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***Reservoir Fluid
Analysis of
Sub-Surface Samples from
Thylacine - 1
Otway Basin, Victoria***

Prepared for
Woodside Energy Limited

October 2001

File: AFL 2001-028

Reservoir Fluid Laboratory
Core Laboratories Australia Pty Ltd
Perth
Western Australia

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Rehbock, Renita R.

From: Kevin [kevin@corelab.com.au]
Sent: Wednesday, November 13, 2002 12:03 PM
To: Rehbock, Renita R.
Cc: John Thompson
Subject: CGR : Thylacine - 1

Renita,

Below are the CGR's from the compositional analysis.

Well : Thylacine 1

CGR

Sample 2 PT-2065
1.73

Sample 4 PT -1063
1.27

Sample 5 PT -4001
2.35

Sample 6 TS-5702
2.16

Sample 7 TS-5601
2.38

Sample 8 PT -2037
2.19

Sample 9 PT -1090
2.26

Sample 11 PT -1095
1.89

Regards,

Kevin

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**CORE LABORATORIES
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19 October, 2001

Woodside Energy Limited
1 Adelaide Terrace
Perth
Western Australia, 6000

Attention: Mr Werner Ribul

Subject: Reservoir Fluid Analysis
Well: Thylacine-1
Location: Western Australia
File: AFL 2001-028

Dear Werner,

Several sub-surface MDT samples, collected on the Thylacine-1 well, were shipped to our Perth laboratory for validity checks and use in a reservoir fluid analysis study. Presented in the following report are the results of these analyses.

Core Laboratories Australia Pty Ltd' appreciates this opportunity to be of service to Woodside Energy Limited. Should you have any questions regarding this report, or if we may be of any further assistance, please feel free to contact me at your convenience.

Yours Faithfully,
For **CORE LABORATORIES AUSTRALIA PTY LTD**


Kevin R. Daken
Laboratory Supervisor

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Thylacine-1

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LABORATORY PROCEDURES

Sample Receipt and Validation

Ten MDT samples (eight gas and two water) were received in our Perth laboratory for use in a compositional and PVT analysis study. As a preliminary quality check, the opening pressure of each sample was determined and compared to field shipping data. The results, summarised on page 1, indicated that all samples were reasonably consistent with reported shipping conditions and were therefore selected for compositional analysis.

Compositional Analysis

The hydrocarbon compositions of the reservoir fluid samples were determined by flash/separation techniques where a fluid sub-sample was flashed at 120°F and separated into liquid and gas phases. Flashed gas was analysed by gas chromatography using the GPA 2286 method and the flash liquid by temperature programmed capillary chromatography. These flash compositions were then mathematically recombined to the measured flash gas-liquid ratio and the original reservoir fluid composition was calculated. The resulting reservoir fluid compositions are reported on pages 2 through 9. The sample in cylinder PT-4001 was selected for PVT analysis.

Note: Processing of the flashed liquid chromatograms revealed low level contamination from the synthetic oil based drilling fluid.

Pressure Volume Relations

A known volume of the PT-4001 reservoir fluid sample was charged to the large volume Sloane-type, high-pressure visual cell and thermally expanded to 105°C. Once equilibrated in single phase, the fluid was then subjected to the constant composition expansion procedure. During this procedure, a trace of liquid was observed at 3155 psig. During subsequent pressure stages, this liquid level remained very constant (indicating probable contamination from the drilling fluid) until 2250 psig where a significant increase in retrograde liquid volume indicated the dew point for the reservoir gas. The pressure volume relations and a retrograde liquid curve were then completed with the resulting volumetric data, pressure volume relation and retrograde liquid measurements presented on page 10. Graphical representations are depicted in figures A-1 through A-3.

After some consideration, Woodside advised that an additional constant composition expansion procedure be performed on sample PT-2065. As this sample had already been shipped for Geochemistry analysis, sample TS-5702 was subsequently selected for analysis.

A known volume of the reservoir fluid sample was charged to the Sloane-type cell and thermally expanded to 96°C, equilibrated in single phase and subjected to the constant composition expansion procedure. Again, a constant trace of (contamination) liquid was observed from 3500 psig until 2500 psig where the significant increase in retrograde liquid volume indicated dew point for the reservoir gas. The pressure volume relations and a retrograde liquid curve were then completed with the resulting volumetric data, pressure volume relation and retrograde liquid measurements presented on page 11. Graphical representations are depicted in figures A-4 through A-6.

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LABORATORY PROCEDURES (cont/-)

Water/Filtrate Analysis

Atmospheric sub-samples were collected from the two pressurised MDT water samples. Since the drilling fluid contained Thiocyanate tracer, two small filtrate samples were also provided. Each of these samples was subjected to a series of standard water analysis tests and determination of the Thiocyanate content was performed. The results of these analyses are presented on page 12.

Using the measured chemical compositions for the drilling fluid filtrate sample and the water sample from cylinder PT-4006, formation water concentrations were calculated using two methods. The results of these calculations are summarised on page 13 with a more detailed calculation outline shown in the correspondence included in the Appendix.

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PRELIMINARY QUALITY CHECKS
of Gas Samples Received in Laboratory

Cylinder Number	Sample Number	Depth (m) ahRT	Reservoir Condition		Shipping Condition		Lab Opening Condition		Dew Point Pressure		Approximate Sample Volume (cc)	Water Recovered (cc)
			psia	°C	psig	°C	psig	°C	psig	°C		
PT-2065	2	2053.8	3280	89	3626	13.6	3770	19.3	-	-	180	0
PT-1063	4	2165.8	3317	98	3698	14.1	3910	18.5	-	-	290	0
PT-4001	5	2165.8	3317	98	3626	12.2	4320	18.2	2250	105	3040	0
TS-5702	6	2236.8	3331	101	3916	13.9	3900	18.6	2500	96	280	0
TS-5601	7	2236.8	3331	101	3481	13.5	3710	19.4	-	-	320	0
PT-2037	8	2279.1	3340	102	3916	13.9	4070	18.4	-	-	300	0
PT-1090	9	2279.1	3340	102	3698	14.2	3880	18.9	-	-	270	0
PT-1095	11	2302.4	3346	103	3771	13.7	3910	18.8	-	-	370	0
PT-1101	12	2344.5	3378	106	2030	13.4	2350	19.0				100%
PT-4006	14	2344.5	3378	106	4061	12.4	4320	18.6				100%

Note 1 : Reservoir and shipping conditions were obtained from Petrotech sample transfer data sheet.

Note 2 : Laboratory opening conditions were measured on the glycol (non-sample) end.

Note 3 : Reported dew point pressures are as measured during PVT analyses.

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COMPOSITION OF RESERVOIR FLUID SAMPLE #2 - PT-2065

(by Flash/Extended Chromatography)

Component Name	Mol %	Wt %	Liquid Density (gm/cc)	MW
Hydrogen Sulfide	0.00	0.00	0.8006	34.08
Carbon Dioxide	8.85	18.38	0.8172	44.01
Nitrogen	1.85	2.44	0.8086	28.013
Methane	80.52	60.95	0.2997	16.043
Ethane	5.28	7.50	0.3562	30.07
Propane	1.50	3.12	0.5070	44.097
iso-Butane	0.32	0.88	0.5629	58.123
n-Butane	0.54	1.48	0.5840	58.123
iso-Pentane	0.22	0.75	0.6244	72.15
n-Pentane	0.16	0.55	0.6311	72.15
Hexanes	0.18	0.72	0.6850	84
Heptanes	0.21	0.96	0.7220	96
Octanes	0.23	1.15	0.7450	107
Nonanes	0.05	0.28	0.7640	121
Decanes	0.02	0.14	0.7780	134
Undecanes	0.01	0.09	0.7890	147
Dodecanes plus	0.06	0.61	0.8376	217
Totals	100.00	100.00		

Total Sample Properties

Molecular Weight 21.19
 Equivalent Liquid Density, gm/scc 0.3737

Plus Fractions	Mol %	Wt %	Density	MW
Heptanes plus	0.58	3.23	0.7577	117
Dodecanes plus	0.06	0.61	0.8376	217

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COMPOSITION OF RESERVOIR FLUID SAMPLE #4 - PT-1063

(by Flash/Extended Chromatography)

Component Name	Mol %	Wt %	Liquid Density (gm/cc)	MW
Hydrogen Sulfide	0.00	0.00	0.8006	34.08
Carbon Dioxide	9.20	19.37	0.8172	44.01
Nitrogen	1.46	1.95	0.8086	28.013
Methane	81.57	62.59	0.2997	16.043
Ethane	4.71	6.77	0.3562	30.07
Propane	1.43	3.01	0.5070	44.097
iso-Butane	0.29	0.81	0.5629	58.123
n-Butane	0.39	1.08	0.5840	58.123
iso-Pentane	0.16	0.55	0.6244	72.15
n-Pentane	0.11	0.38	0.6311	72.15
Hexanes	0.13	0.52	0.6850	84
Heptanes	0.23	1.06	0.7220	96
Octanes	0.20	1.05	0.7450	107
Nonanes	0.05	0.27	0.7640	121
Decanes	0.01	0.07	0.7780	134
Undecanes	0.01	0.06	0.7890	147
Dodecanes plus	0.05	0.46	0.8344	211

Total Sample Properties

Molecular Weight 20.92
 Equivalent Liquid Density, gm/scc 0.3713

Plus Fractions	Mol %	Wt %	Density	MW
Heptanes plus	0.55	2.97	0.7536	114
Dodecanes plus	0.05	0.46	0.8344	211
Totals	100.00	100.00		

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Thylacine-1

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COMPOSITION OF RESERVOIR FLUID SAMPLE #5 - PT-4001

(by Flash/Extended Chromatography)

Component Name	Mol %	Wt %	Liquid Density (gm/cc)	MW
Hydrogen Sulfide	0.00	0.00	0.8006	34.08
Carbon Dioxide	9.29	19.31	0.8172	44.01
Nitrogen	1.38	1.82	0.8086	28.013
Methane	81.13	61.67	0.2997	16.043
Ethane	4.88	6.94	0.3562	30.07
Propane	1.61	3.35	0.5070	44.097
iso-Butane	0.29	0.80	0.5629	58.123
n-Butane	0.39	1.07	0.5840	58.123
iso-Pentane	0.15	0.51	0.6244	72.15
n-Pentane	0.11	0.38	0.6311	72.15
Hexanes	0.14	0.56	0.6850	84
Heptanes	0.23	1.06	0.7220	96
Octanes	0.21	1.06	0.7450	107
Nonanes	0.06	0.37	0.7640	121
Decanes	0.03	0.17	0.7780	134
Undecanes	0.02	0.11	0.7890	147
Dodecanes plus	0.08	0.82	0.8346	212
Totals	100.00	100.00		

Total Sample Properties

Molecular Weight 21.13
 Equivalent Liquid Density, gm/scc 0.3734

Plus Fractions	Mol %	Wt %	Density	MW
Heptanes plus	0.63	3.59	0.7614	120
Dodecanes plus	0.08	0.82	0.8346	212

Woodside Energy Limited

Thylacine-1

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COMPOSITION OF RESERVOIR FLUID SAMPLE #6 - TS-5702

(by Flash/Extended Chromatography)

Component Name	Mol %	Wt %	Liquid Density (gm/cc)	MW
Hydrogen Sulfide	0.00	0.00	0.8006	34.08
Carbon Dioxide	9.40	19.73	0.8172	44.01
Nitrogen	1.23	1.64	0.8086	28.013
Methane	81.82	62.64	0.2997	16.043
Ethane	4.56	6.55	0.3562	30.07
Propane	1.41	2.96	0.5070	44.097
iso-Butane	0.26	0.72	0.5629	58.123
n-Butane	0.36	1.00	0.5840	58.123
iso-Pentane	0.14	0.48	0.6244	72.15
n-Pentane	0.10	0.34	0.6311	72.15
Hexanes	0.13	0.52	0.6850	84
Heptanes	0.22	1.02	0.7220	96
Octanes	0.20	1.01	0.7450	107
Nonanes	0.06	0.36	0.7640	121
Decanes	0.02	0.15	0.7780	134
Undecanes	0.01	0.10	0.7890	147
Dodecanes plus	0.08	0.78	0.8353	213
Totals	100.00	100.00		

Total Sample Properties

Molecular Weight 20.95
 Equivalent Liquid Density, gm/scc 0.3718

Plus Fractions	Mol %	Wt %	Density	MW
Heptanes plus	0.59	3.42	0.7616	120
Dodecanes plus	0.08	0.78	0.8353	213

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Thylacine-1

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COMPOSITION OF RESERVOIR FLUID SAMPLE #7 - TS-5601

(by Flash/Extended Chromatography)

Component Name	Mol %	Wt %	Liquid Density (gm/cc)	MW
Hydrogen Sulfide	0.00	0.00	0.8006	34.08
Carbon Dioxide	9.55	19.96	0.8172	44.01
Nitrogen	1.38	1.83	0.8086	28.013
Methane	81.55	62.15	0.2997	16.043
Ethane	4.53	6.48	0.3562	30.07
Propane	1.34	2.80	0.5070	44.097
iso-Butane	0.25	0.69	0.5629	58.123
n-Butane	0.38	1.05	0.5840	58.123
iso-Pentane	0.15	0.51	0.6244	72.15
n-Pentane	0.11	0.38	0.6311	72.15
Hexanes	0.13	0.52	0.6850	84
Heptanes	0.23	1.06	0.7220	96
Octanes	0.21	1.07	0.7450	107
Nonanes	0.06	0.37	0.7640	121
Decanes	0.03	0.17	0.7780	134
Undecanes	0.02	0.11	0.7890	147
Dodecanes plus	0.08	0.85	0.8352	213
Totals	100.00	100.00		

Total Sample Properties

Molecular Weight 21.05
 Equivalent Liquid Density, gm/scc 0.3735

Plus Fractions	Mol %	Wt %	Density	MW
Heptanes plus	0.63	3.63	0.7616	120
Dodecanes plus	0.08	0.85	0.8352	213

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Thylacine-1

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COMPOSITION OF RESERVOIR FLUID SAMPLE #8 - PT-2037

(by Flash/Extended Chromatography)

Component Name	Mol %	Wt %	Liquid Density (gm/cc)	MW
Hydrogen Sulfide	0.00	0.00	0.8006	34.08
Carbon Dioxide	9.84	20.40	0.8172	44.01
Nitrogen	1.49	1.96	0.8086	28.013
Methane	80.62	60.94	0.2997	16.043
Ethane	4.82	6.83	0.3562	30.07
Propane	1.52	3.15	0.5070	44.097
iso-Butane	0.28	0.77	0.5629	58.123
n-Butane	0.42	1.15	0.5840	58.123
iso-Pentane	0.17	0.58	0.6244	72.15
n-Pentane	0.12	0.41	0.6311	72.15
Hexanes	0.14	0.56	0.6850	84
Heptanes	0.22	1.01	0.7220	96
Octanes	0.19	0.95	0.7450	107
Nonanes	0.05	0.29	0.7640	121
Decanes	0.02	0.11	0.7780	134
Undecanes	0.02	0.11	0.7890	147
Dodecanes plus	0.08	0.78	0.8354	213
Totals	100.00	100.00		

Total Sample Properties

Molecular Weight 21.24
 Equivalent Liquid Density, gm/scc 0.3759

Plus Fractions	Mol %	Wt %	Density	MW
Heptanes plus	0.58	3.25	0.7624	121
Dodecanes plus	0.08	0.78	0.8354	213

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COMPOSITION OF RESERVOIR FLUID SAMPLE #9 - PT-1090

(by Flash/Extended Chromatography)

Component Name	Mol %	Wt %	Liquid Density (gm/cc)	MW
Hydrogen Sulfide	0.00	0.00	0.8006	34.08
Carbon Dioxide	9.91	20.38	0.8172	44.01
Nitrogen	1.52	1.99	0.8086	28.013
Methane	80.14	60.10	0.2997	16.043
Ethane	4.94	6.95	0.3562	30.07
Propane	1.64	3.38	0.5070	44.097
iso-Butane	0.31	0.84	0.5629	58.123
n-Butane	0.45	1.22	0.5840	58.123
iso-Pentane	0.18	0.61	0.6244	72.15
n-Pentane	0.13	0.44	0.6311	72.15
Hexanes	0.15	0.59	0.6850	84
Heptanes	0.23	1.05	0.7220	96
Octanes	0.21	1.05	0.7450	107
Nonanes	0.06	0.35	0.7640	121
Decanes	0.03	0.16	0.7780	134
Undecanes	0.02	0.11	0.7890	147
Dodecanes plus	0.08	0.78	0.8348	212

Total Sample Properties

Molecular Weight 21.40
 Equivalent Liquid Density, gm/scc 0.3777

Plus Fractions	Mol %	Wt %	Density	MW
Heptanes plus	0.63	3.50	0.7614	120
Dodecanes plus	0.08	0.78	0.8348	212
Totals	100.00	100.00		

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Thylacine-1
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COMPOSITION OF RESERVOIR FLUID SAMPLE #11 - PT-1095
(by Flash/Extended Chromatography)

Component Name	Mol %	Wt %	Liquid Density (gm/cc)	MW
Hydrogen Sulfide	0.00	0.00	0.8006	34.08
Carbon Dioxide	9.83	20.41	0.8172	44.01
Nitrogen	1.50	1.98	0.8086	28.013
Methane	80.71	61.07	0.2997	16.043
Ethane	4.81	6.83	0.3552	30.07
Propane	1.43	2.97	0.5070	44.097
iso-Butane	0.27	0.74	0.5629	58.123
n-Butane	0.44	1.21	0.5840	58.123
iso-Pentane	0.18	0.61	0.6244	72.15
n-Pentane	0.12	0.41	0.6311	72.15
Hexanes	0.14	0.56	0.6850	84
Heptanes	0.22	1.01	0.7220	96
Octanes	0.19	0.94	0.7450	107
Nonanes	0.06	0.34	0.7640	121
Decanes	0.02	0.14	0.7780	134
Undecanes	0.01	0.09	0.7890	147
Dodecanes plus	0.07	0.69	0.8339	210
Totals	100.00	100.00		

Total Sample Properties

Molecular Weight 21.19
Equivalent Liquid Density, gm/scc 0.3755

Plus Fractions	Mol %	Wt %	Density	MW
Heptanes plus	0.57	3.21	0.7593	119
Dodecanes plus	0.07	0.69	0.8339	210

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PRESSURE-VOLUME RELATIONS - PT-4001

(at 105 °C)

Pressure psig	Relative Volume (A)	Liquid Volume Percent (B)	Deviation Factor Z
6000	0.4460		1.034
5500	0.4698		0.998
5000	0.4991		0.964
4500	0.5368		0.934
4100	0.5757		0.913
3700	0.6256		0.895
✓3500	0.6560		0.888
✓3302	0.6905		0.882
3100	0.7313		0.878
✓2900	0.7782		0.874
2700	0.8333		0.872
✓2600	0.8645		0.871
2500	0.8985		0.871
✓2400	0.9359		0.871
2300	0.9771		0.871
✓d>2250	1.0000	0.00	0.873
2200	1.0228	0.01	
2100	1.0724	0.02	
2000	1.1276	0.03	
1900	1.1891	0.04	
1700	1.3356	0.05	
1475	1.5505	0.05	
1252	1.8429	0.05	
1060	2.1954	0.04	
915	2.5606	0.04	
810	2.9067	0.03	
722	3.2737	0.03	

(A) Relative Volume: V/V_{sat} or volume at indicated pressure per volume at saturation pressure.

(B) Percent of the total volume of gas and liquid at the indicated pressure and 105 °C

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PRESSURE-VOLUME RELATIONS - TS-5702

(at 96 °C)

Pressure psig	Relative Volume (A)	Liquid Volume Percent (B)	Deviation Factor Z
6000	0.5049		1.054
5500	0.5312		1.016
5000	0.5635		0.980
4500	0.6047		0.947
4000	0.6593		0.918
3500	0.7343		0.895
3100	0.8162		0.882
2900	0.8674		0.877
2700	0.9276		0.874
2600	0.9619		0.873
d»2500	1.0000	0.00	0.872
2400	1.0409	0.01	
2300	1.0858	0.02	
2200	1.1354	0.03	
2100	1.1903	0.04	
1900	1.3193	0.05	
1692	1.4888	0.06	
1486	1.7066	0.06	
1231	2.0819	0.05	
1009	2.5672	0.04	
850	3.0720	0.04	
721	3.6445	0.03	
560	4.7234	0.02	

(A) Relative Volume: V/V_{sat} or volume at indicated pressure per volume at saturation pressure.

(B) Percent of the total volume of gas and liquid at the indicated pressure and 96 °C

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STANDARD WATER ANALYSIS

Sample	PT-4006 2344.5 mahRT	PT-1101 2344.5 mahRT	M-43 Filtrate
Dissolved Constituent	mg/L	mg/L	mg/L
Ions			
Calcium, Ca	360	400	190
Magnesium, Mg	28	36	<25
Iron, Fe (soluble)	12.0	27.0	<25
Sodium, Na	6700	6400	6000
Potassium, K	13000	31000	39000
Strontium, Sr	7.5	8.8	<5
Barium, Ba	6.2	9.5	<10
Chloride, Cl	21000	40000	44000
Sulphate, SO ₄	190	550	1300
Bicarbonate, HCO ₃	1700	1300	1200
Carbonate, CO ₃	<1	<1	<50
Hydroxide, OH	<1	<1	<50
Thiocyanate, SCN	120	280	330
Other Properties			
pH	6.6	6.9	7.3
Resistivity, ohm-m @ 25 °C	0.15	0.09	I/S
Total Dissolved Solids (grav) @ 180 °C	45000	85000	93000
Density, gm/cc @ 20 °C	1.028	1.050	I/S

Notes: I/S denotes Insufficient Sample

CALCULATION OF FORMATION WATER CONCENTRATION

Method 1

Using concentrations of main dissolved constituents – Chloride, Potassium and Sodium.

Calculated Formation Water TDS 13224 mg/litre

Method 2

Using concentrations of Thiocyanate tracer.

Calculated Formation Water TDS 16000 mg/litre

Note: For a more complete description of each calculation method, please refer to the correspondence include in the Appendix.

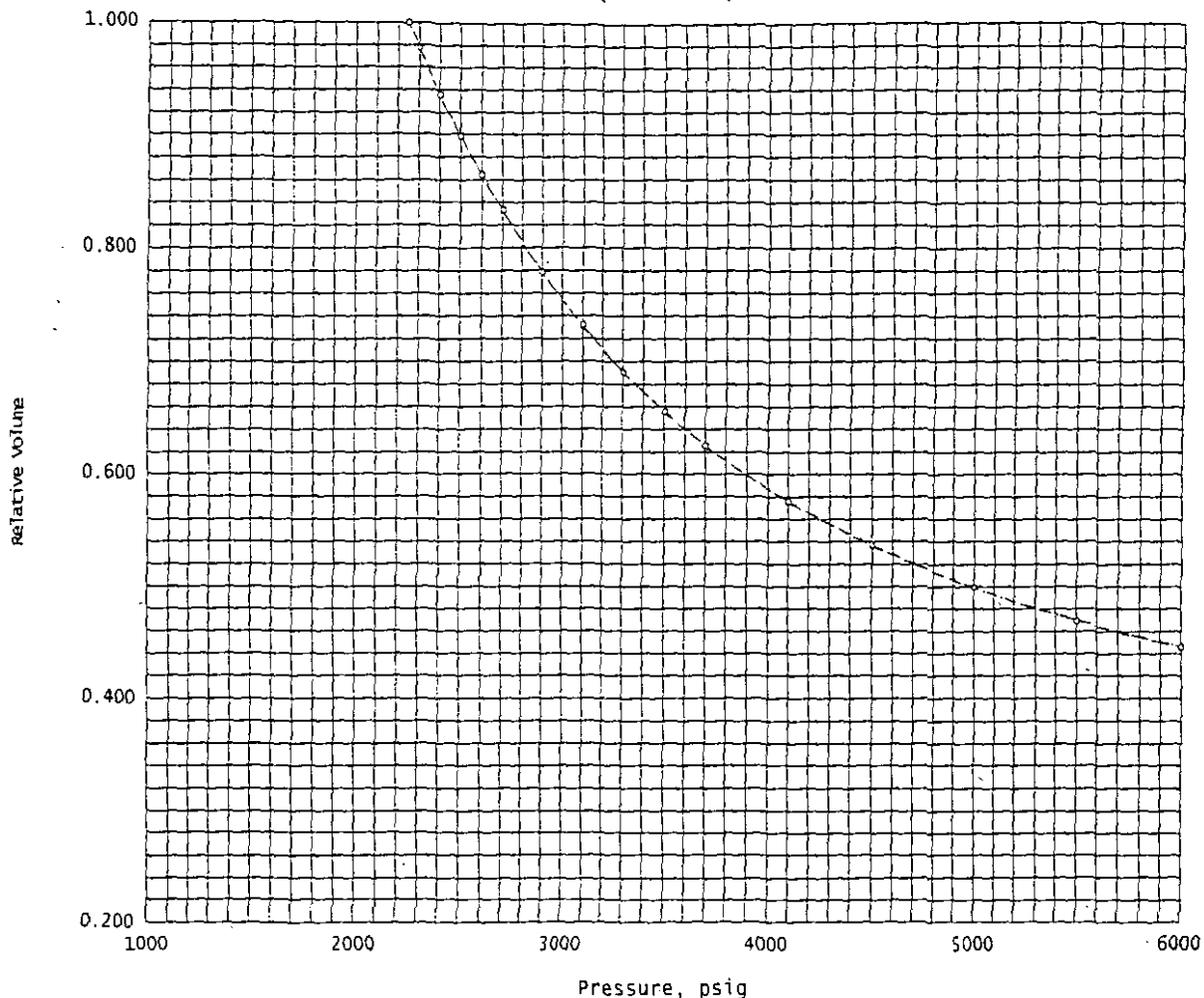
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Thylacine-1

AFL 2001-028

RELATIVE VOLUME - PT-4001

(at 105 °C)



<p>Relative Volume Expression:</p> $y = a + b (xd)^i + c (xd)^j + d (\log(xd))^k$	<p>LEGEND</p>								
<p>where:</p> <table style="width: 100%;"> <tr> <td>a= -9.20303e+ 00</td> <td>i= 0.500</td> </tr> <tr> <td>b= 1.53241e+ 01</td> <td>j= 0.750</td> </tr> <tr> <td>c= -5.12108e+ 00</td> <td>k= 0.995</td> </tr> <tr> <td>d= -1.09599e+ 01</td> <td></td> </tr> </table> <p>Note: xd (dimensionless 'x') = Pi / Psat, psig</p>	a= -9.20303e+ 00	i= 0.500	b= 1.53241e+ 01	j= 0.750	c= -5.12108e+ 00	k= 0.995	d= -1.09599e+ 01		<p>○ Laboratory Data</p> <p>--- Confidence Limits</p> <p>----- Analytical Expression</p> <p>Saturation Pressure: 2250 psig</p>
a= -9.20303e+ 00	i= 0.500								
b= 1.53241e+ 01	j= 0.750								
c= -5.12108e+ 00	k= 0.995								
d= -1.09599e+ 01									
<p>Confidence level: 99 %</p> <p>Confidence interval: +/- 0.00018</p> <p>'r squared': .999998</p>	<p>Pressure-Volume Relations</p> <p>Figure A-1</p>								

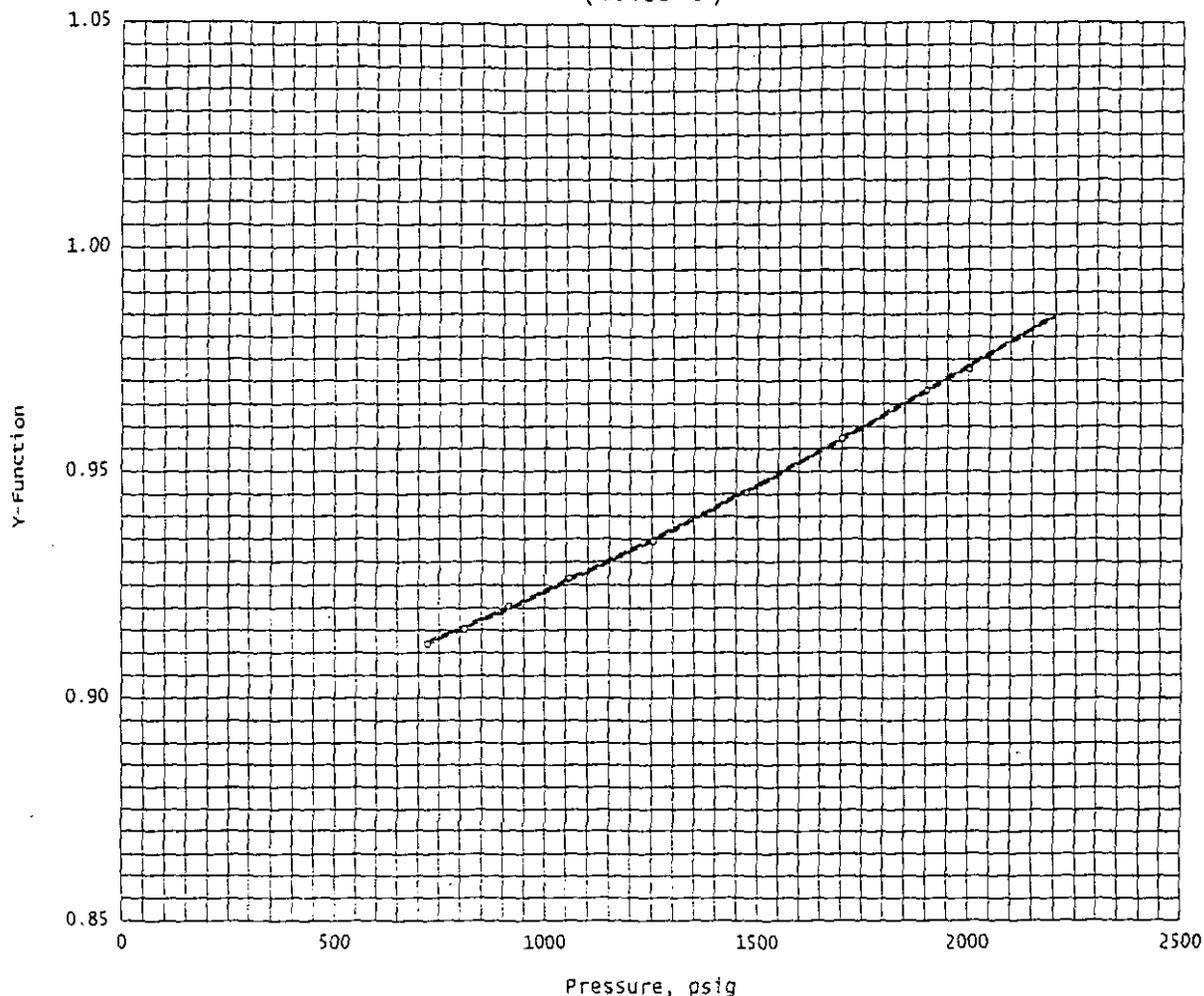
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Thylacine-1

AFL 2001-028

Y-FUNCTION - PT-4001

(at 105 °C)



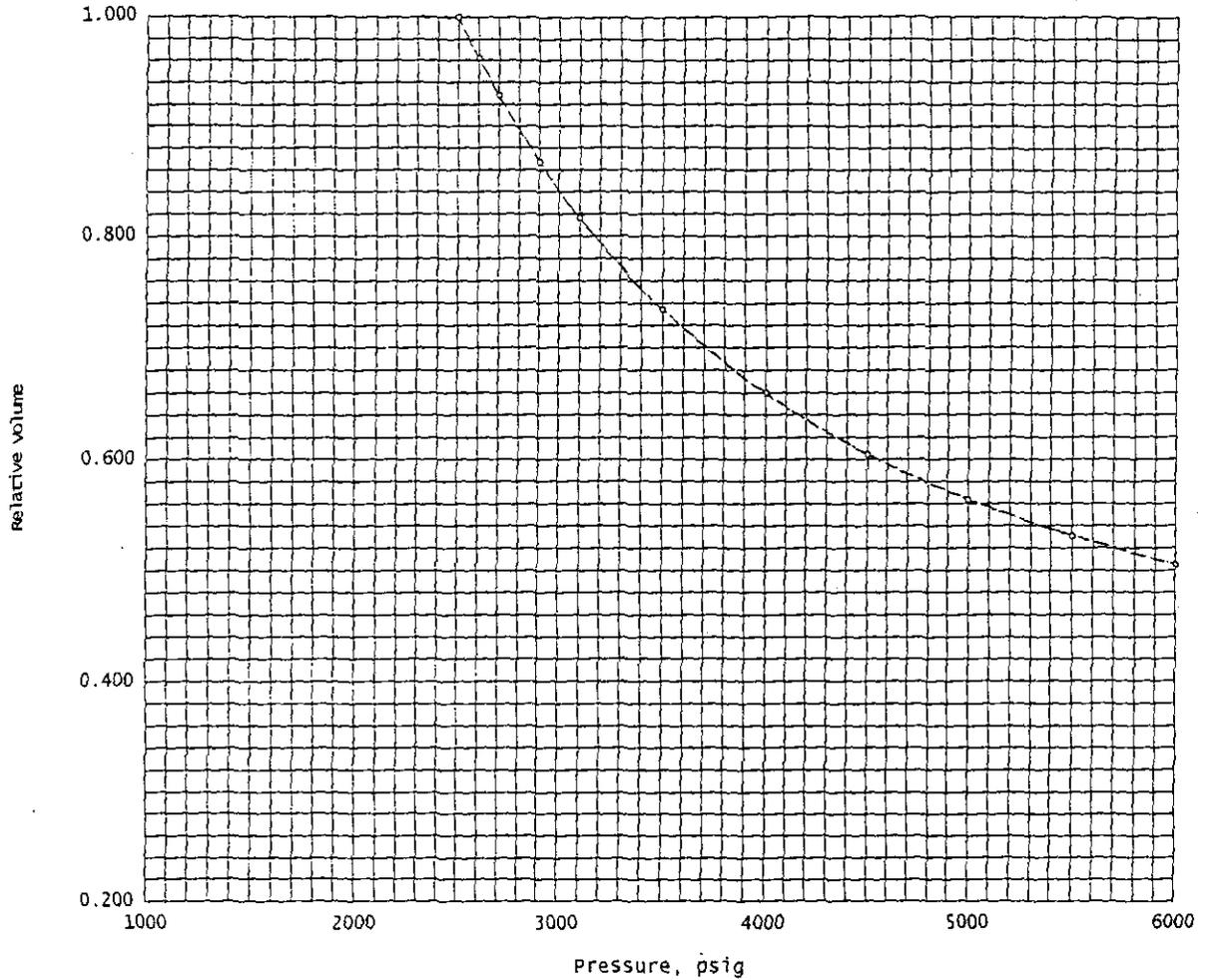
<p>Y-Function Expression:</p> $y = a + b (x_d)^{i_i}$	<p>LEGEND</p>
<p>where:</p> <p>a= 8.92166e- 01 i= 1.374</p> <p>b= 9.54798e- 02</p> <p>Note: x_d (dimensionless 'X') = P_i / P_{sat}, psig</p>	<p>○ Laboratory Data</p> <p>--- Confidence Limits</p> <p>----- Analytical Expression</p> <p>Saturation Pressure: 2250 psig</p>
<p>Confidence level: 99 %</p> <p>Confidence interval: +/- 0</p> <p>'r squared': .999704</p>	<p>Pressure-Volume Relations</p> <p>Figure A-2</p>

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RELATIVE VOLUME - TS-5702
(at 96 °C)



<p>Relative Volume Expression:</p> $y = a + b (Xd)^i + c (Xd)^j + d (\log(Xd))^k$ <p>where:</p> <table> <tr> <td>a= -1.40679e+ 01</td> <td>i= 0.400</td> </tr> <tr> <td>b= 1.75280e+ 01</td> <td>j= 0.850</td> </tr> <tr> <td>c= -2.46012e+ 00</td> <td>k= 0.997</td> </tr> <tr> <td>d= -1.34470e+ 01</td> <td></td> </tr> </table> <p>Note: Xd (dimensionless 'X') = Pi / Psat, psig</p>	a= -1.40679e+ 01	i= 0.400	b= 1.75280e+ 01	j= 0.850	c= -2.46012e+ 00	k= 0.997	d= -1.34470e+ 01		<p>LEGEND</p> <p>○ Laboratory Data</p> <p>--- Confidence Limits</p> <p>— Analytical Expression</p> <p>Saturation Pressure: 2500 psig</p>
a= -1.40679e+ 01	i= 0.400								
b= 1.75280e+ 01	j= 0.850								
c= -2.46012e+ 00	k= 0.997								
d= -1.34470e+ 01									
<p>Confidence level: 99 %</p> <p>Confidence interval: +/- 0.00035</p> <p>'r squared': .999996</p>	<p>Pressure-Volume Relations</p> <p>Figure A-4</p>								

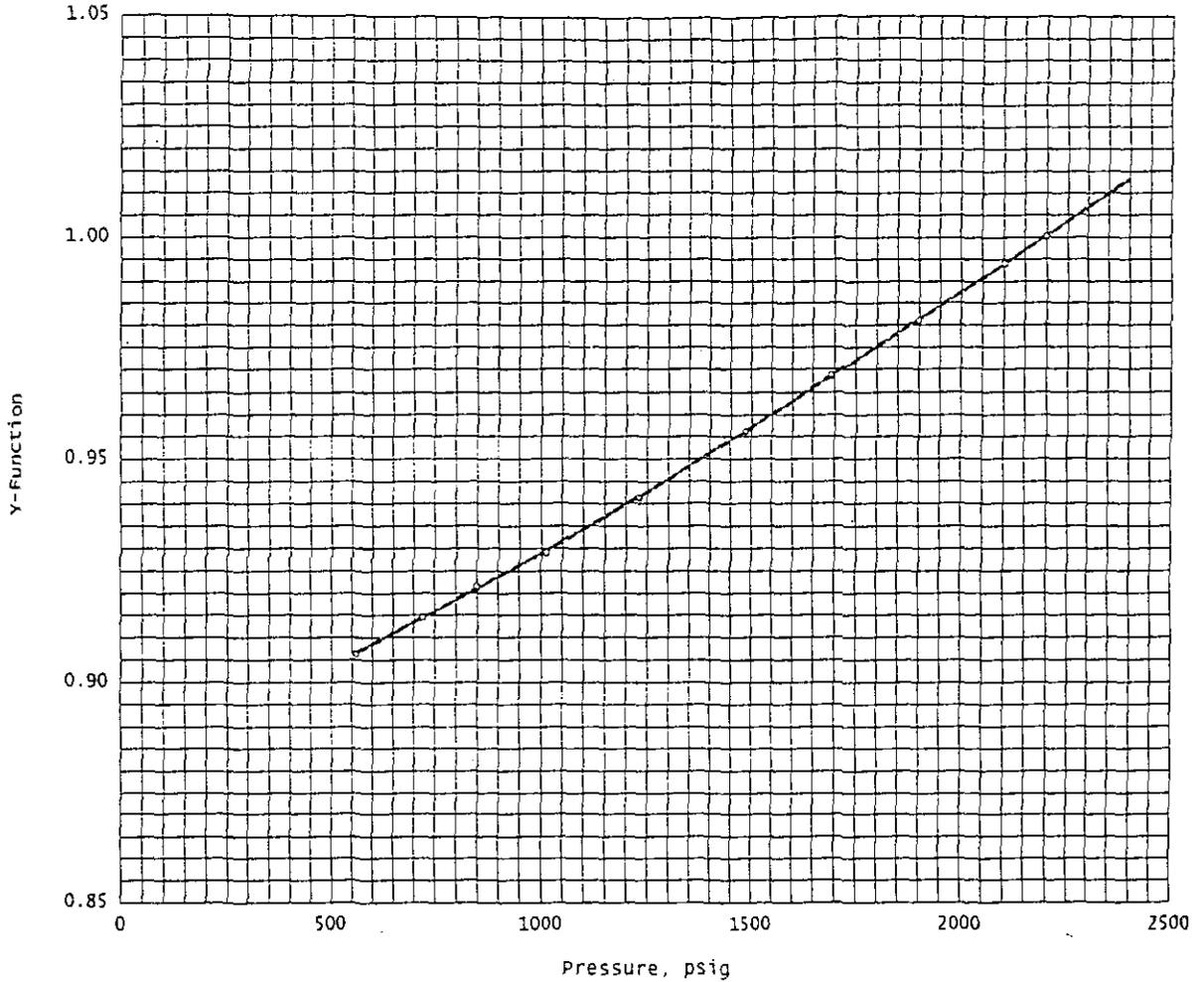
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Thylacine-1

AFL 2001-028

Y-FUNCTION - TS-5702

(at 96 °C)



<p>Y-Function Expression:</p> $y = a + b (x_d)^i$	<p>LEGEND</p> <p>○ Laboratory Data</p> <p>----- Confidence Limits</p> <p>_____ Analytical Expression</p> <p>Saturation Pressure: 2500 psig</p>
<p>where:</p> <p>a= 8.85280e- 01 i= 1.231</p> <p>b= 1.34610e- 01</p> <p>Note: x_d (dimensionless 'x') = P_i / P_{sat}, psig</p>	
<p>Confidence level: 99 %</p> <p>Confidence interval: +/- 0</p> <p>'r squared': .99994</p>	<p>Pressure-Volume Relations</p> <p>Figure A-5</p>

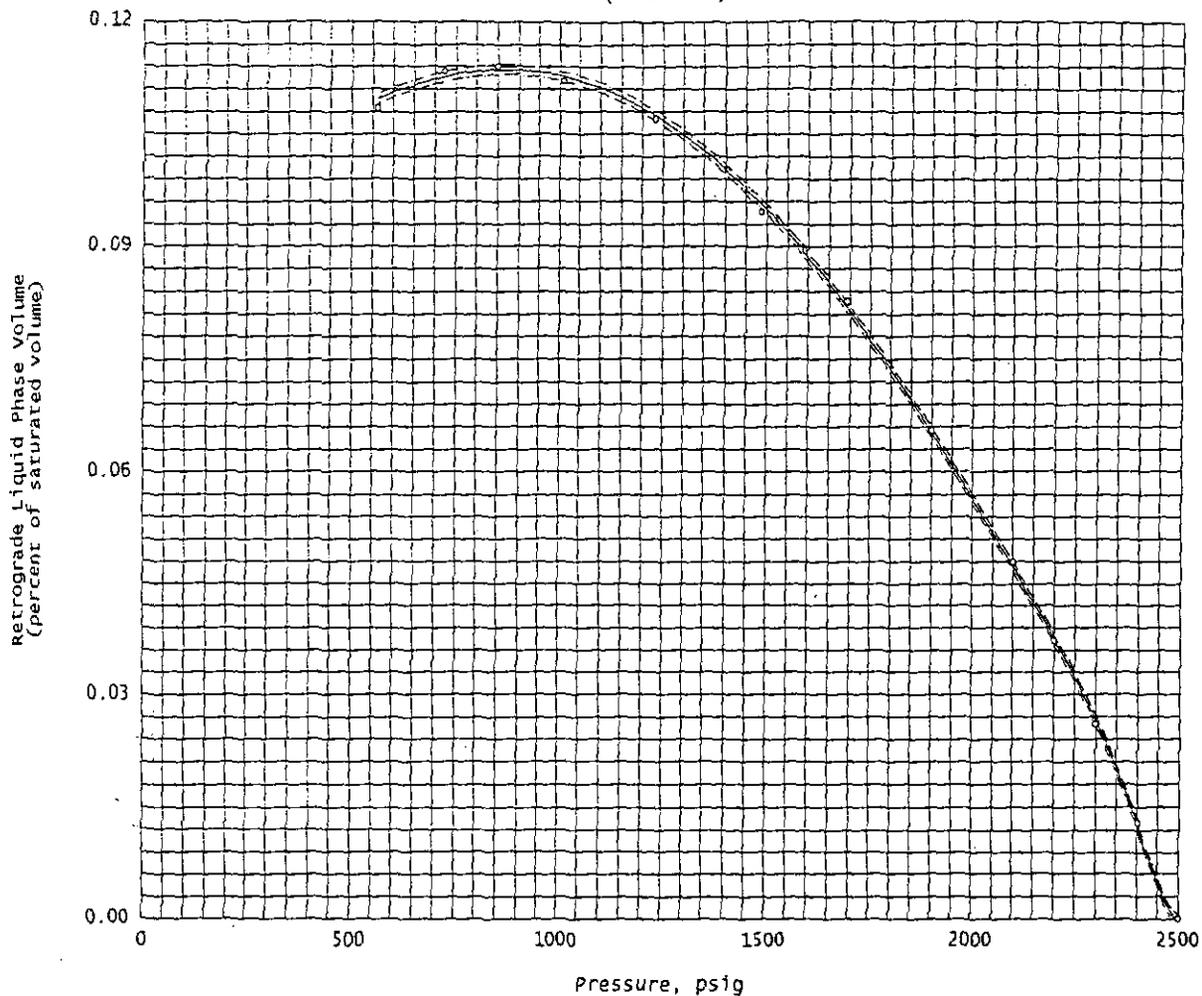
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Thylacine-1

AFL 2001-028

LIQUID PHASE VOLUME - TS-5702

(at 96 °C)



<p>Retrograde Liquid Curve Expression:</p> $\sqrt{y} = a + b (xd)^i + c (xd)^j + d (10 \backslash xd)^k$	<p>LEGEND</p>								
<p>where:</p> <table style="width: 100%;"> <tr> <td>a= 3.04258e- 01</td> <td>i= 2.173</td> </tr> <tr> <td>b= -5.90107e- 01</td> <td>j= 1.405</td> </tr> <tr> <td>c= 4.06318e- 01</td> <td>k= 13.398</td> </tr> <tr> <td>d= -4.81156e- 15</td> <td></td> </tr> </table> <p>Note: xd (dimensionless 'X') = Pi / Psat, psig</p>	a= 3.04258e- 01	i= 2.173	b= -5.90107e- 01	j= 1.405	c= 4.06318e- 01	k= 13.398	d= -4.81156e- 15		<p style="text-align: center;">○ Laboratory Data</p> <p style="text-align: center;">- - - Confidence Limits</p> <p style="text-align: center;">— Analytical Expression</p> <p style="text-align: center;">Saturation Pressure: 2500 psig</p>
a= 3.04258e- 01	i= 2.173								
b= -5.90107e- 01	j= 1.405								
c= 4.06318e- 01	k= 13.398								
d= -4.81156e- 15									
<table style="width: 100%;"> <tr> <td>Confidence level:</td> <td style="text-align: right;">99 %</td> </tr> <tr> <td>Confidence interval:</td> <td style="text-align: right;">+/- 0</td> </tr> <tr> <td>'r squared':</td> <td style="text-align: right;">.999644</td> </tr> </table>	Confidence level:	99 %	Confidence interval:	+/- 0	'r squared':	.999644	<p>Pressure-Volume Relations</p> <p>Figure A-6</p>		
Confidence level:	99 %								
Confidence interval:	+/- 0								
'r squared':	.999644								

Appendix

Correspondence for Calculation of Formation Water Concentrations

FILE
CIRCULATE
COPY
ACTION

Subject: Thylacine Formation Brine Concentration

Date: Wed, 01 Aug 2001 16:10:18 +0800

From: Tony Kennaird <tony@corelab.com.au>

Organization: Core Laboratories Australia Pty Ltd

To: Werner Ribul <werner.ribul@woodside.com.au>

CC: Jon Kelly <Jon.Kelly@woodside.com.au>

cc KD, JT, AS, TK

SENT

Werner/Jon,

Here are a couple of approaches to the calculations - neither of which are perfect!

APPROACH 1

(1) Rmf - 0.074 @ 20 deg C

On the resistivity chart this equates to 115,000 ppm NaCl soln. At the K concentration given, K is about 1:1 with Na, so 115,000 ppm total is reasonable.

(2) Based on atomic weights, 44,000 ppm K will combine with about 40,000 Cl. From Jon's information, there is 59,000 Cl, so the remaining 19,000 is combining with something else, most likely Na.

Again based on atomic weights, 19,000 Cl will combine with about 12,000 Na.

Total of 44,000 K, 59,000 Cl and 12,000 Na is 115,000 total. This links with (1) above.

(3) We have to convert 115,000 ppm to mg/l to work with the water analyses we provided. You do this by dividing by specific gravity - should be about 1.08 for this concentration. So 115,000 ppm divided by 1.08 is around 106,000 mg/l.

(4) Ratio the individual ionic concentrations and keep atomic weight balances and you have something like 40,000 K; 55,000 Cl and 11,000 Na.

(5) Assuming K is in very low concentrations in the formation water (normally a safe bet) then let's take the least contaminated sample PT-4006 at 2344.5 mahRT.

This contains 13,000 K - which combines with 11,833 Cl. Total 24,833 KCl. However, some NaCl in mud filtrate also, ratio is 1.37 (115,000/84,000 from (2) above). So 24,833 x 1.37 = 34,021 mg/l of the salt concentration comes from mud filtrate contamination.

(6) Since original mud salt concentration was about 106,000 mg/l, then this 34,021 is contained in $(34,021/106,000) \times 1,000 = 321 \text{ cm}^3$ of solution.

(7) Total concentration of water from PT-4006 is 43,000 mg/l (if you add up analysed constituents - not TDS).

Therefore 43,000 - 34,021 mg is contained in 1,000 - 321 cm^3 of solution. That is 8979 mg of formation water salt in 679 cm^3 of solution.

Therefore concentration of formation brine is:

$$8979/0.679 = \underline{13,224 \text{ mg/l}}$$

APPROACH 2

(A) Original thiocyanate concentration was 400 ppm (assumption here is 400 ppm in solution, at this concentration 400 ppm is more or less 400 mg/l - however 400 ppm was added to whole mud not make-up water).

(B) From water sample PT-4006 thiocyanate is 120mg/l.

Therefore $120/400 = 30\%$ of the water sample is filtrate.

(C) 30% is 300cm^3 solution in which $106,000 \times 0.3$ mg is dissolved (31,800 mg).

(D) Therefore $43,000 - 31,800$ mg is contained in $1,000 - 300\text{cm}^3$ of solution. That is 11,200 mg in 700cm^3 of solution as formation brine.

Therefore concentration of formation brine is:

$$11,200/0.700 = \underline{16,000\text{ mg/l}}$$

Guys, both approaches are fraught with assumptions. Hope all this makes some sense if you want to incorporate the ideas in a different approach.

Best regards

TK

Tony Kennaird

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