Reservoir Fluid Study

For

Norske Shell Exploration & Production

Well: 31/2-3

North Sea, Norway

CORE LABORATORIES UK LTD.
Petroleum Reservoir Engineering
ABERDEEN, SCOTLAND

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5th January, 1981

Norske Shell Exploration & Production,
Damsle Ferusuei 43,
P.O. Box 10,
40-33 Forus,
Stavanger,
Norway.

Attention: Mr. Dave Jolly

Subject: Reservoir Fluid Study
Well: 31/2-3
North Sea, Norway
Our File Number: RFLA 80091

Gentlemen,

On 8th May, 1980, an RFT subsurface fluid sample was collected during testing on the subject well and forwarded to our Aberdeen laboratory on 14th May, 1980, for use in a reservoir fluid study. In accordance with analyses requirements, the tests were performed and the results presented in this report.

The hydrocarbon composition through hexanes of the subsurface fluid was determined by low temperature fractional distillation. Due to the nature of the fluid we were unable to determine the hydrocarbon composition of the heptanes plus through eicosanes, by high temperature fractional distillation and consequently high temperature chromatography was utilized. The results of these tests in form in terms of both mol percent and weight percent through eicosanes plus are presented on page two.

The subsurface reservoir fluid was examined in a visual cell at the reservoir temperature of 122°F and found to exhibit a retrograde dew point at 1838 psig for RFT 6.11. The pressure-volume relations of the reservoir fluid are shown on page three.

The wellstream composition was used to calculate the cumulative stock tank liquid and sales gas recovery using normal temperature two-stage separation. Also calculated are the plant liquid products on the primary and second stage gas separator gases. The total plant products in the wellstream are also shown on this page. All recoveries are based on a one MMSCF of original reservoir fluid. It must be remembered in applying these data that the recoveries are based on 100 percent plant efficiency. These results are presented on page four.

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In view of these results, the reservoir fluid would usually be considered a dry gas system. Consequently, we would normally not perform a "step-wise" equilibrium (constant volume) depletion to simulate well-stream production below the dew point. We will retain the samples in our laboratory pending further instructions from Norske Shell Exploration & Production.

It has been a pleasure to be of service to Norske Shell Exploration & Production. If you have any questions concerning the data presented in this report, or if we may be of further assistance, please do not hesitate to contact us.

Very truly yours,
Core Laboratories U.K. Ltd.,

L. K. Sebborn,
Laboratory Manager - RFL

LKS/HG
15 cc addressee

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Company	Norske Shell	Date Sampled	8th May, 1980
Well	31/2-3 RFT 6.11	County	North Sea
Field		State	Norway

FORMATION CHARACTERISTICS

Formation Name	
Date First Well Completed	, 19
Original Reservoir Pressure	PSIG @ Ft.
Original Produced Gas-Liquid Ratio	SCF/Bbl
Production Rate	Bbl/Day
Separator Pressure and Temperature	PSIG ° F.
Oil Gravity at 60°F.	° API
Datum	Ft. Subsea
Original Gas Cap	

WELL CHARACTERISTICS

Elevation	Ft.
Total Depth	Ft.
Producing Interval	Ft.
Tubing Size and Depth	In. to Ft.
Productivity Index	Bbl/D/PSI @ Bbl/Day
Last Reservoir Pressure	2268 PSIG @ 1543.5 m
Date	, 19
Reservoir Temperature	122 ° F. @ Ft. *
Status of Well	
Pressure Gauge	
Normal Production Rate	Bbl/Day
Gas-Oil Ratio	SCF/Bbl
Separator Pressure and Temperature	PSIG ° F.
Base Pressure	PSIA
Well Making Water	% Cut

SAMPLING CONDITIONS

Sampled at	1543.5 m
Status of Well	
Gas-Oil Ratio	SCF/Bbl
Separator Pressure and Temperature	PSIG ° F.
Tubing Pressure	PSIG
Casing Pressure	PSIG
Sampled by	Schlumberger
Type Sampler	RFT 2¾ Gallon

REMARKS : * Requested operating temperature

Sample Cylinder SS 663

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Company Norske Shell — Formation
Well 31/2-3 — County North Sea
Field — State Norway

HYDROCARBON ANALYSIS OF Reservoir Fluid GAS SAMPLE

COMPONENT	MOL PERCENT	Weight Percent
Hydrogen Sulfide	NIL	NIL
Carbon Dioxide	0.57	1.43
Nitrogen	1.61	2.56
Methane	93.16	84.98
Ethane	3.47	5.93
Propane	0.39	0.98
iso-Butane	0.30	0.99
n-Butane	0.05	0.17
iso-Pentane	0.05	0.21
n-Pentane	0.02	0.08
Hexanes	0.06	0.29
Methycyclopentane	0.03	0.17
Benzene	NIL	NIL
Cyclohexane	0.04	0.23
Heptanes	0.09	0.64
Methylcyclohexane	0.04	0.27
Toluene	TRACE	0.01
Octanes	0.06	0.48
Ethylbenzene	TRACE	0.01
Meta and Para Xylene	0.01	0.07
Orthoxylene	TRACE	0.01
Nonanes	0.03	0.27
1, 2, 4 Trimethybenzene	TRACE	0.01
Decanes	0.01	0.10
Undecanes	0.01	0.07
Dodecanes	TRACE	0.01
Tridecanes	TRACE	0.01
Tetradecanes	TRACE	0.01
Pentadecanes	TRACE	0.01
Hexadecanes	TRACE	TRACE
Heptadecanes	TRACE	TRACE
Octadecanes	TRACE	TRACE
Nonadecanes	TRACE	TRACE
Eicosanes plus	TRACE	TRACE
	100.00	100.00

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Well 31/2-3

Pressure-Volume Relations at 122 °F.

Pressure PSIG		Relative Volume (1)	Compressibility Factor Z
2500		0.7290	0.848
2400		0.7583	0.847
2300		0.7911	0.847
2286		0.7959	0.847
2200		0.8278	0.848
2100		0.8679	0.849
2000		0.9142	0.852
1900		0.9654	0.855
1838	Dew Point Pressure	1.0000	0.857
1800		1.0221	
1700		1.0880	
1600		1.1621	
1400		1.3432	
1200		1.5874	
1000		1.9321	
800		2.4487	
600		3.3083	

(1) Relative Volume : V/Vsat is barrels at indicated pressure per barrel at saturation pressure.

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CALCULATED RECOVERY PER MMSCF OF ORIGINAL FLUID

Wellstream MSCF	1000
*Normal Temperature Separation**	
Stock Tank Liquid - Barrels	3.82
Primary Separator Gas - MSCF	994.13
Second Stage Gas - MSCF	1.74
Stock Tank Gas - MSCF	1.10
Total Plant Products in Primary Separator Gas - Gallons**	
Propane	104
Butanes (Total)	108
Pentanes Plus	68
Total Plant Products in Second Stage Gas - Gallons**	
Propane	0.24
Butanes (Total)	0.22
Pentanes Plus	0.10
Total Plant Products in Wellstream - Gallons**	
Propane	107
Butanes (Total)	114
Pentanes Plus	226

* Recovery Bases: Primary separation at 1250 psig and 40°F
Second Stage at 500 psig and 40°F
Stock Tank at 0 psig and 27°F

** Recovery assumes 100% plant efficiency

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Core Laboratories U.K. Ltd.,
Reservoir Fluid Analysis,

L. K. Sebborn,
Laboratory Manager - RFL