home oil

1987-04-28

MANITOBA DEPARTMENT OF ENERGY & MINES
Petroleum Division
555 - 330 Graham Avenue
WINNIPEG, Manitoba
R3C 4E3

ATTENTION: MUZAFFAR HUSAIN

Gentlemen:

Please find enclosed two (2) copies of special core tests performed on selected cores from the Pierson area of Manitoba. Samples of core were selected from the wells;

08-09-002-29 W1M
04-15-002-29 W1M
06-19-002-29 W1M and
10-21-002-29 W1M

These samples were tested by Dowell Schlumberger to obtain the relative compressive strength of representative layers in the Spearfish formation.

Questions regarding this testing may be directed to the undersigned at (403) 232-7723. For our records we request you sign and return on copy of the attached letter of transmission.

Yours truly,

HOME OIL COMPANY LIMITED

M.B. Muir, P. Eng.
Senior Engineer
New Well Completions

MBM/sls
0243e
attch.

cc: M.B. Muir
Day File

Home Oil Company Limited
1700 Home Oil Tower
324 Eighth Avenue S.W.
Calgary, Alberta, Canada
T2P 2Z5
Telephone (403) 232-7100

TEAM PETROLEUM'88

DOWELL SCHLUMBERGER
INCORPORATED

LABORATORY REPORT

TO: Home Oil Company LTD
Home Scurry S. Pierson
South Pierson, Manitoba

DATE: March 4, 1987

LAB LOCATION: Tulsa

LAB NO.: TL 60538

TYPE OF SAMPLE: Core from Wells
08-09-002-29 WIM
04-15-002-29 WIM
06-19-002-29 WIM
10-21-002-29 WIM

DESCRIPTION: Formation: Spearfish
Depth: 1006 - 1038 meters

AUTHOR(S): K.H. Nimerick
M. McCoy

ANALYSIS REQUESTED

Core samples from four Home Scurry S. Pierson wells were submitted to Dowell Schlumberger for dynamic and static mechanical property tests.

SUMMARY OF RESULTS

Triaxial compression testing of the Spearfish formation at 1000 psi confining pressure and 110°F showed the Young's modulus of the formation ranged from 2 to 12 x 10^6 psi while Poisson's ratio varied from 0.15 to 0.38.

Ambient dynamic property analysis by ultrasonics showed the Young's modulus of the Spearfish formation ranged from 3 to 13 x 10^6 psi while the Poisson's ratio varied from about 0.1 to 0.3.

K.H. Nimerick
Development Scientist
Technical Services
(918)250-4431

DISTRIBUTION:
Originator: Richard Marcinew (CDN) (3 Copies); Division Lab (CDN)
Tulsa: File; R. Thomas; Formation File

Triaxial Compression Testing

Generalities

Young's modulus (E) and Poisson's ratio (ν) were determined in the laboratory at simulated downhole conditions. The temperature, confining pressure and pore pressure were chosen on the basis of the well information provided.

The use of confining pressure allows the application of a hydrostatic force to the sample representing the minimum in-situ stress acting in the reservoir. For this case, the confining pressures used were effective stresses given by the following relationship:

$$\sigma' = \sigma - \alpha P$$

Where:
- σ' - effective stress (psi) (or effective confining pressure)
- σ - total stress (psi) (frac gradient x depth) (frac gradient = 0.7 psi/ft)
- α - poroelastic constant variable from 0 to 1 depending on bulk and grain compressibility (set at 0.9 for these calculations)
- P - pore pressure (1465 psi)

Test Procedure

Triaxial compression tests are performed on cylindrical core plugs. Sample preparation, practiced by the Dowell Schlumberger Rock Mechanics Laboratory, meets all recommended standards set by the International Society of Rock Mechanics. One-inch diameter samples were prepared, maintaining a length to diameter ratio of at least 2:1. Ends were ground flat and parallel to facilitate compressional loading, minimizing the possibility of flexing the sample. Each sample was jacketed with Teflon to prevent the penetration of confining fluid, and cantilever devices were fitted for the purpose of measuring vertical and horizontal strain.

Each prepared specimen was then placed into the triaxial cell, and the hydraulic ram brought into position on top of the sample. The cell was filled with confining fluid and heaters were used to bring the cell to the appropriate downhole temperature. Once this temperature was reached, the predetermined confining pressure was applied and maintained using a servo-controlled system.

Finally the sample was loaded axially with the hydraulic ram until failure. Throughout the test, strain was measured and recorded graphically in three mutually perpendicular directions as a function of axial stress. Parameters from the graphs produced were then used to calculate the sample's mechanical properties.

Ambient Dynamic Property Analysis by Ultrasonics

Test Procedure

One-inch diameter core plugs were cut to approximately two inches in length and their ends were milled parallel and flat. Transducers were placed on either end of the core plug and both compression and shear wave time lags were measured. These time lags along with physical properties were used to calculate Young's modulus and Poisson's ratio.

Results

STATIC ROCK PROPERTIES

SAMPLE NUMBER	DEPTH (M)	YOUNG'S MODULUS (X 10^6 psi)	POISSON'S RATIO
WELL 8-9			
72+	1026.05	3.62	0.26
WELL 6-19			
36 1/2	1027.30	3.70	0.36
87 1/2	1034.75	2.17	0.25
105 1/2	1038.30	3.17	0.29
WELL 4-15			
HS-4	1014.25	2.65	0.22
HS-0	1016.88	6.25	--
HS-7	1017.70	2.51	0.20
HS-9	1020.50	2.51	0.30
HS-10	1021.85	3.15	--
HS-12	1024.79	3.18	0.37
HS-13	1027.13	11.79	0.36
HS-15	1028.16	6.23	0.33
WELL 10-21*			
26	1006.8	1.80	0.24
61	1011.3	3.10	0.50
66	1012.0	6.21	0.38
84	1014.4	2.62	0.15
98	1016.2	3.21	0.29

Static test conditions: 1000 psi effective confining pressure
110°F cell temperature

*The length of these one-inch diameter core plugs was slightly less than two inches. The recommended minimum ratio of length to width is 2:1.

AMBIENT DYNAMIC PROPERTY ANALYSIS BY ULTRASONICS

SAMPLE NUMBER	DEPTH (M)	YOUNG'S MODULUS (* 10E6 psi)	POISSON'S RATIO
WELL 4-15			
HS-1	1011.37	4.24	.12
HS-2	1012.95	3.46	.17
HS-3	1013.06	4.17	.10
HS-4	1014.25	5.01	.11
HS-5	1014.50	3.79	.14
HS-0	1016.88	5.97	.34
HS-6	1017.13	3.64	.27
HS-7	1017.70	3.75	.26
HS-8	1019.83	5.13	.18
HS-9	1020.50	3.80	.19
HS-10	1021.85	4.22	.17
HS-11	1023.24	4.39	.15
HS-12	1024.79	4.25	.22
HS-13	1027.13	13.10	.24
HS-14	1027.65	8.87	.30
WELL 6-19			
7	1022.83	4.11	.27
9	1023.05	3.26	.23
13.5	1023.80	3.42	.07
23.5	1025.45	3.94	.25
31.5	1026.50	4.65	.10
36.5	1027.30	4.30	.17
44	1028.00	3.22	.17
55.5	1029.10	5.61	.31
66.5	1030.40	3.02	.17
70.5	1030.95	3.87	.11
77.5	1032.45	4.77	.12
83.5	1033.75	6.57	.21
87.5	1034.75	3.49	.12
91.5	1035.40	3.37	.24
105.5	1038.30	4.17	.23
108.5	1039.10	3.34	.24
112.5	1039.70	11.49	.23
113	1039.90	11.97	.27
WELL 8-9			
2.5	1011.20	4.19	.09
4.5	1011.80	3.95	.11
9.5	1013.70	5.08	.21
13.5	1014.50	4.02	.18
17	1015.35	4.74	.11
18.5	1015.65	3.78	.20
28.5	1018.15	4.68	.24
32.5	1019.10	5.09	.14
34	1019.40	3.18	.12
35	1019.70	5.11	.31
46	1021.60	2.80	.24
47.5	1021.85	3.34	.25
53.5	1022.70	2.65	.27
63	1024.10	3.56	.19
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72	1026.05	5.62	.18
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