EXXON PRODUCTION RESEARCH COMPANY

HYDROCARBON REPORT
ANALYSIS OF CONDENSATE SAMPLES
NORTH SEA WELL 15/6-3, 11,530-11,550 FT. (RKB)
ESSO EXPLORATION AND PRODUCTION U.K. INC.

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EPR.37PS.75

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MANAGER

March 31, 1975

Mr. L. W. Welch, Jr.
Esso Europe Inc.
5 Hanover Square
London W1R OHQ
England

Attention: Mr. J. H. Norman

Dear Sir:

EPR.37PS.75 - Hydrocarbon Report
Analysis of Condensate Samples
North Sea Well 15/6-3, 11,530-11,550 Ft. (RKB)
Esso Exploration and Production U.K. Inc.

This report presents the results of analyses requested by Mr. Hugh H. Jacks on two sets of separator gas and liquid samples taken during a production test of the subject well on December 5, 1974.

Very truly yours,

L. J. SNYDER

By R. V. Randall
R. V. Randall

GTP/gah

cc: K. P. Pipes

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TABLE I

Field Production Data*

Source: Esso Exploration and Production U.K. Inc., North Sea Well 15/6-3, 11,530-11,550 ft. (RKB)

Date of Test: December 5, 1974

Shut in bottom hole pressure, psig @ 11,447 ft.	6,357
Shut in bottom hole temperature, °F @ 11,447 ft. (est.)	218
Flowing bottom hole pressure, psig @ 11,447 ft.	5,825
Flowing wellhead pressure, psig	1,775
Flowing wellhead temperature, °F	113
Separator pressure at 03:30 hours, psig	865
Separator temperature @ 23:00 hours, °F	93
Separator pressure @ 08:00 hours, psig	860
Separator temperature @ 08:00 hours, °F	111
Barrels condensate per day @ 14.73 psia and 60°F	1,037
**Barrels separator liquid per day @ 860 psig and 111°F	
Separator gas production, MCF/D @ 14.73 psia and 60°F	34,408
Separator gas/stock-tank liquid ratio	
cu ft/bbl	33,180
bbl/MMcf	30.14
**Separator gas/separator liquid ratio	
cu ft/bbl	27,868
bbl/MMcf	35.88
Condensate gravity, °API @ 60°F	41.5 (0,8179 g/cm³)
Separator gas gravity (AIR = 1)	0.715

*Production data furnished by Hugh H. Jacks.

**Calculated using a laboratory shrinkage from separator to ambient conditions.

TABLE II

Hydrocarbon Analyses of Separator Gas and Liquid Samples and Composite Well Stream

Source: Esso Exploration and Production U.K. Inc., North Sea Well 15/6-3, 11,530-11,550 ft. (RKB)

Date Taken: December 5, 1974 (03:30 hours)

Separator Condition:

Pressure, psig	865
Temperature, °F	93

Component	Separator Liquid Weight %	Separator Liquid Density g/cc @ 60°F	Separator Liquid Molecular Weight	Separator Gas Mol %	Composite Well Stream Mol %
Carbon Dioxide	1.59			7.56	7.42
Nitrogen	0.01			0.45	0.44
Methane	3.35			80.07	78.00
Ethane	1.85			7.01	6.97
Propane	2.54			2.91	3.00
Iso-Butane	0.92			0.36	0.40
N-Butane	2.15			0.63	0.73
Iso-Pentane	1.94			0.15	0.24
N-Pentane	3.19			0.16	0.30
Hexanes	4.44	0.7096	93	0.30	0.45
Heptanes	11.49	0.7649	103	0.30	0.67
Octanes	7.17	0.7758	115	0.07	0.28
Nonanes	8.35	0.7959	129	0.03	0.25
Heavier Fractions	51.01	0.8480	203	--	0.85
Total	100.00			100.00	100.00
Pentane-Free Fraction		0.8151	153		

TABLE III

Comparison of Experimental and Computed Flash Liberation Results

Separator Liquid

Source: Esso Exploration and Production U.K. Inc., NOrth Sea Well 15/6-3, 11,530-11,550 ft. (RKB)

Date Taken: December 5, 1974 (03:30 hours)

(P_1) Pressure psig	Temperature °F	Gas-Oil Ratio - cu ft/bbl Residual Oil: Flashed at P_1 Experimental	Flashed at P_1 Computed	Flashed from P_1 to 0 Experimental	Flashed from P_1 to 0 Computed	Residual Oil Gravity °API at 60°F Experimental	Residual Oil Gravity °API at 60°F Computed	V_r/V_{bp} or $1/B_{oi}$ Experimental	V_r/V_{bp} or $1/B_{oi}$ Computed
0	71	494		--		43.6		0.7923	
0	71		505		--		43.8		0.7915

Data Used in Flash Calculations

Separator Liquid Composition

Component	Mol %	gal/mol
Hydrogen Sulfide	--	
Carbon Dioxide	3.52	
Nitrogen	0.04	
Methane	20.35	
Ethane	6.00	
Propane	5.61	
Iso-Butane	1.54	
N-Butane	3.61	
Iso-Pentane	2.62	
N-Pentane	4.31	
Hexanes	4.65	15.70
Heptanes	10.87	16.13
Octanes	6.08	17.76
Nonanes	6.31	19.42
Heavier Fraction	24.49	28.68
TOTAL	100.00	

K-value Source: NGAA (1957)
Convergence Pressure: 10,000 psia

Unadjusted Flash Data

Molecular weight of heavier fraction	203
Density of heavier fraction, gm/cc at 60°F	0.8480
Specific volume of separator fluid at 956 psig bubble point and 93°F, cu ft/lb	0.02191
Mols per barrel	2.629

Computed flash was made with a +2% adjustment to the C_{10+} density.

TABLE IV

Hydrocarbon Analyses of Separator Gas and Liquid Samples and Composite Well Stream

Source: Esso Exploration and Production U.K. Inc., North Sea Well 15/6-3, 11,530-11,550 ft. (RKB)

Date Taken: December 5, 1974 (08:00 hours)

Separator Condition:

Pressure, psig	860
Temperature, °F	111

Component	Separator Liquid Weight %	Separator Liquid Density g/cc @ 60°F	Separator Liquid Molecular Weight	Separator Gas Mol %	Composite Well Stream Mol %
Carbon Dioxide	1.17			7.54	7.40
Nitrogen	0.01			0.48	0.47
Methane	2.30			79.90	77.94
Ethane	1.34			6.97	6.91
Propane	1.77			3.00	3.04
Iso-Butane	0.63			0.39	0.41
N-Butane	1.52			0.68	0.75
Iso-Pentane	0.90			0.20	0.24
N-Pentane	1.75			0.21	0.29
Hexanes	4.82	0.7104	93	0.31	0.48
Heptanes	9.34	0.7601	106	0.22	0.52
Octanes	8.29	0.7829	115	0.07	0.31
Nonanes	8.11	0.7933	130	0.03	0.24
Heavier Fractions	58.05	0.8491	200	--	1.00
Total	100.00			100.00	100.00
Pentane-Free Fraction		0.8185	158		

TABLE V

Comparison of Experimental and Computed Flash Liberation Results

Separator Liquid

Source: Esso Exploration and Production U. K. Inc., North Sea Well 15/6-3, 11,530-11,550 ft. (RKB)

Date Taken: December 5, 1974 (08:00 hours)

(P_1) Pressure psig	Temperature °F	Gas-Oil Ratio - cu ft/bbl Residual Oil: Flashed at P_1 Experimental	Flashed at P_1 Computed	Flashed from P_1 to 0 Experimental	Flashed from P_1 to 0 Computed	Residual Oil Gravity °API at 60°F Experimental	Residual Oil Gravity °API at 60°F Computed	V_r/V_{bp} or $1/B_{ol}$ Experimental	V_r/V_{bp} or $1/B_{ol}$ Computed
0	70	319		--		42.6		0.8399	
0	*		321		--		42.8		0.8415

Data Used in Flash Calculations

Separator Liquid Composition

Component	Mol %	gal/mol
Hydrogen Sulfide	--	
Carbon Dioxide	2.98	
Nitrogen	0.04	
Methane	16.05	
Ethane	4.99	
Propane	4.49	
Iso-Butane	1.21	
N-Butane	2.92	
Iso-Pentane	1.40	
N-Pentane	2.72	
Hexanes	5.80	15.69
Heptanes	9.86	16.71
Octanes	8.07	17.60
Nonanes	6.98	19.63
Heavier Fraction	32.49	28.22
TOTAL	100.00	

K-value Source: NGAA (1957)
Convergence Pressure: 10,000 psia

Unadjusted Flash Data

Molecular weight of heavier fraction	200
Density of heavier fraction, gm/cc at 60°F	0.8491
Specific volume of separator fluid at 733 psig bubble point and 111°F, cu ft/lb	0.02156
Mols per barrel	2.327

75°F K values and a +1% adjustment to the C_{10+} density were used in the computed flash.

TABLE VI

Composition of Wellhead Gas Taken at 04:45 Hours

Source: Esso Exploration and Production U.K. Inc., North Sea Well 15/6-3, 11,530-11,550 ft. (RKB)

Date Taken: December 5, 1974

Component	Mol Percent
Hydrogen Sulfide	nil
Carbon Dioxide	7.90
Nitrogen	0.17
Methane	76.76
Ethane	7.93
Propane	4.16
Iso-Butane	0.52
N-Butane	0.96
Iso-Pentane	0.28
N-Pentane	0.30
Hexanes Plus	1.02
Total	100.00

TABLE VII

Composition of Wellhead Gas Taken at 06:45 Hours

Source: Esso Exploration and Production U.K. Inc., North Sea Well 15/6-3, 11,530-11,550 ft. (RKB)

Date Taken: December 5, 1974

Component	Mol Percent
Hydrogen Sulfide	nil
Carbon Dioxide	1.93
Nitrogen	nil
Methane	5.51
Ethane	13.11
Propane	30.98
Iso-Butane	6.46
N-Butane	12.89
Iso-Pentane	4.16
N-Pentane	4.64
Hexanes Plus	20.32
Total	100.00

TABLE VIII

Composition of Wellhead Gas Taken at 10:00 Hours

Source: Esso Exploration and Production U.K. Inc., North Sea Well 15/6-3, 11,530-11,550 ft. (RKB)

Date Taken: December 5, 1974

Component	Mol Percent
Hydrogen Sulfide	nil
Carbon Dioxide	7.54
Nitrogen	0.63
Methane	80.43
Ethane	6.72
Propane	2.83
Iso-Butane	0.37
N-Butane	0.64
Iso-Pentane	0.19
N-Pentane	0.22
Hexanes Plus	0.43
Total	100.00