



TM
Core Lab
RESERVOIR OPTIMIZATION

Compositional Analysis

for

Woodside Energy Limited

THA-04

AFL 20060059

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1st November 2007

Woodside Energy Limited
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Attention: Sunil Paliwal, Yousof Hourani

Dear Gents,

Subject: Reservoir Fluid Study: Well: THA-04; Our file: AFL 20060059

Four separator gases and two separator condensate samples were forwarded to our Perth laboratory on 12th December 2006 for initial validation and compositional analysis. Presented in the following report are the results of the requested analyses.

Core Laboratories Australia Pty Ltd are very pleased to have been of service to Woodside Energy Limited in this work. Should any questions arise concerning the data presented in this report, or if we may be of assistance in any other matter, please do not hesitate to contact us.

Yours Faithfully,
For CORE LABORATORIES AUSTRALIA PTY LTD

Murray Macleod
Laboratory Supervisor

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Section A - Summary of Analysis Methods

Summary of Analysis Methods

Separator Sample Validation

The separator gas samples were heated to a temperature 10°C above separator temperature, agitated, and allowed to stabilise. The opening pressure, air content and hydrocarbon composition through C12+ were determined for each sample.

As a preliminary quality check, the opening pressure of each separator condensate sample was determined and compared to field sampling and shipping data. The samples were then stabilised at a pressure of 2000 psig and heated to 100°C for twenty-four hours. The samples were agitated thoroughly to ensure they were completely in single phase and homogenous. Additionally, each sample was checked for free water/filtrate and the bubble point pressure at ambient temperature was determined..

The results are summarised on page B.2.

Separator Gas Composition

Gas compositions were determined by a GPA 2286 method using a multi-column gas chromatograph system. A temperature programme was utilised to obtain optimum detection and separation of dodecanes plus components.

Separator Condensate Composition

Liquid compositions were determined using a combination of flash separation and gas chromatography techniques. Each fluid was flashed at a controlled temperature (50°C) and separated into oil and gas phases. The gas was analysed using extended gas chromatography as described in the gas composition procedure and the flashed oil by temperature programmed high resolution capillary gas chromatography. The two analyses were then mathematically recombined to the flash gas-oil ratio.

Wellstream Calculation

A shrinkage was predicted by inputting the separator condensate composition into a simulation program. This was performed in order to convert the stocktank rate to separator conditions. The measured compositions of the separator products were used, in conjunction with the corrected field gas-oil ratio, to calculate the reservoir fluid composition and the recombination ratio.

Compositional Analysis Databases

For all compositions reported in this study, the molecular weight and density of the individual components are tabulated in Section F of the Appendix.

Section B - Summary of Samples Received and Validation Data

Reported Well and Sampling Information

Reservoir and Well Information

Field.....	Thylacine
Well.....	THA-04
Reservoir Fluid.....	Gas Condensate
Formation.....	n/d
Reservoir Pressure	n/d
Reservoir Temperature.....	n/d
Installation.....	Maersk Guardian
Test.....	n/d
Perforations.....	2743.17-3881.90 m MDBRT

Sampling Information

Date sampled.....	23-Sep-06
Time sampled	various
Type of samples.....	Surface
Sampling company.....	Schlumberger
Sampling point.....	Separator
Choke.....	56/64"
Status of well.....	Flowing
Bottomhole pressure.....	2024.4-2098.1 psia
Bottomhole temperature.....	104.3-104.5°C
Wellhead flowing pressure.....	1628-1716 psia
Wellhead flowing temperature.....	64.0°C
Separator pressure	346-367 psia
Separator temperature	34.0-36.0°C
Pressure base.....	14.696 psia
Temperature base	60°F
Separator gas rate.....	18.58-20.26 MMscf/d
Stocktank oil rate	73.5-75.4 b/d
Water flowrate.....	28.9-44.3 bbl/d
Gas gravity (Air = 1).....	0.740
Supercompressibility factor.....	1.0312-1.0340
H2S.....	1 ppm
CO2.....	2.00%
BS&W.....	28-37%
Oil gravity, API at 60°F	48.70-48.90

Comments:

n/d - data not supplied

Summary of Separator Samples Received and Validation Data

Separator Gases		Sampling :-		Laboratory opening :-		Free Liquid	Air
Sample Number	Cylinder Number	Pressure (psia)	Temp. (°C)	Pressure (psig)	Temp. (°C)	Hydro-C. (cm3)	Content (Mole%)
1.02	1631	346	36.0	374	56.0	3	0.04
1.03	4721A	346	36.0	370	56.0	Trace	0.03
* 1.05	1944A	367	34.0	390	56.0	0	0.03
1.06	1630	367	34.0	378	56.0	Trace	0.03

Separator Liquids		Sampling :-		Bubble point :-		Free Water	Sample
Sample Number	Cylinder Number	Pressure (psia)	Temp. (°C)	Pressure (psig)	Temp. (°C)	Recovered (cm3)	Volume (cm3)
1.01	5876-MA	346	36.0	288	15.0	0	590
* 1.04	4664-EA	367	34.0	298	15.2	0	590

Note:

* Separator gas 1944A (sample no.: 1.05) and separator condensate 4664-EA (sample no.: 1.04) were selected for wellstream composition

Section C - Compositional Analysis Data - Separator Samples

**Compositional Analysis of Separator Gas 1631 to C12+
(Sample No.: 1.02)**

Component	Mole %	Weight %
H2 Hydrogen	0.00	0.00
H2S Hydrogen Sulphide	0.00	0.00
CO2 Carbon Dioxide	9.60	20.31
N2 Nitrogen	1.47	1.98
C1 Methane	80.71	62.23
C2 Ethane	5.14	7.44
C3 Propane	1.82	3.86
iC4 i-Butane	0.31	0.88
nC4 n-Butane	0.41	1.14
C5 Neo-Pentane	0.00	0.00
iC5 i-Pentane	0.16	0.55
nC5 n-Pentane	0.10	0.36
C6 Hexanes	0.11	0.41
M-C-Pentane	0.03	0.11
Benzene	0.01	0.04
Cyclohexane	0.04	0.17
C7 Heptanes	0.02	0.13
M-C-Hexane	0.03	0.13
Toluene	0.01	0.05
C8 Octanes	0.01	0.06
E-Benzene	0.00	0.01
M/P-Xylene	0.00	0.02
O-Xylene	0.00	0.01
C9 Nonanes	0.01	0.05
C10 Decanes	0.01	0.05
C11 Undecanes	0.00	0.01
C12+ Dodecanes Plus	0.00	0.00
Totals	100.00	100.00

Sample Information	
Sampling Date	23.09.06
Sampling Time	20:24-20:46
Sampling Location	Sep Gas Line
Sample Description	Separator Gas
Cylinder Number	1631
Sampling Conditions	346 psia @ 36°C

Additional Sample Information		
Opening Pressure	374	psig
Opening Temperature	56	°C
Total Air Content	0.04	Mole%
Our Lab Identification	-	

Notes	
0.00 means less than 0.005.	

Calculated Residue Properties	Mole %	Weight %	Mole Weight (g.mol ⁻¹)	Density at 60°F (g.cm ⁻³)
C7+ Heptanes plus	0.17	0.84	95.9	0.7687
C8+ Octanes plus	0.07	0.39	107.7	0.7774
C10+ Decanes plus	0.01	0.06	135.2	0.7791
C12+ Dodecanes plus	0.00	0.00	-	-

Calculated Whole Gas Properties		
Real Relative Density	0.7203	(Air=1 @ 14.73 psia and 60°F)
Whole Sample Mole Weight	20.80	g.mol ⁻¹
Gas Density	0.8798	kg.m ⁻³ @ 15°C
Calorific Value	37.33	MJ.m ⁻³ (Real Gross @ 15°C, metered @ 15°C)
Calorific Value	33.74	MJ.m ⁻³ (Real Net @ 15°C, metered @ 15°C)
Gas Compressibility Factor	0.9972	14.73psia @ 60°F

**Compositional Analysis of Separator Gas 4721A to C12+
(Sample No.: 1.03)**

Component	Mole %	Weight %	Sample Information	
H2 Hydrogen	0.00	0.00	Sampling Date	23.09.06
H2S Hydrogen Sulphide	0.00	0.00	Sampling Time	20:24-20:46
CO2 Carbon Dioxide	9.50	19.94	Sampling Location	Sep Gas Line
N2 Nitrogen	1.48	1.98	Sample Description	Separator Gas
C1 Methane	80.75	61.75	Cylinder Number	4721A
C2 Ethane	5.07	7.26	Sampling Conditions	346.0 psia @ 36°C
C3 Propane	1.76	3.71	Additional Sample Information	
iC4 i-Butane	0.29	0.81	Opening Pressure	370 psig
nC4 n-Butane	0.37	1.02	Opening Temperature	56 °C
C5 Neo-Pentane	0.00	0.00	Total Air Content	0.03 Mole%
iC5 i-Pentane	0.13	0.44	Our Lab Identification	-
nC5 n-Pentane	0.08	0.27	Notes	
C6 Hexanes	0.07	0.29	0.00 means less than 0.005.	
M-C-Pentane	0.02	0.09		
Benzene	0.01	0.03		
Cyclohexane	0.05	0.21		
C7 Heptanes	0.06	0.31		
M-C-Hexane	0.11	0.50		
Toluene	0.07	0.30		
C8 Octanes	0.07	0.47		
E-Benzene	0.01	0.04		
M/P-Xylene	0.03	0.13		
O-Xylene	0.01	0.04		
C9 Nonanes	0.05	0.32		
C10 Decanes	0.01	0.09		
C11 Undecanes	0.00	0.00		
C12+ Dodecanes Plus	0.00	0.00		
Totals	100.00	100.00		

Calculated Residue Properties	Mole %	Weight %	Mole Weight (g.mol ⁻¹)	Density at 60°F (g.cm ⁻³)
C7+ Heptanes plus	0.50	2.53	102.4	0.7650
C8+ Octanes plus	0.36	1.89	107.2	0.7714
C10+ Decanes plus	0.01	0.09	134.0	0.7780
C12+ Dodecanes plus	0.00	0.00	-	-

Calculated Whole Gas Properties	
Real Relative Density	0.7263 (Air=1 @ 14.73 psia and 60°F)
Whole Sample Mole Weight	20.97 g.mol ⁻¹
Gas Density	0.8873 kg.m ⁻³ @ 15°C
Calorific Value	37.75 MJ.m ⁻³ (Real Gross @ 15°C, metered @ 15°C)
Calorific Value	34.13 MJ.m ⁻³ (Real Net @ 15°C, metered @ 15°C)
Gas Compressibility Factor	0.9971 14.73psia @ 60°F

**Compositional Analysis of Separator Gas 1944A to C12+
(Sample No.: 1.05)**

Component	Mole %	Weight %	Sample Information	
H2 Hydrogen	0.00	0.00	Sampling Date	23.09.06
H2S Hydrogen Sulphide	0.00	0.00	Sampling Time	23:37-00:02
CO2 Carbon Dioxide	9.50	19.46	Sampling Location	Sep Gas Line
N2 Nitrogen	1.46	1.91	Sample Description	Separator Gas
C1 Methane	80.15	59.80	Cylinder Number	1944A
C2 Ethane	5.02	7.03	Sampling Conditions	367 psia @ 34°C
C3 Propane	1.71	3.51	Additional Sample Information	
iC4 i-Butane	0.28	0.75	Opening Pressure	390 psig
nC4 n-Butane	0.35	0.95	Opening Temperature	56 °C
C5 Neo-Pentane	0.00	0.00	Total Air Content	0.03 Mole%
iC5 i-Pentane	0.13	0.45	Our Lab Identification	-
nC5 n-Pentane	0.09	0.30	Notes	
C6 Hexanes	0.16	0.61	0.00 means less than 0.005.	
M-C-Pentane	0.08	0.30		
Benzene	0.03	0.11		
Cyclohexane	0.19	0.76		
C7 Heptanes	0.20	0.95		
M-C-Hexane	0.30	1.39		
Toluene	0.15	0.64		
C8 Octanes	0.13	0.63		
E-Benzene	0.01	0.04		
M/P-Xylene	0.02	0.11		
O-Xylene	0.00	0.02		
C9 Nonanes	0.04	0.25		
C10 Decanes	0.00	0.03		
C11 Undecanes	0.00	0.00		
C12+ Dodecanes Plus	0.00	0.00		
Totals	100.00	100.00		

Calculated Residue Properties	Mole %	Weight %	Mole Weight (g.mol ⁻¹)	Density at 60°F (g.cm ⁻³)
C7+ Heptanes plus	1.15	5.23	96.9	0.7668
C8+ Octanes plus	0.65	3.11	102.2	0.7788
C10+ Decanes plus	0.00	0.03	134.0	0.7780
C12+ Dodecanes plus	0.00	0.00	-	-

Calculated Whole Gas Properties	
Real Relative Density	0.7445 (Air=1 @ 14.73 psia and 60°F)
Whole Sample Mole Weight	21.50 g.mol ⁻¹
Gas Density	0.9094 kg.m ⁻³ @ 15°C
Calorific Value	38.75 MJ.m ⁻³ (Real Gross @ 15°C, metered @ 15°C)
Calorific Value	35.08 MJ.m ⁻³ (Real Net @ 15°C, metered @ 15°C)
Gas Compressibility Factor	0.9969 14.73psia @ 60°F

**Compositional Analysis of Separator Gas 1630 to C12+
(Sample No.: 1.06)**

Component	Mole %	Weight %	Sample Information	
H2 Hydrogen	0.00	0.00	Sampling Date	23.09.06
H2S Hydrogen Sulphide	0.00	0.00	Sampling Time	23:37-00:02
CO2 Carbon Dioxide	9.58	20.08	Sampling Location	Sep Gas Line
N2 Nitrogen	1.46	1.95	Sample Description	Separator Gas
C1 Methane	80.57	61.58	Cylinder Number	1630
C2 Ethane	5.13	7.34	Sampling Conditions	367.0 psia @ 34°C
C3 Propane	1.81	3.79	Additional Sample Information	
iC4 i-Butane	0.31	0.85	Opening Pressure	378 psig
nC4 n-Butane	0.39	1.09	Opening Temperature	56 °C
C5 Neo-Pentane	0.00	0.00	Total Air Content	0.03 Mole%
iC5 i-Pentane	0.14	0.49	Our Lab Identification	-
nC5 n-Pentane	0.09	0.32	Notes	
C6 Hexanes	0.09	0.37	0.00 means less than 0.005.	
M-C-Pentane	0.03	0.11		
Benzene	0.01	0.04		
Cyclohexane	0.05	0.18		
C7 Heptanes	0.04	0.19		
M-C-Hexane	0.07	0.31		
Toluene	0.05	0.20		
C8 Octanes	0.07	0.36		
E-Benzene	0.01	0.05		
M/P-Xylene	0.03	0.17		
O-Xylene	0.01	0.05		
C9 Nonanes	0.06	0.36		
C10 Decanes	0.02	0.14		
C11 Undecanes	0.00	0.00		
C12+ Dodecanes Plus	0.00	0.00		
Totals	100.00	100.00		

Calculated Residue Properties	Mole %	Weight %	Mole Weight (g.mol ⁻¹)	Density at 60°F (g.cm ⁻³)
C7+ Heptanes plus	0.43	2.15	104.1	0.7676
C8+ Octanes plus	0.31	1.64	110.2	0.7715
C10+ Decanes plus	0.02	0.14	134.4	0.7783
C12+ Dodecanes plus	0.00	0.00	-	-

Calculated Whole Gas Properties	
Real Relative Density	0.7269 (Air=1 @ 14.73 psia and 60°F)
Whole Sample Mole Weight	20.99 g.mol ⁻¹
Gas Density	0.8882 kg.m ⁻³ @ 15°C
Calorific Value	37.74 MJ.m ⁻³ (Real Gross @ 15°C, metered @ 15°C)
Calorific Value	34.12 MJ.m ⁻³ (Real Net @ 15°C, metered @ 15°C)
Gas Compressibility Factor	0.9971 14.73psia @ 60°F

Section D - Compositional Analysis Data - Separator Condensate

**Compositional Analysis of Separator Condensate 4664-EA to C36+
(Sample No.: 1.04)**

Component		Mole %	Weight %
H ₂	Hydrogen	0.00	0.00
H ₂ S	Hydrogen Sulphide	0.00	0.00
CO ₂	Carbon Dioxide	2.17	0.81
N ₂	Nitrogen	0.06	0.01
C ₁	Methane	8.32	1.13
C ₂	Ethane	2.64	0.67
C ₃	Propane	2.78	1.04
iC ₄	i-Butane	1.06	0.53
nC ₄	n-Butane	1.91	0.94
C ₅	Neo-Pentane	0.03	0.02
iC ₅	i-Pentane	1.61	0.99
nC ₅	n-Pentane	1.48	0.90
C ₆	Hexanes	3.65	2.67
	M-C-Pentane	2.00	1.43
	Benzene	0.79	0.52
	Cyclohexane	3.66	2.61
C ₇	Heptanes	4.70	4.00
	M-C-Hexane	7.04	5.87
	Toluene	3.69	2.88
C ₈	Octanes	6.59	6.39
	E-Benzene	0.71	0.64
	M/P-Xylene	2.93	2.64
	O-Xylene	1.05	0.95
C ₉	Nonanes	5.30	5.77
	1,2,4-TMB	0.71	0.73
C ₁₀	Decanes	5.69	6.87
C ₁₁	Undecanes	3.99	4.98
C ₁₂	Dodecanes	2.83	3.87
C ₁₃	Tridecanes	2.35	3.49
C ₁₄	Tetradecanes	8.17	13.21
C ₁₅	Pentadecanes	2.25	3.94
C ₁₆	Hexadecanes	5.42	10.22
C ₁₇	Heptadecanes	3.08	6.20
C ₁₈	Octadecanes	0.74	1.57
C ₁₉	Nonadecanes	0.32	0.72
C ₂₀	Eicosanes	0.13	0.30
C ₂₁	Heneicosanes	0.08	0.20
C ₂₂	Docosanes	0.03	0.09
C ₂₃	Tricosanes	0.02	0.05
C ₂₄	Tetracosanes	0.01	0.02
C ₂₅	Pentacosanes	0.01	0.02
C ₂₆	Hexacosanes	0.00	0.01
C ₂₇	Heptacosanes	0.00	0.01
C ₂₈	Octacosanes	0.00	0.01
C ₂₉	Nonacosanes	0.00	0.01
C ₃₀	triacontanes	0.00	0.01
C ₃₁	Hentriacontanes	0.00	0.01
C ₃₂	Dotriacontanes	0.00	0.01
C ₃₃	Tritriacontanes	0.00	0.01
C ₃₄	Tetratriacontanes	0.00	0.01
C ₃₅	Pentatriacontanes	0.00	0.01
C ₃₆₊	Hexatriacontanes Plus	0.00	0.01
Totals :		100.00	100.00

Note: 0.00 means < 0.005.

**Compositional Analysis of Separator Condensate 4664-EA to C36+
 (Sample No.: 1.04)**

Calculated Residue Properties

C ₇₊	Mole%	74.29
	Molecular Weight (g mol ⁻¹)	143
	Density at 15.6°C (g cm ⁻³)	0.7923
C ₁₁₊	Mole%	29.43
	Molecular Weight (g mol ⁻¹)	196
	Density at 15.6°C (g cm ⁻³)	0.8255
C ₂₀₊	Mole%	0.28
	Molecular Weight (g mol ⁻¹)	306
	Density at 15.6°C (g cm ⁻³)	0.8733
C ₃₆₊	Mole %	0.00
	Molecular Weight (g mol ⁻¹)	571
	Density at 15.6°C (g cm ⁻³)	0.9302

Calculated Whole Sample Properties

Average mole weight (g mol ⁻¹)	118
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Section E - Wellstream Compositions

**Gas-Oil Ratio Calculations, Products 1944A and 4664-EA
 (Sample Nos.: 1.05 & 1.04)**

Field Data

Standard Conditions	Pressure base	14.70 psia
	Temperature base	15.6 °C
Separator Conditions	Separator pressure	352 psig
	Separator temperature	34.0 °C
Gas Flow Data	Gas gravity factor, F _g	1.1625
	Supercompressibility factor, F _{pvl}	1.0340
	Gas flow rate, Q _f	18.6 MMscf / day
Liquid Flow Data	Shrinkage factor	1.082
	B S & W	28.0 %
	Stocktank oil flow rate	73.5 bbl / day at 14.70 psia and 15.6°C

Laboratory Adjusted Data

Standard Conditions	Pressure base	14.70 psia
	Temperature base	15.6 °C
Gas Flow Data	Gas gravity factor, F _g	1.1591
	Supercompressibility factor, F _{pvl}	1.0303
	Gas flow rate, =	Q _f x (F _g /F _g) x (F _{pvl} /F _{pvl}) x F _{pb} x F _{tb}
	=	18.5 MMscf / day
Liquid Flow Data	Shrinkage factor =	1.082
	Separator Oil Flow Rate =	57.3 bbl / day at 352 psig and 34.0°C

Gas-Oil Ratio (Adjusted)	=	18.5 / 57.3 MMscf / bbl at 352 psig and 34.0°C
	=	0.32 MMscf / bbl at 352 psig and 34.0°C
		3.10 bbl / MMscf at 352 psig and 34.0°C

F_g is the gas gravity factor, the reciprocal of the square root of the gas gravity.
 F_{pvl} is the supercompressibility factor, the reciprocal of the square root of the deviation factor.
 Q is the gas flow rate.
 F_{pb} is (field pressure base) / (report pressure base).
 F_{tb} is (report temperature base) / (field temperature base), temperatures in Rankine.

**Compositional Analysis of Separator Products and Calculated Wellstream to C36+
(Sample Nos.: 1.05 & 1.04)**

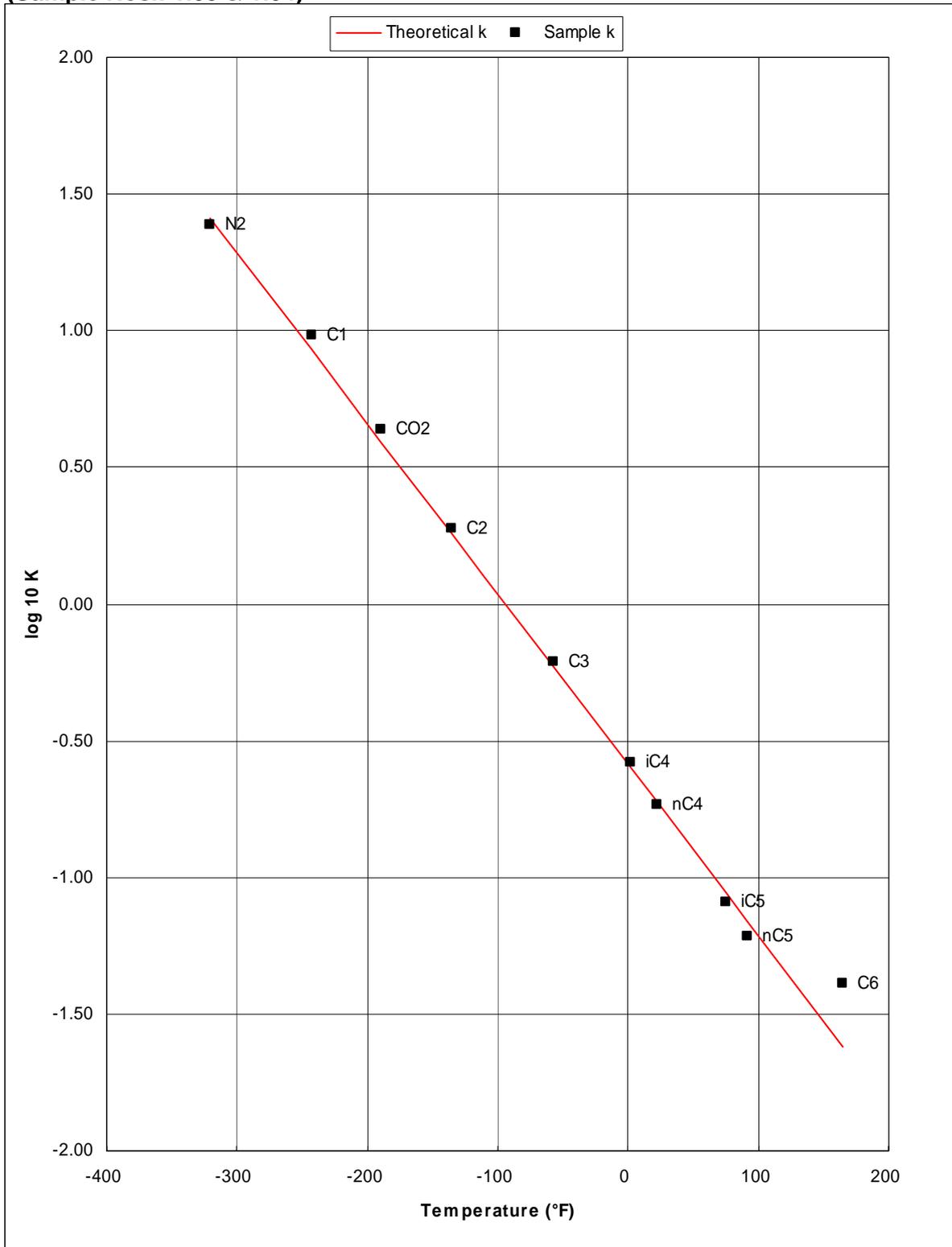
Component	Separator Liquid		Separator Gas		Wellstream	
	Mole %	Weight %	Mole %	Mole %	Weight %	
H ₂ Hydrogen	0.00	0.00	0.00	0.00	0.00	
H ₂ S Hydrogen sulphide	0.00	0.00	0.00	0.00	0.00	
CO ₂ Carbon dioxide	2.17	0.81	9.51	9.49	19.22	
N ₂ Nitrogen	0.06	0.01	1.46	1.46	1.88	
C ₁ Methane	8.32	1.13	80.16	79.99	59.06	
C ₂ Ethane	2.64	0.67	5.02	5.01	6.94	
C ₃ Propane	2.78	1.04	1.71	1.71	3.48	
iC ₄ i-Butane	1.06	0.53	0.28	0.28	0.75	
nC ₄ n-Butane	1.91	0.94	0.35	0.35	0.95	
C ₅ neo-Pentane	0.03	0.02	0.00	0.00	0.00	
iC ₅ i-Pentane	1.61	0.99	0.13	0.13	0.44	
nC ₅ n-Pentane	1.48	0.90	0.09	0.09	0.31	
C ₆ Hexanes	3.65	2.67	0.15	0.16	0.63	
Me-Cyclo-pentane	2.00	1.43	0.08	0.09	0.33	
Benzene	0.79	0.52	0.03	0.03	0.11	
Cyclo-hexane	3.66	2.61	0.19	0.20	0.77	
C ₇ Heptanes	4.70	4.00	0.20	0.21	0.98	
Me-Cyclo-hexane	7.04	5.87	0.30	0.32	1.44	
Toluene	3.69	2.88	0.15	0.16	0.68	
C ₈ Octanes	6.59	6.39	0.12	0.14	0.72	
Ethyl-benzene	0.71	0.64	0.01	0.01	0.06	
Meta/Para-xylene	2.93	2.64	0.02	0.03	0.13	
Ortho-xylene	1.05	0.95	0.00	0.00	0.01	
C ₉ Nonanes	5.30	5.77	0.04	0.05	0.32	
Tri-Me-benzene	0.71	0.73	0.00	0.00	0.01	
C ₁₀ Decanes	5.69	6.87	0.00	0.01	0.10	
C ₁₁ Undecanes	3.99	4.98	0.00	0.01	0.07	
C ₁₂ Dodecanes	2.83	3.87	0.00	0.01	0.05	
C ₁₃ Tridecanes	2.35	3.49	0.00	0.01	0.05	
C ₁₄ Tetradecanes	8.17	13.21	0.00	0.02	0.19	
C ₁₅ Pentadecanes	2.25	3.94	0.00	0.01	0.06	
C ₁₆ Hexadecanes	5.42	10.22	0.00	0.01	0.14	
C ₁₇ Heptadecanes	3.08	6.20	0.00	0.01	0.09	
C ₁₈ Octadecanes	0.74	1.57	0.00	0.00	0.02	
C ₁₉ Nonadecanes	0.32	0.72	0.00	0.00	0.01	
C ₂₀ Eicosanes	0.13	0.30	0.00	0.00	0.00	
C ₂₁ Heneicosanes	0.08	0.20	0.00	0.00	0.00	
C ₂₂ Docosanes	0.03	0.09	0.00	0.00	0.00	
C ₂₃ Tricosanes	0.02	0.05	0.00	0.00	0.00	
C ₂₄ Tetracosanes	0.01	0.02	0.00	0.00	0.00	
C ₂₅ Pentacosanes	0.01	0.02	0.00	0.00	0.00	
C ₂₆ Hexacosanes	0.00	0.01	0.00	0.00	0.00	
C ₂₇ Heptacosanes	0.00	0.01	0.00	0.00	0.00	
C ₂₈ Octacosanes	0.00	0.01	0.00	0.00	0.00	
C ₂₉ Nonacosanes	0.00	0.01	0.00	0.00	0.00	
C ₃₀ Triacontanes	0.00	0.01	0.00	0.00	0.00	
C ₃₁ Hentriacontanes	0.00	0.01	0.00	0.00	0.00	
C ₃₂ Dotriacontanes	0.00	0.01	0.00	0.00	0.00	
C ₃₃ Tritriacontanes	0.00	0.01	0.00	0.00	0.00	
C ₃₄ Tetratriacontanes	0.00	0.01	0.00	0.00	0.00	
C ₃₅ Pentatriacontanes	0.00	0.01	0.00	0.00	0.00	
C ₃₆₊ Hexatriacontanes plus	0.00	0.01	0.00	0.00	0.00	
Totals :	100.00	100.00	100.00	100.00	100.00	

Note: 0.00 means less than 0.005.

**Compositional Analysis of Separator Products and Calculated Wellstream to C36+
(Sample Nos.: 1.05 & 1.04)**

Calculated Properties	Separator Liquid	Separator Gas	Wellstream
C₇₊			
Mole%	74.29	1.14	1.33
Molecular Weight (g mol ⁻¹)	143	97	104
Density at 15.6°C (g cm ⁻³)	0.7923	0.7602	0.7664
C₁₁₊			
Mole%	29.43		0.08
Molecular Weight (g mol ⁻¹)	196		196
Density at 15.6°C (g cm ⁻³)	0.8255		0.8253
C₂₀₊			
Mole%	0.28		0.00
Molecular Weight (g mol ⁻¹)	306		290
Density at 15.6°C (g cm ⁻³)	0.8733		0.8674
C₃₆₊			
Mole %	0.00		
Molecular Weight (g mol ⁻¹)	571		
Density at 15.6°C (g cm ⁻³)	0.9302		
Calculated Whole Sample Properties			
Average mole weight (g mol ⁻¹)	118	21.5	21.7
Density at separator conditions (g cm ⁻³ at 352 psig and 34.0°C)	0.7488		
Real relative density (Air = 1.000 at 14.696 psia 15.6°C)		0.744	

**Graph of log(Equilibrium k) v Temperature
 (Sample Nos.: 1.05 & 1.04)**



Note: Theoretical k Values ref. GPSA Engineering Data Book, Vol I, Section 25, "Equilibrium Ratio (K) Data", 1987.

Section F - Appendix

Data Used in Gas Compositional Calculations

Component		Mole Weight (g mol-1)	Density (g cm-3 at 60°F)	Component		Mole Weight (g mol-1)	Density (g cm-3 at 60°F)
Hydrogen	*	2.016	N/A	33DMC5	*	100.20	0.6954
Oxygen/(Argon)	**	31.999	1.1410	Cyclohexane	*	84.16	0.7827
Nitrogen (Corrected)	**	28.013	0.8086	2MC6/23DMC5	*	100.20	0.6917
Methane	**	16.043	0.2997	11DMCYC5/3MC6	*	99.20	0.7253
Carbon Dioxide	**	44.010	0.8172	t13DMCYC5	*	98.19	0.7528
Ethane	**	30.070	0.3558	c13DMCYC5/3EC5	*	99.20	0.7262
Hydrogen Sulphide	**	34.080	0.8006	t12DMCYC5	*	98.19	0.7554
Propane	**	44.097	0.5065	Heptanes (nC7)	*	100.20	0.6875
i-Butane	**	58.123	0.5623	22DMC6	*	114.23	0.6994
n-Butane	**	58.123	0.5834	MCYC6	*	98.19	0.7740
Neo-Pentane	*	72.15	0.5968	ECYC5	*	98.19	0.7704
i-Pentane	**	72.150	0.6238	223TMC5/24&25DMC6	*	114.23	0.7060
n-Pentane	**	72.150	0.6305	ctc124TMCYC5	*	112.21	0.7511
22DMC4	*	86.18	0.6529	ctc123TMCYC5	*	112.21	0.7574
23DMC4/CYC5	*	78.16	0.7129	Toluene	*	92.14	0.8734
2MC5	*	86.18	0.6572	Octanes (nC8)	*	114.23	0.7063
3MC5	*	86.18	0.6682	E-Benzene	*	106.17	0.8735
Hexanes (nC6)	*	86.18	0.6631	M/P-Xylene	*	106.17	0.8671
22DMC5	*	100.20	0.6814	O-Xylene	*	106.17	0.8840
M-C-Pentane	*	84.16	0.7533	Nonanes (nC9)	*	128.26	0.7212
24DMC5	*	100.20	0.6757	Decanes	***	134	0.778
223TMC4	*	100.20	0.6947	Undecanes	***	147	0.789
Benzene	*	78.11	0.8820	Dodecanes	***	161	0.800

Data Source Refs :

* ASTM Data Series Publication DS 4B (1991) - Physical Constants of Hydrocarbon and Non-Hydrocarbon Compounds.

** GPA Table of Physical Constants of Paraffin Hydrocarbons and Other Components of Natural Gas, GPA 2145-96.

*** Journal of Petroleum Technology, Nov 1978, Pages 1649-1655.
Predicting Phase Behaviour of Condensate/Crude Oil Systems Using Methane Interaction Coefficients
- D.L. Katz & A. Firoozabadi.

Note :

The gas mole % compositions were calculated from the measured weight % compositions using the most detailed analysis results, involving as many of the above components as were identified. The reported component mole % compositions were then sub-grouped into the generic carbon number components.

Data Used in Liquid Compositional Calculations

Component		Mole Weight (g mol-1)	Density (g cm-3 at 60°F)	Component		Mole Weight (g mol-1)	Density (g cm-3 at 60°F)
Hydrogen	*	2.016	N/A	Undecanes	***	147	0.789
Hyd. sulphide	**	34.080	0.8006	Dodecanes	***	161	0.800
Carbon Dioxide	**	44.010	0.8172	Tridecanes	***	175	0.811
Nitrogen	**	28.013	0.8086	Tetradecanes	***	190	0.822
Methane	**	16.043	0.2997	Pentadecanes	***	206	0.832
Ethane	**	30.070	0.3558	Hexadecanes	***	222	0.839
Propane	**	44.097	0.5065	Heptadecanes	***	237	0.847
i-Butane	**	58.123	0.5623	Octadecanes	***	251	0.852
n-Butane	**	58.123	0.5834	Nonadecanes	***	263	0.857
i-Pentane	**	72.150	0.6238	Eicosanes	***	275	0.862
n-Pentane	**	72.150	0.6305	Heneicosanes	***	291	0.867
Hexanes	**	86.177	0.6634	Docosanes	***	305	0.872
Me-cyclo-pentane	*	84.16	0.7533	Tricosanes	***	318	0.877
Benzene	*	78.11	0.8820	Tetracosanes	***	331	0.881
Cyclo-hexane	*	84.16	0.7827	Pentacosanes	***	345	0.885
Heptanes	**	100.204	0.6874	Hexacosanes	***	359	0.889
Me-cyclo-hexane	*	98.19	0.7740	Heptacosanes	***	374	0.893
Toluene	*	92.14	0.8734	Octacosanes	***	388	0.896
Octanes	**	114.231	0.7061	Nonacosanes	***	402	0.899
Ethyl-benzene	*	106.17	0.8735	Triacosanes	***	416	0.902
Meta/Para-xylene	*	106.17	0.8671	Hentriacosanes	***	430	0.906
Ortho-xylene	*	106.17	0.8840	Dotriacosanes	***	444	0.909
Nonanes	**	128.258	0.7212	Tritriacosanes	***	458	0.912
1-2-4-T-M-benzene	*	120.19	0.8797	Tetratriacosanes	***	472	0.914
Decanes	**	142.285	0.7334	Pentatriacosanes	***	486	0.917

Data Source Refs :

* ASTM Data Series Publication DS 4B (1991) - Physical Constants of Hydrocarbon and Non-Hydrocarbon Compounds.

** GPA Table of Physical Constants of Paraffin Hydrocarbons and Other Components of Natural Gas GPA 2145-96.

*** Journal of Petroleum Technology, Nov 1978, Pages 1649-1655.
Predicting Phase Behaviour of Condensate/Crude Oil Systems Using Methane Interaction Coefficients
- D.L. Katz & A. Firoozabadi.

Note :

The residue mole weight and density values (eg heptanes plus, undecanes plus, eicosanes plus) are calculated so that the calculated average mole weights and densities correspond with the measured values. This can lead to anomalous residue mole weights and densities where the Katz and Firoozabadi values may not be suitable for the isomer groups detected.

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