


HYDRO

| RFT RESULTS - SAMPLE | | | | | WELL: 25/1-9 |
|----------------------|------------------|-------------|------------|-------------|-----------------|
| RUN NO/ TEST NO. | DEPTH mRKB-MD | IHP PSIA | FP PSIA | FHP PSIA | REMARKS |
| 1A/1 | 2052.0 | 3254.3 | 2573.0 | 4354.9 | Very good perm. |
| 2 | 2053.5 | 3258.1 | 2574.1 | 3257.9 | " |
| 3 | 2056.5 | 3262.7 | 2577.5 | 3263.0 | " |
| 4 | 2059.0 | 3266.8 | 2586.4 | 3266.9 | Fair Perm. |
| 5 | 2062.0 | 3271.6 | 2588.2 | 3271.5 | Very Good Perm. |
| 6 | 2066.5 | 3278.5 | 2594.2 | 3278.6 | " |
| 7 | 2072.0 | 3287.3 | 2602.3 | 3287.2 | " |
| 8 | 2100.5 | 3331.5 | 2648.3 | 3331.5 | " |
| 9 | 2116.0 | 3355.8 | 2679.4 | 3355.8 | " |
| 10 | 2135.0 | 3385.7 | 2708.2 | 3386.0 | " |
| 11 | 2250.0 | 3567.4 | 2894.3 | 3568.9 | " |
| 12 | 2275.0 | 3608.2 | 2930.7 | 3608.5 | " |
| 13 | 2520.0 | 4195.3 | 3383.2 | 3994.3 | Good Perm. |
| 14 | 2647.0 | 4195.3 | 3676.8 | 4195.1 | Very Good Perm. |
| 15 | 2698.5 | 4274.7 | 3748.9 | 4274.9 | Good Perm. |
| 16 | 2736.0 | 4334.5 | 3802.7 | 4334.4 | " |


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|----------------------|------------------|-------------|------------|-------------|----------------------------|
| RUN NO/ TEST NO. | DEPTH mRKB-MD | IHP PSIA | FP PSIA | FHP PSIA | REMARKS |
| 2B/1 | 2054.5 | 3258.4 | 2573.0 | 3258.9 | Very Good Perm. |
| 2 | 2056.2 | 3261.0 | 2575.5 | 3260.9 | Fair Perm. |
| 3 | 2060.0 | 3267.3 | 2590.0 | 3268.9 | Supercharged |
| 4 | 2061.0 | 3268.6 | 2586.6 | - | Very Good Perm. |
| 5 | 2062.0 | 3270.1 | 2587.9 | 3271.5 | " |
| 6 | 2064.0 | 3275.1 | 2590.5 | 3275.0 | " |
| 7 | 2295.0 | 3641.1 | 2959.9 | 3641.1 | " |
| 8 | 2335.0 | 3688.3 | 3004.5 | 3688.5 | " |
| 9 | 2405.0 | 3814.8 | 3122.1 | 3814.2 | " |
| 10 | 2411.0 | 3824.2 | 3130.9 | 3824.7 | " |
| 11 | 2458.0 | 3898.8 | 3406.0 | 3898.4 | " |
| 12 | 2465.0 | 3909.2 | 3416.9 | 3909.2 | No drawdown |
| 13 | 2547.0 | 4038.7 | 3431.9 | 4038.2 | Fair Perm. |
| 2C/1 | 2051.5 | 3279.0 | 2574.0 | 3279.4 | Good Perm, Seal failure |
| 2 | 2051.5 | 3279.4 | 2574.9 | 3278.8 | Seal failure |
| 3 | 2053.3 | 3282.7 | - | 3282.3 | Possible probe blockage |
| 4 | 2053.5 | 3282.8 | - | 3282.8 | " |
| 5 | 2054.5 | 3283.7 | 2573.7 | 3283.7 | Very Good Perm. |
| 6 | 2056.5 | 3287.0 | 2577.5 | 3285.4 | " |
| 7 | 2052.0 | 3278.5 | 2573.4 | 3278.7 | " |

RFT RESULTS - SAMPLE

WELL: 25/1-9

SAMPLES ARE TAKEN IN THE FRIGG FORMATION

SEGREGATED SAMPLE NO. 1 AT 2053.5 mRKB (RUN NO. 2A)

| | |
|------------------------|--|
| Chamber vol., gal.: | 2 3/4 |
| Filling time, min.: | 32 |
| P chamber, PSIG: | 2000 |
| Gas vol., SCF | 56.3 |
| Oil/cond. vol., liter: | N.A |
| Oil/cond. gravity, API | N.A |
| Water/Filt., liter: | 0.38 |
| Water/Fist., ppm/Cl: | 12750 |
| Remarks: | Drained on drillfloor. 1 gal chamber sealed and sent onshore. Filling time was 14 minutes. |

SEGREGATED SAMPLE NO. 2 AT 2056.5 mRKB (RUN NO. 2C)

| | |
|--------------------------|---|
| Chamber vol., gal: | 2 3/4 |
| Filling time, min.: | 25 |
| P chamber, PSIG: | 1650 |
| Gas vol., SCF: | 10.3 |
| Oil/cond. vol., liter: | 5.2 |
| Oil/cond. gravity, g/cc: | 0.87 |
| Water/Filt., liter: | 4.4 |
| Water/Filt., ppm/Cl: | 13800 |
| Remarks: | Drained on drillfloor. 1 gal chamber sealed and sent onshore. Filling time was 8 minutes. |

6.5 Drilling fluids summary

36" hole section: 135 m - 221 m

This section was drilled using seawater with returns to the seabed. A 5 m³ high viscous pill was pumped on each connection. Then 63 m³ of 1.25 rd high viscous mud was spotted and the casing was run.

26" hole section: 220 m - 990 m

This section was drilled using prehydrated bentonite/seawater with high viscous pills pumped on every 3. connection. Got stuck at 499 m when drilling 12 1/4" pilot hole. Worked the pipe free with 1702 kN overpull. Displaced the hole to high viscous mud. Opened up to 26". Had to make one extra wiper trip due to logging problems. Displaced the hole to high viscous mud and ran the 20" casing.

17 1/2" hole section: 990 m - 1965 m

This section was drilled using a KCl/Polymer mud. Problems with tight hole were encountered from 1400 to TD. Soltex was added to plaster the formation, and this seemed to help. Logging was done with no problems. Several tight spots had to be reamed when doing wiper trip prior to running the 13 3/8" casing and the mud weight was raised to 1.24 rd. The 13 3/8" casing had to be washed down from 1915 m to 1936 m and was cemented with full returns. Left over mud was transferred to the stand-by boat.

12 1/4" section: 1965 - 2807

This section was drilled with a PAC-polymer/seawater fluid and the weight was kept down to a minimum, starting out at 1.08 rd. The hole was drilled to 2048 m where the coring started. Drilling proceeded to 2807 m with no severe hole problems, although tight hole was often experienced between 2020 m and 2050 m. Logging was done and the well was plugged and permanently abandoned.

| | | | | | | | | | | | | |
|--------------------------------|--|--|--|--|--|--|--|--|--|--|-----------|--|
| ((((ooo) Norsk Hydro | Daily mud properties | | | | | | | | | | Date | |
| | System: Boredata Sandnes | | | | | | | | | | 26/3-1987 | |
| | Well: 25/1-9 Mud Contractor: PROMUD | | | | | | | | | | | |

| Date | Mid. depth m, MD | Mud dens. (SG) | FV cps | YP mPa | GEL 0 mPa | GEL 10 mPa | Ph | 100 psi (cc) | HP/HT (cc) | Cl- inn/out mg/l | Alkalinity | | | Ca++ inn/out mg/l | Oil % | Sol % | H2O % | V.G. meter at 115 gr. F | | | | | | Mud type | |
|--------|---------------------|-------------------|-----------|-----------|-----------------|------------------|------|--------------------|---------------|------------------------|------------|-----|-----|-------------------------|----------|----------|----------|-------------------------|------------|------------|------------|----------|----------|-------------|---------|
| | | | | | | | | | | | Pf | Pa | Mf | | | | | 600 rpm | 300 rpm | 200 rpm | 100 rpm | 6 rpm | 3 rpm | | |
| 860906 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | Spud | |
| 860907 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | Spud |
| 860908 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | Spud |
| 860909 | 221 | 1.15 | 0 | 0 | | | | | | /200 | | | | | | | | | | | | | | | Spud |
| 860910 | 453 | 1.15 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | Spud |
| 860911 | 990 | 1.15 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | Spud |
| 860912 | 990 | 1.03 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | Spud |
| 860913 | 990 | 1.15 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | Spud |
| 860914 | 990 | 1.15 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | Spud |
| 860915 | 990 | 1.15 | 14 | 7 | 1 | 2 | 9.7 | 6 | | 67000/67000 | 0.1 | 0.1 | 0.2 | 160/160 | | 2 | | | | | | | | | KCL |
| 860916 | 1034 | 1.13 | 10 | 7 | 3 | 4 | 10.5 | 6 | | 68000/68000 | 0.1 | 0.1 | 0.1 | 40/40 | | 3 | | | | | | | | | KCL |
| 860917 | 1300 | 1.15 | 14 | 11 | 2 | 4 | 9.5 | 6 | | 66000/66000 | 0.1 | 0.6 | 0.1 | 600/600 | | 3 | | | | | | | | | KCL |
| 860918 | 1715 | 1.16 | 13 | 10 | 2 | 4 | 9.6 | 5 | | 64000/64000 | 0.1 | 0.4 | 0.2 | 940/940 | | 3 | | | | | | | | | KCL |
| 860919 | 1940 | 1.16 | 12 | 10 | 2 | 4 | 9.1 | 5.2 | | 62000/62000 | 0.1 | 0.4 | 0.3 | 1040/1040 | | 3 | | | 46 | 33 | 26 | 19 | 4 | 3 | KCL |
| 860920 | 1965 | 1.2 | 14 | 8 | 2 | 4 | 9.3 | 6.3 | | 63000/63000 | 0.1 | 0.3 | 0.3 | 980/980 | | 5 | | | 44 | 30 | 22 | 17 | 5 | 3 | KCL |
| 860921 | 1965 | 1.24 | 14 | 10 | 2 | 4 | 9.3 | 7.3 | | 60000/60000 | 0.1 | 0.4 | 0.4 | 1120/1120 | | 6 | | | 48 | 34 | 23 | 19 | 5 | 3 | KCL |
| 860922 | 1965 | 1.24 | 14 | 10 | | | | | | | | | | | | | | | | | | | | | KCL |
| 860923 | 1974 | 1.08 | 10 | 9 | 1 | 2 | 9.8 | 5 | | 22000/22000 | 0.2 | 0.3 | 0.6 | 400/400 | | 3 | | | 37 | 27 | 20 | 13 | 2 | 1 | Polymer |
| 860924 | 2050 | 1.08 | 13 | 10 | 2 | 3 | 9.5 | 4.9 | | 22000/22000 | 0.1 | 0.4 | 0.4 | 400/400 | | 3 | | | 46 | 33 | 25 | 15 | 2 | 1 | Polymer |
| 860925 | 2089 | 1.08 | 15 | 8 | 1 | 2 | 9.8 | 4.2 | | 23000/23000 | 0.1 | 0.6 | 0.6 | 400/400 | | 3 | | | 46 | 31 | 23 | 15 | 2 | 1 | Polymer |
| 860926 | 2111 | 1.08 | 14 | 9 | 1 | 2 | 10 | 4 | | 23000/23000 | 0.1 | 0.5 | 0.6 | 360/360 | | 3 | | | 45 | 31 | 24 | 16 | 3 | 2 | Polymer |
| 860927 | 2234 | 1.08 | 17 | 13 | 2 | 2 | 10 | 4.5 | 15 | 22000/22000 | 0.1 | 0.6 | 0.6 | 260/260 | | 3 | | | 60 | 43 | 34 | 23 | 4 | 3 | Polymer |
| 860928 | 2244 | 1.08 | 18 | 13 | 2 | 2 | 10 | 4.5 | 15 | 22000/22000 | 0.1 | 0.6 | 0.5 | 240/240 | | 3 | | | 63 | 45 | 35 | 25 | 4 | 3 | Polymer |
| 860929 | 2319 | 1.08 | 18 | 12 | 3 | 3 | 10.2 | 4.5 | 15 | 22000/22000 | 0.2 | 0.6 | 0.6 | 220/220 | | 3 | | | 63 | 45 | 36 | 25 | 5 | 5 | Polymer |
| 860930 | 2511 | 1.08 | 18 | 14 | 4 | 4 | 10.3 | 4.5 | 13 | 18000/18000 | 0.1 | 0.6 | 0.5 | 200/200 | | 3 | | | 63 | 45 | 36 | 25 | 6 | 5 | Polymer |
| 861001 | 2602 | 1.09 | 18 | 14 | 3 | 5 | 9.8 | 4.2 | 13 | 19000/19000 | 0.2 | 0.5 | 0.4 | 200/200 | | 4 | | | 64 | 46 | 36 | 26 | 7 | 6 | Polymer |
| 861002 | 2702 | 1.09 | 18 | 12 | 3 | 5 | 9.9 | 3.9 | 13 | 19000/19000 | 0.2 | 0.6 | 0.5 | 220/220 | | 4 | | | 60 | 42 | 33 | 23 | 6 | 4 | Polymer |
| 861003 | 2723 | 1.09 | 17 | 11 | 3 | 4 | 9.6 | 4 | 14 | 19000/19000 | 0.2 | 0.7 | 0.6 | 220/220 | | 4 | | | 56 | 39 | 29 | 20 | 5 | 3 | Polymer |
| 861004 | 2807 | 1.08 | 19 | 13 | 3 | 5 | 10.4 | 3.9 | 13 | /19000 | 0.2 | 0.7 | 0.7 | /260 | | 3 | | | 64 | 45 | 35 | 25 | 6 | 5 | Polymer |
| 861005 | 2807 | 1.09 | 19 | 12 | 3 | 5 | 10.1 | 4 | 13 | /19000 | 0.2 | 0.7 | 0.5 | /260 | | 4 | | | 63 | 44 | 35 | 24 | 7 | 4 | Polymer |
| 861006 | 2807 | 1.09 | 16 | 12 | 3 | 6 | 10.1 | 4 | 13 | /19000 | 0.2 | 0.7 | 0.6 | /260 | | 4 | | | 55 | 39 | 30 | 23 | 6 | 4 | Polymer |
| 861007 | 2807 | 1.09 | 16 | 11 | 3 | 5 | 10 | 3.9 | 13 | 19000/ | 0.2 | 0.6 | 0.6 | 260/ | | 4 | | | 54 | 38 | 30 | 22 | 7 | 4 | Polymer |
| 861008 | 2807 | 1.09 | 15 | 11 | 3 | 5 | 10.3 | 3.8 | 13 | 19000/19000 | 0.2 | 1 | 0.9 | 240/240 | | 4 | | | 52 | 37 | 29 | 20 | 6 | 4 | Polymer |
| 861009 | 1797 | 1.09 | 16 | 9 | 3 | 5 | 10.7 | 4 | | 19000/ | 0.2 | 1.2 | 0.9 | 380/ | | 4 | | | 50 | 34 | 27 | 19 | 7 | 3 | Polymer |
| 861010 | 170 | 1.03 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | Polymer |
| 861011 | 0 | 1.03 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | Polymer |
| 861012 | 0 | 1.03 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | Polymer |

Table B-5 Daily mud properties

| | | | |
|---|-------------------------------------|-----------------------------|-----------|
| ((((ooo) ----- Norsk Hydro | Table B-6 | M u d c o n s u m p t i o n | Date |
| | Well: 25/1-9 Mud company: PROMUD | System : Boredata Sandnes | 27/3-1987 |

Hole size: 36

| | | |
|--------------|------|-----|
| BARITE | (Mt) | 32 |
| BENTONITE | (Mt) | 24 |
| CAUSTIC SODA | (Kg) | 300 |
| LIME | (Kg) | 100 |
| SODA ASH | (Kg) | 300 |

Hole size: 26

| | | |
|-----------------|------|------|
| BARITE | (Mt) | 101 |
| BENTONITE | (Mt) | 66 |
| CAUSTIC SODA | (Kg) | 900 |
| SODA ASH | (Kg) | 1700 |
| Others: | | |
| MILTEMP | (Kg) | 50 |
| SAPP | (Kg) | 50 |
| WO21 | (Kg) | 1000 |
| MILPOLYMER 302 | (Kg) | 1275 |
| DRISPAC REG | (Kg) | 544 |
| DRISPAC SUPERLO | (Kg) | 590 |
| PERMALOSE | (Kg) | 4000 |
| PRO-DEFOAM | (l) | 108 |

Hole size: 17.5

| | | |
|---------------------------|------|-------|
| BARITE | (Mt) | 110 |
| CAUSTIC SODA | (Kg) | 1550 |
| POTASSIUM CL. (KCl) | (Kg) | 50000 |
| POTASSIUM CL. (KCl) Brine | (m3) | 400 |
| SODA ASH | (Kg) | 250 |
| SODIUM BICARBONATE | (Kg) | 400 |
| SOLTEX | (Kg) | 3360 |
| LIQUID DEFOAMER | (l) | 81 |
| Others: | | |
| PRO-DEFOAM | (l) | 324 |
| MILPOLYMER 302 | (Kg) | 4225 |
| DRISPAC REG | (Kg) | 2141 |
| DRISPAC SUPERLO | (Kg) | 2173 |
| PERMALOSE | (Kg) | 3875 |

Hole size: 12.25

| | | |
|-----------------|------|-------|
| BARITE | (Mt) | 59 |
| BENTONITE | (Mt) | 7 |
| CAUSTIC SODA | (Kg) | 4650 |
| SOLTEX | (Kg) | 3723 |
| LIQUID DEFOAMER | (l) | 81 |
| Others: | | |
| DRISPAC REG | (Kg) | 10390 |
| DRISPAC SUPERLO | (Kg) | 5063 |
| MILPOLYMER 302 | (Kg) | 5475 |

Hole size: 0

| | | |
|-------------|------|----|
| BARITE | (Mt) | 1 |
| Others: | | |
| DRISPAC REG | (Kg) | 69 |

TABLE B-7 TOTAL MUD MATERIAL CONSUMPTION

| Product | No. units | Size of unit |
|--------------------|-----------|----------------|
| Barite | 303 | Mt |
| Bentonite | 97 | Mt |
| Caustic Soda | 7400 | Kg |
| Lime | 100 | Kg |
| Soda ash | 2250 | Kg |
| KCl | 50000 | Kg |
| KCl brine | 400 | m ³ |
| Sodium bicarbonate | 400 | Kg |
| Soltex | 7083 | Kg |
| Liquid defoamer | 162 | l |
| Miltemp | 50 | Kg |
| SAPP | 50 | Kg |
| WO21 | 1000 | Kg |
| Milpolymer 302 | 10975 | Kg |
| Drispac reg | 13144 | Kg |
| Drispac superlo | 7826 | Kg |
| Permalose | 7875 | Kg |
| Pro-defoamer | 432 | l |

| | | |
|---|--|--|
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| APPROVED BY | | |

SUMMARY

The gas components C_1 - C_4 and CO_2 have been separated from natural gases of well 25/1-9, and the $\delta^{13}C$ values of these components have been measured. The isotopic composition of hydrogen from CH_4 has also been measured.

1. INTRODUCTION

Two gas samples from well 25/1-9 were received and analyzed in August 1987.

On the samples C_1 - C_4 and CO_2 are quantified, and the $\delta^{13}C$ value is measured on methane, ethane, propane, the butanes and CO_2 and the δD value is also measured on methane.

2. ANALYTICAL PROCEDURE

The natural gases have been quantified and 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 and a Finnigan Mat delta mass spectrometer. Our $\delta^{13}C$ value on NBS 22 is $-29.77 \pm .06$ o/oo PDB.

3. RESULTS

The composition of the samples are given in Table 1. The results have been normalized to 100%. The stable isotope results are given in Table 2.

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

Table 1 Volume composition of gas samples from well 25/1-9

| Sample | IFE no. | C ₁ % | C ₂ % | C ₃ % | i-C ₄ % | n-C ₄ % | CO ₂ % | ΣC _{1-C₄} | $\frac{\Sigma C_{2-C_4}}{\Sigma C_{1-C_4}}$ | $\frac{i-C_4}{n-C_4}$ |
|---------|------------|---------------------|---------------------|---------------------|-----------------------|-----------------------|----------------------|-------------------------------|---|-----------------------|
| 34 barg | 6723 | 95.8 | 2.0 | 0.48 | 0.19 | 0.14 | 1.5 | 98.5 | 0.03 | 1.36 |
| 35 barg | 6724 | 95.9 | 1.9 | 0.48 | 0.19 | 0.12 | 1.4 | 98.6 | 0.03 | 1.58 |

Table 2 Isotopic composition of gas samples from well 25/1-9

| Sample | IFE no. | C ₁ | | C ₂ | C ₃ | i-C ₄ | n-C ₄ | CO ₂ | |
|---------|------------|--------------------------|------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | | δ ¹³ C PDB | δD SMOW | δ ¹³ C PDB | δ ¹³ C PDB | δ ¹³ C PDB | δ ¹³ C PDB | δ ¹³ C PDB | δ ¹⁸ O PDB |
| 34 barg | 6723 | -44.3 | -196 | -25.6 | -18.3 | -24.9 | -21.6 | 11.9 | - 8.6 |
| 35 barg | 6724 | -44.5 | -206 | -25.3 | -15.7 | -28.7 | -22.6 | 9.5 | -12.9 |