ßßR+29ßßS / 29ßßR+29ßßS+29aaS

Ratio 6: 21a+22a / 21a+22a+29aaS+29ßßR+29ßßS+29aaR

Ratio 7: 21a+22a / 21a+22a+28daS+28aaS+29daR+29aaS+29ßßR+29ßßS+29aaR

Ratio 8: 29ßßR+29ßßS / 29aaS+29ßßR+29ßßS+29aaR

Ratio 9: 29aaS / 29aaR

Ratio 10: 29ßßR+29ßßS / 29aaR

Table 11c: Raw triterpane data (peak height) m/z 191 SIR for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | 23/3 | 24/3 | 25/3 | 24/4 | 26/3 | 27Ts | 27Tm | 28aß | 25nor30aß | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 29aß | 29Ts | 30d | 29ßa | 30O | 30aß | 30ßa | 30G | 31aßS | |
| | | 31aßR | 32aßS | 32aßR | 33aßS | 33aßR | 34aßS | 34aßR | 35aßS | 35aßR | |
| 6506/11-5S | MDT | 930.5 | 728.9 | 345.2 | 645.7 | 249.1 | 1347.9 | 390.2 | 155.5 | 196.0 | O45/0001 |
| | | 1048.4 | 867.8 | 635.5 | 104.0 | 0.0 | 1405.6 | 172.2 | 0.0 | 444.1 | |
| | | 367.2 | 223.0 | 161.8 | 130.7 | 94.7 | 69.7 | 0.0 | 0.0 | 0.0 | |

Table 11d: Raw sterane data (peak height) m/z 217 SIR for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | 21a | 22a | 27dßS | 27dßR | 27daR | 27daS | 28dßS | 28dßR | 28daR* | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 29dßS* | 28daS* | 27aaR | 29dßR | 29daR | 28aaS | 29daS* | 28ßßS | | |
| | | 28aaR | 29aaS | 29ßßR | 29ßßS | 29aaR | | | | | |
| 6506/11-5S | MDT | 1327.7 | 335.4 | 2393.9 | 801.7 | 533.8 | 330.4 | 661.9 | 710.9 | 647.6 | O45/0001 |
| | | 1577.2 | 669.3 | 845.6 | 1276.4 | 419.5 | 194.5 | 534.6 | 690.0 | | |
| | | 121.6 | 340.0 | 629.3 | 620.0 | 357.8 | | | | | |

* 28daR coel with 27aaS, 29dßS coel with 27ßßR, 28daS coel with 27ßßS, 29daS coel with 28ßßR

Table 11e: Raw sterane data (peak height) m/z 218 SIR for Statoil, Norsk Sektor, Norske Havet 

| Well | Descript. | 27ßßR | 27ßßS | 28ßßR | 28ßßS | 29ßßR | 29ßßS | 30ßßR | 30ßßS | Sample |
|---|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 784.9 | 651.0 | 557.4 | 695.4 | 674.6 | 633.9 | 194.6 | 192.6 | O45/0001 |

Table 11f: Raw triterpane data (peak height) m/z 177 SIR for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | 25nor28aß | 25nor30aß | Sample |
|---|---|---|---|---|
| 6506/11-5S | MDT | 679.5 | 239.7 | 045/0001 |

Table 11g: Amount of triterpanes (ppb) m/z 191 SIR for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | 23/3 | 24/3 | 25/3 | 24/4 | 26/3 | 27Ts | 27Tm | 28aß | 25nor30aß | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 29aß | 29Ts | 30d | 29ßa | 30O | 30aß | 30ßa | 30G | 31aßS | |
| | | 31aßR | 32aßS | 32aßR | 33aßS | 33aßR | 34aßS | 34aßR | 35aßS | 35aßR | |
| 6506/11-5S | MDT | 12884.3 | 10092.7 | 4780.0 | 8939.8 | 3449.4 | 18663.4 | 5402.4 | 2152.9 | 2713.7 | 045/0001 |
| | | 14515.9 | 12015.2 | 8799.7 | 1440.0 | 0.0 | 19462.0 | 2384.6 | 0.0 | 6149.0 | |
| | | 5083.9 | 3087.1 | 2239.8 | 1810.1 | 1311.5 | 965.2 | 0.0 | 0.0 | 0.0 | |

Table 11h: Amount of steranes (ppb) m/z 217 SIR for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | 21a | 22a | 27dßS | 27dßR | 27daR | 27daS | 28dßS | 28dßR | 28daR* | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 29dßS* | 28daS* | 27aaR | 29dßR | 29daR | 28aaS | 29daS* | 28ßßS | | |
| | | 28aaR | 29aaS | 29ßßR | 29ßßS | 29aaR | | | | | |
| 6506/11-5S | MDT | 18384.1 | 4644.6 | 33145.9 | 11100.8 | 7390.5 | 4574.8 | 9164.3 | 9843.6 | 8967.2 | O45/0001 |
| | | 21838.0 | 9267.5 | 11708.7 | 17673.1 | 5809.0 | 2693.0 | 7402.4 | 9553.8 | | |
| | | 1683.7 | 4707.7 | 8712.9 | 8585.2 | 4954.1 | | | | | |

* 28daR coel with 27aaS, 29dßS coel with 27ßßR, 28daS coel with 27ßßS, 29daS coel with 28ßßR

Table 11i: Amount of standard and weight of sample for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | Standard | Amount | Weight | Sample |
|---|---|---|---|---|---|
| 6506/11-5S | MDT | 1994.3 | 1.400 | 50.7 | 045/0001 |

Table 12a: Variation in Triaromatic Sterane Distribution (peak height) for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | Ratio1 | Ratio2 | Ratio3 | Ratio4 | Ratio5 | Sample |
|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 0.97 | 0.97 | 0.90 | 0.91 | 0.94 | 045/0001 |

Ratio1: a1 / a1 + g1
Ratio2: b1 / b1 + g1
Ratio3: a1 + b1 / a1 + b1 + c1 + d1 + e1 + f1 + g1
Ratio4: a1 / a1 + e1 + f1 + g1
Ratio5: a1 / a1 + d1

Table 12b: Variation in Monoaromatic Sterane Distribution (peak height) for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | Ratio1 | Ratio2 | Ratio3 | Ratio4 | Sample |
|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 0.76 | 0.64 | 0.60 | 0.44 | 045/0001 |

Ratio1: A1 / A1 + E1
Ratio2: B1 / B1 + E1
Ratio3: A1 / A1 + E1 + G1
Ratio4: A1+B1 / A1+B1+C1+D1+E1+F1+G1+H1+I1

Table 12c: Aromatisation of Steranes (peak height) for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | Ratio1 | Ratio2 | Sample |
|---|---|---|---|---|
| 6506/11-5S | MDT | 0.75 | 0.59 | 045/0001 |

Ratio1: $\frac{C1+D1+E1+F1+G1+H1+I1}{C1+D1+E1+F1+G1+H1+I1 + c1+d1+e1+f1+g1}$

Ratio2: g1 / g1 + I1

Table 12d: Raw triaromatic sterane data (peak height) m/z 231 for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | a1 | b1 | c1 | d1 | e1 | f1 | g1 | Sample |
|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 2660.3 | 2414.7 | 134.1 | 163.4 | 120.5 | 80.6 | 74.9 | 045/0001 |

Table 12e: Raw monoaromatic sterane data (peak height) m/z 253 for Statoil, Norsk Sektor, Norske Havet



| Well | Descript. | A1 | B1 | C1 | D1 | E1 | F1 | G1 | H1 | I1 | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 863.9 | 484.2 | 237.2 | 151.5 | 273.6 | 86.0 | 291.4 | 610.6 | 52.0 | 045/0001 |

Table 13A: Light Hydrocarbons from Whole Oil GC for Statoil, Norsk Sektor, Norske Havet



| Well | Description | iC4 | nC4 | iC5 | nC5 | 2,2DMC4 | 2,3DMC4 | 2MC5 | 3MC5 | nC6 | MCyC5 | Benz | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | - | - | - | - | 0.06 | - | - | - | 3.69 | 2.30 | 1.97 | 045/0001 |

Table 13B: Light Hydrocarbons from Whole Oil GC for Statoil, Norsk Sektor, Norske Havet



| Well | Description | CyC6 | 2MC6 | 3MC6 | 1,3ci-DMCyC5 | 1,3tr-DMCyC5 | 1,2tr-DMCyC5 | nC7 | MCyC6 | Tol | nC8 | p/m-Xylene | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 4.13 | 2.32 | 1.70 | 0.61 | 0.58 | 1.96 | 5.58 | 8.91 | 8.51 | 5.98 | 7.69 | O45/0001 |

Table 13C: Thompson's indices for Statoil, Norsk Sektor, Norske Havet



| Well | Description | A | B | X | W | C | I | F | H | U | R | S | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT | 0.53 | 1.53 | 1.29 | 4.77 | 0.71 | 1.28 | 0.63 | 21.64 | 1.80 | 2.41 | 61.50 | 045/0001 |

# THOMPSON'S INDICES

$$A = \frac{\text{Benzene}}{\text{nC6}} \qquad B = \frac{\text{Toluene}}{\text{nC7}} \qquad X = \frac{\text{p/m-xylene}}{\text{nC8}} \qquad W = \frac{\text{Benzene} * 10}{\text{CyC6}}$$

$$C = \frac{\text{nC6} + \text{nC7}}{\text{CyC6} + \text{MCyC6}} \qquad I = \frac{\text{2MC6} + \text{3MC6}}{\text{1,3ciDMCyC5} + \text{1,3trDMCyC5} + \text{1,2trDMCyC5}} \qquad F = \frac{\text{nC7}}{\text{MCyC6}}$$

$$H = \frac{\text{nC7} * 100}{\text{CyC6} + \text{2MC6} + \text{2,3DMC4} + \text{3MC6} + \text{1,3ciDMCyC5} + \text{1,3trDMCyC5} + \text{1,2trDMCyC5} + \text{nC7} + \text{MCyC6}}$$

$$U = \frac{\text{CyC6}}{\text{MCyC5}} \qquad R = \frac{\text{nC7}}{\text{2MC6}} \qquad S = \frac{\text{nC6}}{\text{2,2DMC4}}$$

Table 14A: Volume Composition of Gas Samples from well SMØRBUKK WELLS



Depth unit of measure: m

| Well | Descript. | C1 | C2 | C3 | iC4 | nC4 | iC5 | nC5 | CO2 | sum C1-C5 | wet-ness | iC4/ nC4 | Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT 4674.00m | 73.00 | 10.80 | 6.20 | 1.00 | 2.10 | 0.64 | 0.68 | 5.60 | 94.4 | 0.22 | 0.48 | 0001-0B |

Table 14B: Isotopic Composition of Gas Samples from well SMØRBUKK WELLS



Depth unit of measure: m

| Well | Descript. | C1 d13C | C1 dD | C2 d13C | C3 d13C | iC4 d13C | nC4 d13C | CO2 d13C | CO2 d18O | Sample |
|---|---|---|---|---|---|---|---|---|---|---|
| 6506/11-5S | MDT 4674.00m | -44.7 | -202.0 | -30.6 | -28.4 | -28.0 | -28.0 | -14.3 | -16.4 | 0001-0B |

GEOLAB NOR

| Table 17 | API-gravity data for well NOCS 6506/11-5S oil | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Sample | | | API-gravity | | | |
| | | | | | | |
| MDT | 4674.0 m | | 40.08 | | | |
| | | | | | | |
| | | | | | | |

**Institutt for energiteknikk**
*Institute for Energy Technology*

| | KJELLER | HALDEN |
|---|---|---|
| ADDRESS | Box 40, N-2007 Kjeller, Norway | N-1751 Halden, Norway |
| TELEPHONE | +47 63 806000 | +47 69 183100 |
| TELEX | 76 361 isotp n | 76 335 energ n |
| TELEFAX | +47 63 815553 | |

| | | |
|---|---|---|
| | | **AVAILABILITY** In Confidence |
| **REPORT TYPE** | **REPORT NO.** IFE/KR/F-96/223 | **DATE** 1996-12-11 |
| | **REPORT TITLE** DATAREPORT ON STABLE ISOTOPES, GAS SAMPLES FROM WELL 6506/12-1 and 6506/11-5S (ref. IFE no. 2.5.0210.96) | **DATE OF LAST REV.** **REV. NO.** |
| | **CLIENT** Geolab Nor/Statoil | **NUMBER OF PAGES** 7 |
| | **CLIENT REF.** G96-23 | **NUMBER OF ISSUES** 16 |

**SUMMARY**

Four gas samples from well 6506/12-1 (DST 2A, DST 4B, DST 5D and DST 7), and one gas sample from well 6506/11-5S (MDT), are analysed for gas and isotopic composition.

The work is done in accordance with the "The Norwegian Industry Guide to Organic Geochemical Analyses", Third Edition 1993.

**DISTRIBUTION**

Geolab Nor/Statoil (10)
Andresen, B.
Bjørnstad, T.
Johansen, H.
Sieglé, S.
File (2)

**KEYWORDS**

| | NAME | DATE | SIGNATURE |
|---|---|---|---|
| **PREPARED BY** | Bjørg Andresen<br>Sylviane Sieglé | 1996-12-11 | Bjørg Andresen<br>Sylviane Sieglé |
| **REVIEWED BY** | Harald Johansen | 1996-12-11 | Harald Johansen |
| **APPROVED BY** | Tor Bjørnstad | 1996-12-11 | Tor Bjørnstad |

# 1 Introduction

Four gas samples from well 6506/12-1 (DST 2, DST 4B, DST 5D and DST 7) and one gas sample from well 6506/11-5S (MDT) are analysed for gas and isotopic composition.

On the samples $C_1$ - $C_5$ and $CO_2$ are quantified. The $\delta^{13}C$ value is measured on methane, ethane, propane, the butanes and $CO_2$. In addition the $\delta D$ value is measured on methane.

# 2 Analytical procedures

Aliquots of 1.0 ml of the gas samples are sampled with a syringe for analysis on a Porapak Q column connected with flame ionisation (FID) and thermal conductivity (TCD) detectors. The detection limit for the hydrocarbon gas components is 0.01 µl/ml and 0.2 µl/ml for $CO_2$.

For the isotope analysis 5 - 10 ml is sampled with a syringe and then separated into the different gas components by a Carlo Erba 4200 gas chromatograph. The hydrocarbon gas components are oxidised in separate CuO-ovens in order to prevent cross contamination. The combustion products $CO_2$ and $H_2O$ are frozen into collection vessels and separated.

The combustion water is reduced with zinc metal in sealed quarts tubes to prepare hydrogen for isotopic analysis. The isotopic measurements are performed on a Finnigan MAT 251 and a Finnigan Delta mass spectrometer.

IFEs value on NBS 22 is -29.77 ± .06‰ PDB.

The uncertainty in the $\delta^{13}C$ value is estimated to be ± 0.3‰ PDB and includes all the different analytical steps. The estimate is based on repeated analysis of a laboratory standard gas mixture. The uncertainty in the $\delta D$ value is likewise estimated to be ± 5‰.

# 3 Results

The volume composition of the gas samples is shown in Table 1 (normalised composition), and the stable isotope composition is shown in Table 2.

The molecular composition related to carbon isotope variations in methane from the gas samples from well 6506/12-1 and 6506/11-5S are plotted in Figure 1 (Schoell, 1983), the carbon and hydrogen variations in methane are plotted in Figure 2 (Schoell, 1983) and the carbon isotope variations in ethane related to the carbon isotope variations in methane in Figure 3 (Schoell, 1983).

*Table 1 Volume composition (normalised values) of gas samples from well 6506/12-1 and well 6506/11-5S*

| Sample | IFE no GEO | $C_1$ % | $C_2$ % | $C_3$ % | $iC_4$ % | $nC_4$ % | $iC_5$ % | $nC_5$ % | $CO_2$ % | $\Sigma C_1$-$C_5$ % | Wet-ness | $iC_4$/ $nC_4$/ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6506/12-1, DST 2 | 961476 | 76.5 | 10.2 | 5.2 | 0.72 | 1.2 | 0.30 | 0.29 | 5.5 | 94.5 | 0.19 | 0.60 |
| 6506/12-1, DST 4B | 961477 | 77.8 | 9.8 | 5.0 | 0.69 | 1.2 | 0.28 | 0.29 | 4.9 | 95.1 | 0.18 | 0.56 |
| 6506/12-1, DST 5D | 961478 | 79.1 | 9.3 | 5.0 | 0.73 | 1.4 | 0.33 | 0.35 | 3.8 | 96.2 | 0.18 | 0.54 |
| 6506/12-1, DST 7 | 961479 | 80.4 | 8.7 | 4.7 | 0.66 | 1.2 | 0.29 | 0.29 | 3.7 | 96.3 | 0.17 | 0.55 |
| 6506/11-5S, MDT | 961480 | 73.0 | 10.8 | 6.2 | 1.00 | 2.1 | 0.64 | 0.68 | 5.6 | 94.4 | 0.23 | 0.49 |

*Table 2 Isotopic composition of gas samples from well 6506/12-1 and well 6506/11-5S*

| Sample | IFE no GEO | $C_1$ $\delta^{13}C$ ‰ PDB | $C_1$ $\delta$ D ‰ SMOW | $C_2$ $\delta^{13}C$ ‰ PDB | $C_3$ $\delta^{13}C$ ‰ PDB | $iC_4$ $\delta^{13}C$ ‰ PDB | $nC_4$ $\delta^{13}C$ ‰ PDB | $CO_2$ $\delta^{13}C$ ‰ PDB | $CO_2$ $\delta^{18}O$ ‰ PDB |
|---|---|---|---|---|---|---|---|---|---|
| 6506/12-1, DST 2 | 961476 | -44.2 | -204 | -30.7 | -28.4 | -28.0 | -27.5 | -14.3 | -15.3 |
| 6506/12-1, DST 4B | 961477 | -45.2 | -199 | -30.5 | -28.6 | -27.5 | -28.2 | -11.0 | -15.5 |
| 6506/12-1, DST 5D | 961478 | -44.8 | -202 | -31.2 | -28.8 | -29.0 | -28.4 | -12.1 | -15.6 |
| 6506/12-1, DST 7 | 961479 | -44.8 | -198 | -29.3 | -28.1 | -27.8 | -27.9 | -12.3 | -16.1 |
| 6506/11-5S, MDT | 961480 | -44.7 | -202 | -30.6 | -28.4 | -28.0 | -28.0 | -14.3 | -16.4 |

3

Institute for energy technology


| | KJELLER | HALDEN |
|---|---|---|
| ADDRESS | N-2007 Kjeller, Norway | N-1751 Halden, Norway |
| TELEPHONE | +47 2 712560 - 713560 | +47 31 83100 |
| TELEX | 74 573 energ n | 76 335 energ n |
| TELEFAX | +47 2 715553 | |


AVAILABILITY

Private
Confidential

REPORT TYPE

REPORT NO.
IFE/KR/F-85/040

DATE
1985-03-15

REPORT TITLE

RESERVOIRED AND HEADSPACE GAS GEOCHEMISTRY ON SAMPLES FROM WELL 6506/12-1

DATE OF LAST REV.

REV. NO.

CLIENT

Den norske stats oljeselskap a.s

NUMBER OF PAGES
13

CLIENT REF.
T-6269 No. 11

NUMBER OF ISSUES
20

DISTRIBUTION
Statoil 10
Råheim, A.
Andresen, B.
Brevik, E.
Berg, J.O.
Gaudernack, B.

KEYWORDS

| | NAME | DATE | SIGNATURE |
|---|---|---|---|
| PREPARED BY | Bjørg Andresen | 1985-03-15 | Bjørg Andresen |
| | Einar Brevik | 1985-03-15 | Einar Brevik |
| | Arne Råheim | 1985-03-15 | Arne Råheim |
| REVIEWED BY | | | |
| APPROVED BY | Karen Garder | 1985-03-15 | Karen Garder |

## 1 INTRODUCTION

Headspace cans from well 6506/12-1 were received early January 1985 and were analyzed during January. $C_1$-$C_4$ are quantified and the $\delta^{13}C$ value is measured on methane and when possible on ethane, propane and the butanes.

3 DST samples were received in the mid of February and analyzed during early March. The $\delta^{13}C$ value is measured on methane, ethane, propane, the butanes and $CO_2$, $\delta^{18}O$ on $CO_2$, and $\delta D$ on methane.

## 2 ANALYTICAL PROCEDURE

The headspace gas was quantified by a Carlo Erba HRGC 5300 gas chromatograph equipped with a FID detector. To be able to do the isotopic measurements the gases have been separated into the different gas components by a Carlo-Erba 4200 instrument. This gas chromatograph is equipped with a special injection loop in order to concentrate the samples, in the case of low concentration of the gas components. The hydrocarbon gas components were oxidized in separate CuO-ovens in order to prevent cross contamination. The combustion products $CO_2$ and $H_2O$ were frozen into collection vessels and separated.

The water was reduced with zinc metal in a sealed tube to prepare hydrogen for isotopic analysis. The isotopic measurements were performed on a Finnigan Mat 251 mass spectrometer. Our $\delta^{13}C$ value on NBS-22 is -29.77 $\pm$ .06 o/oo.

## 3 RESULTS

The composition of the headspace gas and the DST samples are given in Tables 1 and 2. The results have not been normalized to 100%. The rest is air. The results are also shown graphically in Fig. 1. The stable

isotope results from the headspace gas are given in Table 3, and the DST samples in Table 4.

Our uncertainty on the $\delta^{13}C$ value is estimated to be $\pm$0.3 o/oo and includes all the different analysis step. The uncertainty on the $\delta D$ value is likewise estimated to be $\pm$5 o/oo.

Table 1 The Composition of Headspace Gas from Well 6506/12-1

| Sample depth (m) | $C_1$ x $10^4$ ppm | $C_2$ ppm | $C_3$ ppm | $iC_4$ ppm | $nC_4$ ppm | Abundance $\Sigma C_1$-$C_4$ x $10^4$ ppm | Abundance $\Sigma C_2$-$C_4$ x $10^4$ ppm | Wetness | $\frac{iC_4}{nC_4}$ |
|---|---|---|---|---|---|---|---|---|---|
| 3840 | 1.7475 | 2375 | 5090 | 330 | 1340 | 2.6610 | 0.9135 | 0.34 | 0.25 |
| 3860 | 0.3335 | 4050 | 7725 | 1455 | 6220 | 2.2785 | 1.9450 | 0.85 | 0.23 |
| 3880 | 0.0645 | 375 | 370 | 55 | 250 | 0.1695 | 0.1050 | 0.62 | 0.22 |
| 3900 | 0.0680 | 790 | 840 | 160 | 650 | 0.3120 | 0.2440 | 0.78 | 0.25 |
| 3920 | 0.0370 | 285 | 355 | 55 | 155 | 0.1220 | 0.0850 | 0.70 | 0.35 |
| 3940 | 0.0435 | 335 | 380 | 30 | 105 | 0.1285 | 0.0850 | 0.66 | 0.29 |
| 3960 | 0.1815 | 1450 | 1365 | 155 | 365 | 0.5150 | 0.3335 | 0.65 | 0.42 |
| 3970-3980 | 0.0790 | 285 | 300 | 65 | 135 | 0.1575 | 0.0785 | 0.50 | 0.48 |
| 4000-4010 | 0.0035 | 65 | 145 | 25 | 70 | 0.0340 | 0.0305 | 0.90 | 0.36 |
| 4020 | 0.0785 | 740 | 620 | 85 | 250 | 0.2480 | 0.1695 | 0.68 | 0.34 |
| 4040 | 0.1675 | 1380 | 970 | 115 | 290 | 0.4430 | 0.2755 | 0.62 | 0.40 |
| 4060 | 0.0015 | 35 | 85 | 15 | 50 | 0.0200 | 0.0185 | 0.93 | 0.30 |
| 4080 | 0.1390 | 1240 | 1145 | 135 | 355 | 0.4265 | 0.2875 | 0.67 | 0.38 |
| 4100 | 0.4420 | 2640 | 1500 | 180 | 380 | 0.9120 | 0.4700 | 0.52 | 0.47 |
| 4120 | 0.0945 | 1015 | 585 | 60 | 155 | 0.2760 | 0.1815 | 0.66 | 0.39 |
| 4140 | 0.0095 | 245 | 275 | 45 | 120 | 0.0780 | 0.0685 | 0.88 | 0.38 |
| 4160 | 0.0115 | 200 | 275 | 60 | 110 | 0.0760 | 0.0645 | 0.85 | 0.55 |

cont.

Table 1 cont.

| Sample depth (m) | $C_1$ x $10^4$ ppm | $C_2$ ppm | $C_3$ ppm | $iC_4$ ppm | $nC_4$ ppm | Abundance $\Sigma C_1-C_4$ x $10^4$ ppm | Abundance $\Sigma C_2-C_4$ x $10^4$ ppm | Wetness | $\frac{iC_4}{nC_4}$ |
|---|---|---|---|---|---|---|---|---|---|
| 4180 | 0.5580 | 2290 | 2180 | 490 | 1115 | 1.1655 | 0.6075 | 0.52 | 0.44 |
| 4200 | 0.1390 | 1240 | 1145 | 135 | 355 | 0.4265 | 0.2875 | 0.67 | 0.38 |
| 4240 | 1.0095 | 4630 | 2650 | 330 | 635 | 1.8340 | 0.8245 | 0.45 | 0.52 |
| 4260 | 0.6700 | 2985 | 1640 | 195 | 455 | 1.1975 | 0.5275 | 0.44 | 0.43 |
| 4280 | 1.2725 | 4675 | 2100 | 225 | 535 | 2.0260 | 0.7535 | 0.37 | 0.42 |
| 4300 | 0.0590 | 575 | 290 | 35 | 110 | 0.1600 | 0.1010 | 0.63 | 0.32 |
| 4320 | 0.1340 | 1170 | 760 | 90 | 245 | 0.3605 | 0.2265 | 0.63 | 0.37 |
| 4350 | 0.2950 | 1555 | 1130 | 170 | 430 | 0.6235 | 0.3285 | 0.53 | 0.40 |
| 4370 | 0.0160 | 245 | 275 | 40 | 115 | 0.0835 | 0.0675 | 0.81 | 0.35 |
| 4390 | 0.0100 | 125 | 200 | 35 | 110 | 0.0570 | 0.0470 | 0.82 | 0.32 |
| 4410 | 0.0165 | 160 | 165 | 30 | 90 | 0.0610 | 0.0445 | 0.73 | 0.33 |
| 4430 | 0.7700 | 2705 | 1195 | 280 | 595 | 1.2475 | 0.4775 | 0.38 | 0.47 |
| 4450 | 10.3100 | 17600 | 3900 | 200 | 500 | 12.5300 | 2.2200 | 0.18 | 0.40 |
| 4470 | 3.0700 | 12300 | 3300 | 160 | 350 | 4.6810 | 1.6110 | 0.34 | 0.46 |
| 4490 | 7.8100 | 13800 | 3500 | 205 | 410 | 9.6015 | 1.7915 | 0.19 | 0.50 |
| 4510 | 19.6000 | 20800 | 4600 | 250 | 480 | 22.2130 | 2.6130 | 0.12 | 0.52 |

cont.

Table 1 cont.

| Sample depth (m) | $C_1$ x $10_4$ ppm | $C_2$ ppm | $C_3$ ppm | $iC_4$ ppm | $nC_4$ ppm | Abundance $\Sigma C_1-C_4$ x $10^4$ ppm | Abundance $\Sigma C_2-C_4$ x $10^4$ ppm | Wetness | $\frac{iC_4}{nC_4}$ |
|---|---|---|---|---|---|---|---|---|---|
| 4530 | 19.3800 | 25100 | 5300 | 305 | 490 | 22.4995 | 3.1195 | 0.14 | 0.62 |
| 4550 | 12.2900 | 19700 | 4500 | 250 | 435 | 14.7785 | 2.4885 | 0.17 | 0.57 |
| 4580 | 0.2450 | 2370 | 1055 | 380 | 795 | 0.7050 | 0.4600 | 0.65 | 0.48 |
| 4600-4610 | 57.9000 | 56700 | 8100 | 515 | 690 | 64.5005 | 6.6005 | 0.10 | 0.75 |
| 4630-4640 | 35.1700 | 36000 | 5200 | 320 | 460 | 39.3680 | 4.1980 | 0.11 | 0.70 |
| 4660-4670 | 6.2500 | 10500 | 1465 | 80 | 160 | 7.4705 | 1.2205 | 0.16 | 0.50 |
| 4680-4690 | 19.3800 | 25100 | 3185 | 185 | 280 | 22.2550 | 2.8750 | 0.13 | 0.66 |
| 4700-4710 | 6.9800 | 8200 | 1195 | 90 | 120 | 7.9405 | 0.9605 | 0.12 | 0.75 |
| 4720-4730 | 1.4700 | 3720 | 745 | 140 | 185 | 1.9490 | 0.4790 | 0.25 | 0.76 |
| 4740-4750 | 1.8200 | 3685 | 635 | 60 | 85 | 2.2665 | 0.4465 | 0.20 | 0.71 |
| 4760-4770 | 1.1810 | 3065 | 765 | 70 | 100 | 1.5810 | 0.4000 | 0.25 | 0.70 |
| 4780-4790 | 1.8800 | 2710 | 395 | 30 | 40 | 2.1975 | 0.3175 | 0.14 | 0.75 |
| 4800-4810 | 3.0800 | 5210 | 625 | 45 | 50 | 3.6730 | 0.5930 | 0.16 | 0.90 |
| 4860-4870 | 1.6210 | 3190 | 475 | 45 | 45 | 1.9965 | 0.3755 | 0.19 | 1.0 |
| 4890-4900 | 1.4600 | 2210 | 330 | 35 | 35 | 1.7210 | 0.2610 | 0.15 | 1.0 |

Table 2 Composition of DST Gas Samples from Well 6506/12-1

| Sample | $CO_2$ % | $C_1$ % | $C_2$ % | $C_3$ % | $iC_4$ % | $nC_4$ % | Abundance $\Sigma C_1-C_4$ % | Abundance $\Sigma C_2-C_4$ % | Wetness | $\frac{iC_4}{nC_4}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| DST 5B 4203-18 m RKB | 4.9 | 67.5 | 7.1 | 4.1 | 0.50 | 1.1 | 79.9 | 12.4 | 0.15 | 0.45 |
| DST 4B 4251-61 m RKB | 6.9 | 77.8 | 8.2 | 4.6 | 0.52 | 1.0 | 92.1 | 14.2 | 0.16 | 0.52 |
| DST 2C 4350 m RKB | 7.2 | 71.2 | 8.0 | 4.2 | 0.44 | 0.83 | 84.7 | 13.5 | 0.16 | 0.53 |

Table 3 Isotopic Composition of Headspace Gas from Well 6506/12-1

| Sample depth m | $\delta^{13}C$ | | | | |
|---|---|---|---|---|---|
| | $C_1$ | $C_2$ | $C_3$ | $iC_4$ | $nC_4$ |
| 3860 | -30.1 | -29.2 | -32.3 | -25.2 | -32.9 |
| 3880 | -35.0 | | | | |
| 3900 | -32.8 | -29.6 | -34.4 | | -31.8 |
| 3960 | -29.6 | -28.7 | -28.6 | -28.5 | -29.5 |
| 3970-80 | -29.6 | | | | |
| 4020 | -31.0 | | | | |
| 4040 | -46.6 | | | | |
| 4080 | -35.9 | | | | |
| 4100 | -36.7 | -28.4 | -29.1 | -23.2 | -30.1 |
| 4120 | -33.1 | | | | |
| 4180 | -41.5 | -30.1 | -29.2 | -24.5 | -29.9 |
| 4200 | -36.6 | | | | |
| 4240 | -39.7 | -29.8 | -29.4 | -27.7 | -32.0 |
| 4260 | -37.2 | | | | |
| 4280 | -37.4 | | | | |
| 4300 | -23.4 | | | | |
| 4320 | -28.8 | | | | |
| 4350 | -40.8 | -28.8 | -29.7 | -27.4 | -30.1 |
| 4430 | -39.2 | -31.7 | -31.0 | | -29.4 |
| 4450 | -38.9 | | | | |
| 4470 | -34.7 | | | | |
| 4490 | -30.9 | | | | |
| 4510 | -38.2 | -29.5 | -26.8 | -25.5 | -28.5 |
| 4530 | -37.6 | | | | |
| 4550 | -37.9 | | | | |
| 4580 | -22.0 | | | | |
| 4600-10 | -38.8 | -29.7 | -27.7 | -26.4 | -28.4 |

cont.

Table 3 cont.

| Sample depth m | $\delta^{13}C$ | | | | |
|---|---|---|---|---|---|
| | $C_1$ | $C_2$ | $C_3$ | $iC_4$ | $nC_4$ |
| 4630-40 | -39.9 | | | | |
| 4660-70 | -36.6 | | | | |
| 4680-90 | -35.3 | | | | |
| 4700-10 | -41.5 | | | | |
| 4720-30 | -38.0 | -29.9 | -27.1 | -27.5 | -28.5 |
| 4740-50 | -40.0 | | | | |
| 4760-70 | -41.8 | | | | |
| 4780-90 | -40.4 | | | | |
| 4800-10 | -40.8 | | | | |
| 4860-70 | -44.4 | -28.9 | -27.2 | | |
| 4890-4900 | -42.5 | | | | |

Table 4 Isotopic Composition of DST Samples from Well 6506/12-1

| Sample | $C_1$ | | $C_2$ | $C_3$ | $iC_4$ | $nC_4$ | $CO_2$ | |
|---|---|---|---|---|---|---|---|---|
| | $\delta^{13}C$ | $\delta D$ | $\delta^{13}C$ | $\delta^{13}C$ | $\delta^{13}C$ | $\delta^{13}C$ | $\delta^{13}C$ | $\delta^{18}O$ |
| DST 5B 4203-18 m RKB | -45.6 | -235 | -28.4 | -26.3 | -25.5 | -24.5 | -18.9 | -23.3 |
| DST 4B 4251-61 m RKB | -45.8 | -251 | -30.4 | -27.2 | - | -26.8 | -10.8 | -14.9 |
| DST 2C 4350 m RBK | -45.0 | -250 | -30.9 | -27.9 | - | -26.1 | -13.8 | -14.7 |

5

**PETROLEUM TECHNOLOGY**

**GEOLOGICAL LABORATORIES**



| | |
|---|---|
| **Report no.** | |
| **GEOLAB.** | 86.42 |
| **Copy no.** | |
| **No. of copies** | 10 |

| | |
|---|---|
| **Grading** | Confidential |

**Title** CORRELATION STUDY BETWEEN TEST FLUIDS FROM THE WELLS 6506/12-1, 3 AND 5, AND RELATIONS TO POTENTIAL SOURCE ROCKS.

| | | |
|---|---|---|
| **Requested by** K. Opsvik og K. Borgersen, HLB | **Project** Block 6506/12,Haltenbanken | |
| **Date** 08.12.86 | **Number of pages** 52 | **No. of encs.** 3 Appendices |

**Key words** Fluid analyses, test samples, bulk characteristics, oil-oil and oil-source rock correlations, maturity evaluation, multivariate data analysis.

**Prepared by** GEOLAB
T Meyer, project leader
L Sandvik, analytical work
A Langmo, - " -
S Ulvøen, data analysis

**Textoperator**

**Approved by**

17/12-86 H. Irwin

17/12-86 S. Olaussen

# 1. LIST OF TABLES

Table 1 Test samples from the 6506/12 block

| Well | Test sample | Depth (mRKB) |
|---|---|---|
| 6506/12-1 | DST-2 C | 4351 - 4373 |
| Alpha South | DST-4B O/C | 4251 - 4261 |
| (Smørbukk) | DST-5B C | 4203 - 4218 |
| | DST-7 C | 3993 - 4011 |
| 6506/12-3 | DST-1 O/C | 4222 - 4241 |
| Beta | DST-2 C | 4165 - 4170 |
| | DST-3 C | 3960 - 3980 |
| | DST-4 O/C | 3880,5 - 3890 |
| | DST-5 O/C | 3822 - 3836 |
| | DST-6 O | 3162 - 3173 |
| 6506/12-5 | DST-2 O/C | 4004 - 4008 |
| | DST-4 O | 3174 - 3177,5 |

O: oil

C: condensate

Table 2 Bulk characteristics of the test sample $C_{15+}$ fractions

| | | | % Hydrocarbons | | | % Nonhydrocarbons | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Well | Test sample | 2) API° | SAT | ARO | Total HC | NSO | ASPH | Total Non HC | %$C_{15+}$ | GOR 2) $Sm^3/Sm^3$ |
| 6506/12-1 | DST-2 | 47.6 | 83.78 | 10.21 | 93.99 | 4.56 | 1.38 | 5.94 | 41.2 | 1338 |
| | DST-4B | 41.3 | 86.26 | 8.73 | 94.99 | 3.28 | 1.66 | 4.94 | 65.4 | 973 |
| | DST-5B | 45.7 | 88.90 | 6.87 | 95.77 | 2.88 | 1.32 | 4.20 | 52.5 | 1550 |
| | DST-7 | 45.0 | 75.10 | 18.60 | 93.70 | 6.30 | 0 | 6.30 | 59.9 | 1424 |
| 6506/12-3 | DST-1 | 42.0 | 79.89 | 14.89 | 94.78 | 3.72 | 1.17 | 4.89 | 51.4 | 496 |
| | DST-2 | 39.5 | 77.91 | 16.81 | 94.72 | 3.49 | 1.47 | 4.96 | 50.3 | 1241 |
| | DST-3 | 44.0 | 81.67 | 10.26 | 91.93 | 6.13 | 1.47 | 7.60 | 49.9 | 1395 |
| | DST-4 | 42.0 | 73.49 | 17.49 | 90.98 | 6.40 | 2.32 | 8.72 | 60.9 | 513 |
| | DST-5 | 40.0 | 79.16 | 13.77 | 92.93 | 4.92 | 2.03 | 6.95 | 67.9 | 273 |
| | DST-6 | 42.0 | 87.86 | 6.99 | 94.85 | 4.31 | 0.77 | 5.08 | 63.8 | 191 |
| 6506/12-5 | DST-2 | 37.3 | 82.01 | 8.51 | 88.52 | 7.27 | 2.21 | 9.48 | 68.2 | 271 |
| | DST-4 | 43.9 | 85.83 | 6.04 | 91.87 | 5.66 | 2.46 | 8.12 | 67.6 | 159 |

1) Stabilized fluid sample
2) Average value from rig test

Table 3 Bulk characteristics of the test sample $C_4$ - $C_7$ fractions

| Well | Test sample | % n-Paraffins | % iso-Paraffins | % Naphthenes | % Aromatics |
|---|---|---|---|---|---|
| 6506/12-1 | DST-2 | 18.38 (25.30) | 11.11 (15.29) | 43.17 (59.41) | 27.34 |
| | DST-4B | 32.29 (36.92) | 27.90 (31.90 | 27.26 (31.17) | 12.55 |
| | DST-5B | 19.10 (24.36) | 16.75 (21.36) | 42.57 (54.28) | 21.59 |
| | DST-7 | 32.40 (35.08) | 22.52 (24.38) | 37.45 (40.55) | 7.63 |
| 6506/12-3 | DST-1 | 23.50 (27.62) | 16.76 (19.70) | 44.83 (52.69) | 14.92 |
| | DST-2 | 16.88 (21.83) | 8.42 (10.89) | 52.03 (67.28) | 22.67 |
| | DST-3 | 26.57 (31.09) | 18.53 (21.69) | 40.35 (47.22) | 14.56 |
| | DST-4 | 28.50 (33.27) | 20.40 (23.82) | 36.76 (42.91) | 14.34 |
| | DST-5 | 31.68 (35.83) | 22.31 (25.23) | 34.42 (38.93) | 11.59 |
| | DST-6 | 31.73 (33.12) | 24.98 (29.11) | 39.10 (40.81) | 4.19 |
| 6506/12-5 | DST-2 | 30.30 (35.04) | 21.77 (25.17) | 34.41 (39.79) | 13.51 |
| | DST-4 | 35.50 (36.64) | 28.42 (29.34) | 32.96 (34.02) | 3.12 |

Values in brackets are percentage of total $C_4$ - $C_7$ saturate fraction.

Table 4 Pristane and phytane related to n-paraffins

| Well | Test sample | Pr/n-$C_{17}$ | Ph/n-$C_{18}$ | Pr/Ph |
|---|---|---|---|---|
| 6506/12-1 | DST-2 | 0.69 | 0.40 | 1.63 |
| | DST-4B | 0.72 | 0.60 | 1.56 |
| | DST-5B | 0.72 | 0.60 | 1.48 |
| | DST-7 | 0.77 | 0.60 | 1.56 |
| 6506/12-3 | DST-1 | 0.63 | 0.46 | 0.70 |
| | DST-2 | 0.77 | 0.55 | 1.54 |
| | DST-3 | 0.78 | 0.46 | 1.87 |
| | DST-4 | 0.79 | 0.60 | 1.29 |
| | DST-5 | 0.86 | 0.69 | 1.29 |
| | DST-6 | 0.71 | 0.47 | 1.54 |
| 6506/12-5 | DST-2 | 0.83 | 0.72 | 1.44 |
| | DST-4 | 0.74 | 0.53 | 1.67 |

Table 5 Pentacyclic triterpane relations for maturity and source evaluation

| | | m/z 191 | | | | | |
|---|---|---|---|---|---|---|---|
| Well | Test sample | 1) % 22S ($C_{32}$) | 2) % Ts/Ts+Tm ($C_{27}$) | 3) %αβ ($C_{30}$) | 4) $C_{29}/C_{30}$ (αβ) | 5) $C_{32}/C_{33}$ (αβ 22S) | 6) % $C_{30}/C_{30}+C_{29}$ (βα) |
| 6506/12-1 | DST-2 | 52.2 | 74.7 | 89.3 | 0.7 | 1.5 | 87.5 |
| | DST-4B | 59.0 | 72.1 | 92.0 | 0.5 | 1.5 | 87.1 |
| | DST-5B | 55.8 | 77.5 | 93.5 | 0.5 | 1.5 | 84.2 |
| | DST-7 | 65.1 | 76.4 | 81.8 | 0.4 | 1.6 | 84.3 |
| 6506/12-3 | DST-1 | 60.3 | 41.8 | 97.1 | 1.1 | 1.7 | 43.8 |
| | DST-2 | 59.4 | 48.4 | 91.5 | 1.0 | 1.6 | 61.1 |
| | DST-3 | 58.8 | 45.9 | 91.0 | 1.1 | 1.7 | 61.9 |
| | DST-4 | 72.0 | 55.9 | 90.5 | 0.5 | 1.6 | 80.8 |
| | DST-5 | 59.2 | 43.1 | 91.0 | 0.9 | 1.5 | 61.1 |
| | DST-6 | 57.4 | 45.2 | 89.9 | 0.9 | 1.5 | 61.5 |
| 6506/12-5 | DST-2 | 58.4 | 63.4 | 89.1 | 0.5 | 1.5 | 81.6 |
| | DST-4 | 56.1 | 72.9 | 78.8 | 0.5 | 1.5 | 78.5 |

Table 6 Sterane relations for maturity and source evaluation

| | m/z 217 | | | m/z 218 |
|---|---|---|---|---|
| Well | 1) Test sample | 2) % 20S ($C_{29}$) | % ββ ($C_{29}$) | 3) $C_{27}:C_{28}:C_{29}$ |
| 6506/12-1 | DST-2 | 51.2 | 59.8 | 41:28:31 |
| | DST-4B | 51.9 | 61.2 | 38:29:33 |
| | DST-5B | 48.9 | 63.4 | 39:29:32 |
| | DST-7 | 48.4 | 73.0 | 36:36:28 |
| 6506/12-3 | DST-1 | 55.3 | 53.7 | 34:28:38 |
| | DST-2 | 58.2 | 55.9 | 34:28:38 |
| | DST-3 | 56.3 | 54.6 | 33:27:44 |
| | DST-4 | 64.6 | 58.6 | 37:28:35 |
| | DST-5 | 54.7 | 54.8 | 35:28:37 |
| | DST-6 | 57.1 | 52.5 | 35:28:37 |
| 6506/12-5 | DST-2 | 65.5 | 57.0 | 38:32:30 |
| | DST-4 | 38.3 | 62.5 | 30:31:39 |

Table 7 Biomarker characteristics for source rock evaluation

| Well | Depth (mRKB) | m/z 191 $\frac{C_{29}}{C_{30}}$ ($\alpha\beta$) | m/z 218 $\frac{C_{32}}{C_{33}}$ ($\alpha\beta$ 22S) | $C_{27}:C_{28}:C_{30}$ | Lithology |
|---|---|---|---|---|---|
| 6506/12-1 | 3839 | 0.3 | 1.6 | 47:34:19 | silt/shale |
| | 3850 | 0.3 | 1.4 | 46:33:21 | shale/mudst. |
| | 3853.3 | 0.4 | 1.5 | 45:34:21 | silt/shale |
| | 3908 | 0.6 | 2.0 | 42:27:31 | silt/shale |
| | 3950 | 0.6 | 1.7 | 44:30:26 | silt/shale |
| | 4520 | 0.7 | 1.6 | 33:28:38 | coal/sst (80%) |
| | 4610 - 20 | 0.6 | 1.4 | 36:30:34 | coal |
| | 4670 - 80 | 0.6 | 1.7 | 40:27:33 | sst/silt |
| 6506/12-3 | 3714 | 0.4 | 1.3 | 41:28:31 | silt/mudst. |
| | 3716 | 0.4 | 1.3 | 40:31:29 | shale/mudst. |
| | 3726 | 0.4 | 1.7 | 36:21:43 | shale/mudst. |
| | 3740 - 50 | 0.6 | 1.6 | 35:23:42 | mudst. |
| | 3800 - 10 | 0.7 | 2.3 | 35:23:42 | silt/mudst. |
| 6506/12-4 | 3850 - 60 | 0.4 | 1.5 | 31:37:32 | shale/mudst. |
| | 3870 - 80 | 0.6 | 1.9 | 21:39:39 | shale/mudst. |
| | 3900 -3910 | 0.8 | 1.6 | 28:44:27 | mudst. |
| | 3960 - 70 | 0.8 | 1.8 | 33:34:33 | silt/mudst. |
| | 4430 - 40 | 0.9 | 1.6 | 33:32:35 | sst |
| 6506/12-5 | 3780 - 90 | 0.3 | 1.5 | 37:32:31 | silt/shale |
| | 3810 - 20 | 0.2 | 1.5 | 41:26:33 | silt/shale |
| | 3820 - 30 | 0.6 | 1.8 | 44:32:24 | silt/shale |
| | 3850 - 60 | 0.4 | 1.5 | 33:30:37 | clyst/silt/shale |
| | 3914.92-3915 | 0.6 | 1.9 | 36:24:40 | shale |
| | 3945.91-3946 | 0.6 | 2.6 | 25:22:53 | shale |
| | 4580 - 87 | 0.6 | 2.5 | 15:35:63 | sst/coal (15%) |

Table 8 Sterane relations for maturity and migration evaluation

| Well | Test sample | 1) $C_{29}$ (αα) 20S/20R | 2) $C_{29}$ (20R) ββ/αα |
|---|---|---|---|
| 6506/12-1 | DST-2 | 1.04 | 1.48 |
| | DST-4B | 1.17 | 1.71 |
| | DST-5B | 0.91 | 1.63 |
| | DST-7 | 0.94 | 2.0 3) |
| 6506/12-3 | DST-1 | 1.24 | 1.56 |
| | DST-2 | 1.33 | 1.73 |
| | DST-3 | 1.24 | 1.65 |
| | DST-4 | 1.64 | 2.08 |
| | DST-5 | 1.15 | 1.52 |
| | DST-6 | 1.28 | 1.56 |
| 6506/12-5 | DST-2 | 1.75 | 1.85 |
| | DST-4 | 1.06 | 1.09 |

3) Estimated value

Table 9 Carbon isotope results (0/00 PDB)

| Well | Test sample | SAT | Total crude | ARO | NSO'S | ASPH. | X |
|---|---|---|---|---|---|---|---|
| 6506/12-1 | DST-2 | -28.97 | -28.94 | -27.47 | -27.2 | -28.3 | 0.66 |
| | DST-4B | -28.95 | -29.15 | -26.35 | -26.5 | -27.8 | 3.10 |
| | DST-5B | -28.81 | -30.23 | -27.34 | -27.3 | -26.3 | 0.54 |
| | DST-7 | -29.5 | -28.4 | - | -27.8 | -28.2 | - |
| 6506/12-3 | DST-1 | -29.36 | -28.99 | -27.37 | -26.4 | -27.9 | 1.87 |
| | DST-2 | -29.08 | -29.00 | -26.95 | -26.2 | - | 2.09 |
| | DST-3 | -29.39 | -29.05 | -27.51 | -25.6 | - | 1.63 |
| | DST-4 | -29.47 | -29.34 | -28.32 | -21.7 | -28.5 | 0.04 |
| | DST-5 | -29.39 | -29.34 | -28.01 | -28.3 | -28.3 | 0.52 |
| | DST-6 | -29.12 | -29.16 | -27.85 | -27.7 | -26.6 | 0.20 |
| 6506/12-5 | DST-2 | -29.70 | -29.53 | -28.21* | -28.20 | -29.11 | 0.86 |
| | DST-4 | -29.68 | -29.38 | -28.22 | -28.37 | -29.25 | 0.79 |

* Small sample

1) $X = -2.53\ (\delta^{13}C_{SAT}) + 2.22\ (\delta^{13}C_{ARO}) - 11.65$

Table 10a Carbon isotope results (0/00 PDB) from rock samples

| Well | Depth (mRKB) | SAT | ARO | Total extract | X [1] |
|---|---|---|---|---|---|
| 6506/12-1 | 3839 | -31.02 | -29.81 | -30.54 | 0.65 |
| | 3850 | -30.75 | -28.24 | -30.77 | 3.45 |
| | 3853.3 | -30.24 | -28.04 | -30.36 | 2.61 |
| | 3879 | -27.54 | -27.05 | -28.64 | -2.02 |
| | 3950 | -29.03 | -25.45 | - | 5.30 |
| | 4440 | -27.43 | -24.77 | -26.68 | 2.76 |
| | 4520 | -25.95 | -23.87 | -25.47 | 1.01 |
| | 4590 -4600 | -26.25 | -25.71 | -26.46 | -2.31 |
| | 4610 - 20 | -27.74 | -26.56 | -26.57 | -0.43 |
| | 4670 - 80 | -27.20 | -26.38 | -26.13 | -1.40 |
| 6506/12-3 | 3714.0 | -31.56 | -30.91 | -31.05 | -0.40 |
| | 3716.0 | -31.57 | -30.74 | -30.97 | -0.02 |
| | 3726.0 | -27.94* | -27.23* | -27.51 | -1.41 |
| | 3740 - 50 | - | - | -26.49 | - |
| | 3800 - 10 | -27.36 | -25.05 | -25.22 | 1.96 |
| 6506/12-4 | 3850 - 60 | -30.58 | -29.83 | -28.92 | -0.51 |
| | 3870 - 80 | -29.40 | -28.77 | -28.92 | -1.14 |
| | 4430 - 40 | -27.60 | -26.32 | -26.91 | -0.25 |

1) For explanation see table 9

* Small sample

Table 10b Carbon isotope results (0/00 PDB) from rock samples

| Well | Depth (MRKB) | Whole extract | SAT | ARO | NSO | ASPH | Kerogei |
|---|---|---|---|---|---|---|---|
| 6506/12-5 | 3780 - 90 | -30.72 | -30.92 | -30.12 | -30.12 | -30.56 | -30.05 |
| | 3820 - 30 | -28.19 | -27.06 | -26.84 | -26.83 | -27.60 | -27.17 |
| | 3850 - 60 | -27.52 | -28.64 | -27.09 | -27.04 | -27.04 | -26.15 |
| | 3914.92 | -25.33 | -27.15 | -25.20 | -27.11 | -25.75 | -24.70 |
| | 3945.91-3946 | -25.77 | -28.32 | -25.70 | -26.65 | -26.00 | -24.32 |

société nationale
elf aquitaine (production)

U-474

EP/S/EXP/LAB.Pau n°87/124RP Pau , le Août 1987

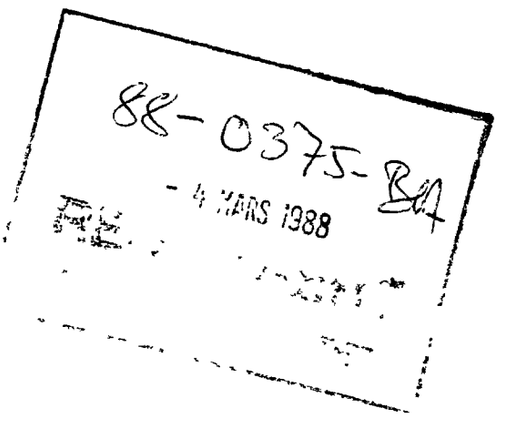
3

# HALTENBANKEN AREA (NORWAY)

## Geochemical study of the core samples

Wells : 64-07/9-2
64-07/4-1
65-06/12-1
65-07/12-3

EP/S/EXP/LAB.Pau n°87/124RP




Aquitaine 6407/4-1

**CONFIDENTIAL**
**NO REPRODUCTION**

P. CAILLEAUX

C. PALACIOS

adresse postale ☐ tour Elf - Cédex 45 92078 Paris La Défense
☒ Pau - 64018 Pau Cédex
☐ Lacq - BP 22 Lacq 64170 Artix
☐ Boussens - Boussens 31360 Saint Martory

téléphone 33 (1) 47 44 45 46
(33) 59 83 40 00
(33) 59 05 24 50
(33) 61 97 80 00

telex Elfa 615 400 F
Petra 560 804 F
Petra 560 053 F
SNEA 530 385 F

Imp 7332 A SNEA(P) RGM 953 006 004

## ANNEX 1E

### Summary of organic matter petrology data
### HALTENBANKEN area

| WELL | DEPTH | SAMPLE | Ro % | eq Ro | FLUO INDEX | REMARKS |
|---|---|---|---|---|---|---|
| 64-07/9-2 | 1638.9 | K1 | | 0.45 | 2 | |
| | 1640.9 | K1 | | 0.45 | 2 | |
| 64-07/4-1 | 4471-4474 | Cutting | 1.0 | | ε | |
| | 4498-4501 | Cutting | 1.10 | | ε | |
| | 4561-4564 | Cutting | 1.20 | | 0 | |
| | 4601.21 | K15 | 1.20 | | ε | |
| | 4684-4687 | Cutting | 1.25 | | ε | |
| | 4774-4777 | Cutting | 1.30 | | ε | |
| | 4834-4835 | Cutting | 1.35 | | ε | |
| 65-06/12-1 | 4011.60 | K2 | ∿ 0.8 | | 0.25 | |
| | 4027.90 | K3 | | 0.8-0.9 | 0.75 | |
| | 4038.50 | K3 | | 0.9-1.0 | 1.5 | |
| | 4042.60 | K3 | | 0.8-0.9 | 3.5 | |
| | 4582.75 | K15 | 1.0 | | ε | |
| | 4586.60 | K15 | 0.95 | | 0.5 | |
| | 4590.90 | K15 | 0.95 | | 0.75 | |
| | 4593.40 | K15 | > 0.9 | | | fluo vitrinite |
| 65-07/12-3 | 2504.50 | K3 | 0.5 | | 0.25 | |
| | 2807.20 | K3 | 0.5 | | 2 | |
| | 2518.55 | K3 | 0.35 | | 0 | vitrinite nodule |
| | | K3 | > 0.4 | | 2.5 | vitrinite in shale |

## ABBREVIATIONS AND UNITS USED IN THE TABLES

| | |
|---|---|
| S | Sample type (K=core, S=SWC, C=cutting) |
| TOC | Total Organic Carbon (% weight of rock) |
| S1 | Hydrocarbons present in the rock (mg HC/g rock) |
| S2 | Hydrocarbons produced by pyrolysis (mg HC/g rock) |
| S3 | CO2 produced by pyrolysis (mg CO2/g rock) |
| PI | Production Index = S1/(S1+S2) |
| HI | Hydrogen Index (mg HC/ g TOC) |
| OI | Oxygen Index (mg CO2/g TOC) |
| TM | Temperature recorded at the maximum of pyrolysis (°C) |
| EOM | Extractible Organic Matter (ppm of rock) |
| SAT. | Saturated HC ) |
| ARO. | Aromatic HC ) (% of EOM ) |
| POL. | Polar compounds ) |
| S/A | Saturated HC/Aromatic HC ratio |
| Pr,Ph | Pristane,Phytane |
| A/B | (Pristane/n-C17)/(Phytane/n-C18) |
| CPI | Carbon Preference Index |
| MPI 1 | Methylphenantrene Index 1 = 1.5(2MP+3MP)/(P+1MP+9MP) |
| MPI 2 | Methylphenantrene Index 2 = 3(2MP)/(P+1MP+9MP) |

TABLE 1 64-07/9-2 ORGANIC INVENTORY

| DEPTH | S | TOC | S1 | S2 | S3 | PI | HI | OI | TM |
|---|---|---|---|---|---|---|---|---|---|
| 1638.9 | K1 | 4.08 | 0.69 | 10.30 | 0.79 | 0.06 | 252 | 19 | 406 |
| 1640.9 | K2 | 5.96 | 0.97 | 18.74 | 1.20 | 0.05 | 314 | 20 | 408 |

TABLE 2 64-07/4-1 ORGANIC INVENTORY

| DEPTH | S | TOC | S1 | S2 | S3 | PI | HI | OI | TM |
|---|---|---|---|---|---|---|---|---|---|
| 4606.21 | K1S | 28.21 | 1.70 | 40.52 | 0.34 | 0.04 | 143 | 1 | 473 |
| 4608.52 | " | 0.58 | 0.06 | 0.14 | 0.57 | 0.30 | 24 | 98 | - |
| 4610.0 | " | 1.17 | 0.06 | 0.24 | 0.27 | 0.20 | 20 | 23 | - |
| 4613.12 | " | 0.27 | 0.14 | 0.05 | 0.33 | 0.78 | 18 | 122 | - |
| 4614.32 | " | 2.46 | 0.15 | 1.12 | 0.25 | 0.12 | 45 | 10 | 487 |
| 4616.53 | " | 0.31 | 0.04 | 0.04 | 0.18 | 0.50 | 12 | 58 | - |
| 4618.10 | " | 1.63 | 0.14 | 0.71 | 0.23 | 0.17 | 43 | 14 | 481 |
| 4618.95 | " | 6.02 | 0.54 | 5.43 | 0.16 | 0.09 | 90 | 2 | 474 |
| 4619.23 | " | 4.40 | 0.36 | 3.29 | 0.25 | 0.10 | 74 | 5 | 478 |

TABLE 3 65-06/12-1 ORGANIC INVENTORY

| DEPTH | S | TOC | S1 | S2 | S3 | PI | HI | OI | TM |
|---|---|---|---|---|---|---|---|---|---|
| 4582.75 | K1S | 13.71 | 1.12 | 13.32 | 1.28 | 0.08 | 97 | 9 | 466 |
| 4586.6 | " | 24.90 | 5.66 | 53.88 | 1.58 | 0.10 | 216 | 6 | 462 |
| 4590.9 | " | 0.75 | 0.07 | 0.19 | 0.65 | 0.27 | 25 | 86 | - |
| 4593.4 | " | 35.09 | 6.36 | 66.72 | 1.48 | 0.09 | 190 | 4 | 453 |

TABLE 4 65-07/12-3 ORGANIC INVENTORY

| DEPTH | S | TOC | S1 | S2 | S3 | PI | HI | OI | TM |
|---|---|---|---|---|---|---|---|---|---|
| 2504.3 | K3 | 56.80 | 2.54 | 104.40 | 7.84 | 0.02 | 183 | 13 | 423 |
| 2505.8 | " | 61.05 | 4.14 | 137.12 | 7.28 | 0.03 | 224 | 11 | 418 |
| 2507.2 | " | 6.47 | 0.53 | 8.80 | 1.40 | 0.06 | 136 | 21 | 429 |
| 2509.2 | " | 2.04 | 0.24 | 2.21 | 2.88 | 0.10 | 108 | 141 | 432 |
| 2510.5 | " | 0.92 | 0.03 | 0.45 | 2.44 | 0.06 | 48 | 265 | 435 |
| 2514.9 | " | 0.23 | 0.02 | 0.06 | 0.81 | 0.25 | 26 | 352 | - |
| 2516.3 | " | 24.36 | 1.02 | 60.48 | 2.60 | 0.02 | 248 | 10 | 429 |
| 2518.55 | " | 53.77 | 5.60 | 148.64 | 5.76 | 0.04 | 276 | 10 | 429 |
| 2518.55 A | " | 37.02 | 1.25 | 69.70 | 4.45 | 0.02 | 188 | 12 | 424 |
| 2518.55 B | " | 60.27 | 2.30 | 104.40 | 14.20 | 0.02 | 173 | 23 | 415 |

A shale
B lens of homogenous vitrinite

IATROSCAN

TABLE 5 84-07/9-2 EXTRACTS

| DEPTH m | EOM ppm | EOM %TOC | SAT. % | ARO. % | POL. % | S/A | MOE /S1 | d13C 0/00 |
|---|---|---|---|---|---|---|---|---|
| 1638.9 | 2300 | 5.64 | 10.5 | 9.9 | 79.6 | 1.1 | 3.3 | -29.9 |
| 1640.9 | 2930 | 4.92 | 8.9 | 11.6 | 79.5 | 0.8 | 3.0 | -30.3 |

TABLE 6 84-07/4-1 EXTRACTS

| DEPTH | EOM | EOM %TOC | SAT. | ARO. | POL. | S/A | MOE /S1 | d13C 0/00 |
|---|---|---|---|---|---|---|---|---|
| 4606.21 | 680 | 0.24 | 4.3 | 28.4 | 67.3 | 0.15 | 0.4 | -25.05 |
| 4618.95 | 210 | 0.35 | 10.1 | 32.6 | 57.3 | 0.3 | 0.4 | -25.7 |

TABLE 7 85-06/12-1 EXTRACTS

| DEPTH | EOM | EOM %TOC | SAT. | ARO. | POL. | S/A | MOE /S1 | d13C 0/00 |
|---|---|---|---|---|---|---|---|---|
| 4586.6 | 1740 | 0.70 | 11.9 | 37.7 | 50.5 | 0.3 | 0.3 | -25.9 |
| 4593.4 | 2100 | 0.60 | 18.4 | 42.0 | 39.6 | 0.4 | 0.3 | -26.7 |

TABLE 8 85-07/12-3 EXTRACTS

| DEPTH | EOM | EOM %TOC | SAT. | ARO. | POL. | S/A | MOE /S1 | d13C 0/00 |
|---|---|---|---|---|---|---|---|---|
| 2505.8 | 29420 | 4.82 | 3.4 | 19.7 | 76.9 | 0.2 | 7.1 | -27.2 |
| 2518.55 A | 9850 | 2.66 | 5.8 | 18.1 | 76.1 | 0.3 | 7.9 | - |
| 2518.55 B | 23260 | 3.86 | <2 | 15 | 33 | <0.1 | 10.1 | - |

A shale ( -27.5

B lens of homogenous vitrinite A at B ( -25.4

TABLE 9 64-07/9-2 CHROMATOGRAPHICAL DATA

| DEPTH | nALK %SAT | Pr /n-C17 | Ph /n-C18 | Pr /Ph | A/B | CPI 20-30 | MPI1 | MPI2 |
|---|---|---|---|---|---|---|---|---|
| 1640.9 | 9 | 0.84 | 1.26 | 1.33 | 0.67 | 1.13 | - | - |

TABLE 10 64-07/4-1 CHROMATOGRAPHICAL DATA

| DEPTH | nALK %SAT | Pr /n-C17 | Ph /n-C18 | Pr /Ph | A/B | CPI 20-30 | MPI1 | MPI2 |
|---|---|---|---|---|---|---|---|---|
| 4606.21 | 11 | 0.58 | 0.68 | 0.68 | 0.86 | 0.98 | 1.42 | 1.64 |
| 4618.95 | 14 | 0.73 | 0.94 | 0.84 | 0.78 | 0.96 | 1.47 | 1.71 |

TABLE 11 65-06/12-1 CHROMATOGRAPHICAL DATA

| DEPTH | nALK %SAT | Pr /n-C17 | Ph /n-C18 | Pr /Ph | A/B | CPI 20-30 | MPI1 | MPI2 |
|---|---|---|---|---|---|---|---|---|
| 4586.6 | 32 | 0.37 | 0.13 | 2.40 | 2.91 | 1.03 | 1.01 | 1.21 |
| 4593.4 | 33 | 0.41 | 0.16 | 2.35 | 2.60 | 1.04 | 0.90 | 1.02 |

TABLE 12 65-07/12-3 CHROMATOGRAPHICAL DATA

| DEPTH | nALK %SAT | Pr /n-C17 | Ph /n-C18 | Pr /Ph | A/B | CPI 20-30 | MPI1 | MPI2 |
|---|---|---|---|---|---|---|---|---|
| 2505.8 | 8 | 2.85 | 0.81 | 4.13 | 3.50 | 2.38 | 0.53 | 0.74 |
| 2518.55 A | 28 | 0.93 | 0.55 | 2.42 | 1.42 | 2.32 | 0.51 | 0.51 |
| 2518.55 B | 8 | 2.62 | 0.47 | 3.76 | 5.53 | 1.95 | 0.44 | 0.47 |

A shale
B lens of homogenous vitrinite

S N E A (P) Organic Geochemistry
COMPUTERIZED GC/MS CONDENSED ANALYTICAL REPORT ON STERANES AND TERPANES

Table 13 : HALTENBANKEN AREA .

| SAMPLE / SNEA(P) Ref / Fraction | WELL DEPTH | C 29 STERANES RATIOS: 29bb S / 29aa R | 29aa S / 29aa R | 27Sdia / 29aa R | 22 4Me / 29aa R | %20S / C29 | Xbb / C29 | 21st / 22st | 22 4Me / 22st | TERPANES RATIOS: C29H / C30H | Tm / Ts | 23/3 / 24/4 | %22S / C31 | %22S / C32 | ba/ab / C30 X 100 | Terp./Ster.: 23/3 / 21st | TT / ST | OPTIONAL ANALYSIS 1: 29DH / 29H | 28BNH / 29H | 29/5 / 29H | Oln / 30H | Ocrn / 30H | 30/3* / 29H | 30/3* / 23/3 | 35/6 / 35H* | 35H* / 33H* | 29+30 / 35H* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 64-07/04-1 | 4606.20 (Meters) | 0.87 | 0.56 | 0.65 | v. low. | 41. | 55. | 2.53 | v. low. | 0.67 | 1.29 | N/A | 51. | 58. | 12. | v. low. | 12.35 | l. low. | l. low. | 0.33 | l. low. | 0.10 | N / A | N / A | N / A | N / A | l. high |
| 64-07/04-1 | 4618.90 (Meters) | 0.92 | 0.68 | 0.74 | 0.25 | 43. | 55. | 3.25 | 0.40 | 0.66 | 1.34 | 3.31 | 48. | 56. | 12. | 1.66 | 9.22 | l. low. | l. low. | 0.32 | l. low. | l. low. | l. low. | l. low. | N / A | N / A | l. high |
| 64-07/9-2 | 1640.90 (Meters) | N/A | N/A | N/A | N/A | N/A | N/A | 3.06 | v. low. | 1.22 | N/A | N/A | 13. | N/A | N/A | v. low. | v. low. | l. low. | l. low. | 0.46 | l. low. | N / A | N / A | N / A | N / A | N / A | l. high |
| 65-06/12-1 | 4586.60 (Meters) | 1.20 | 0.80 | 0.16 | N/A | 47. | 58. | 3.09 | N/A | 0.69 | 1.04 | 0.52 | N/A | N/A | N/A | 2.00 | 5.67 | l. low. | l. low. | 0.26 | l. low. | l. low. | 1.20 | 3.34 | N / A | N / A | l. high |
| 65-06/12-1 | 4593.40 (Meters) | 1.19 | 0.79 | 0.17 | N/A | 48. | 57. | 1.48 | N/A | 0.95 | 1.82 | N/A | 59. | N/A | 6. | v. low. | 5.93 | l. low. | l. low. | 0.17 | l. low. | N / A | N / A | N / A | N / A | N / A | l. high |
| 65-07/12-3 | 2505.80 (Meters) | 0.59 | 0.61 | N/A | N/A | 43. | 43. | N/A | N/A | 0.25 | 1.08 | N/A | N/A | N/A | N/A | N/A | 7.37 | l. low. | l. low. | N / A | l. low. | l. low. | l. low. | N / A | N / A | N / A | l. high |
| 65-07/12-3 | 2518.55 (Meters) | 0.42 | 0.22 | v. low. | v. low. | 29. | 45. | N/A | N/A | 0.40 | 2.34 | N/A | N/A | N/A | N/A | v. low. | 5.08 | l. low. | l. low. | N / A | l. low. | l. low. | l. low. | N / A | N / A | N / A | l. high |
| SAMPLE / SNEA(P) Re | WELL DEPTH | 29bb S / 29aa R | 29aa S / 29aa R | 27Sdia / 29aa R | 22 4Me / 29aa R | %20S / C29 | Xbb / C29 | 21st / 22st | 22 4Me / 22st | C29H / C30H | Tm / Ts | 23/3 / 24/4 | %22S / C31 | %22S / C32 | ba/ab / C30 X 100 | Terp./Ster.: 23/3 / 21st | TT / ST | 29DH / 29H | 28BNH / 29H | 29/5 / 29H | Oln / 30H | Ocrn / 30H | 30/3* / 29H | 30/3* / 23/3 | 35/6 / 35H* | 35H* / 33H* | 29+30 / 35H* |

N/A = Not Available