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PETROLEUM DIVISION

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PE907357

**A Reservoir Fluid Study
of Sample
from
Turrum #5
Gippsland Basin**

Prepared for
Esso Australia Ltd.

November 1995

File : AFL 95033

Reservoir Fluid Laboratory
Core Laboratories
Perth
Australia

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23 November 1995

Esso Australia Ltd.
360 Elizabeth Street,
Melbourne
Victoria 3000

Attention: Mr. Michael Scott

Subject: Reservoir Fluid Study
Well: Turrum #5
Location: Gippsland Basin
File: AFL 95033

Dear Mr. Scott,

Four samples in MDT chambers from the Turrum #5 well were submitted to our Perth laboratory for quality checking prior to analysis. The three chambers with samples from the gas zone were all found to be empty. The fourth chamber from the oil zone contained a small amount of oil. Presented in the following report are the results of the analysis performed on the oil sample.

Core Laboratories appreciates this opportunity to be of service to Esso Australia Ltd. 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**

Kevin Daken
Laboratory Supervisor

Esso Australia Ltd.
Turrum #5
AFL 95033

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LABORATORY PROCEDURES

Samples

Four MDT chambers were submitted to our Perth laboratory for sample transferral and analysis. On transferring the samples for analysis the three chambers containing gas samples were all found to be empty. The fourth Chamber (DA-16) was found to only contain a small volume of oil sample (approximately 100 cc). As requested a bubble point determination was performed on the oil sample and was found to be 2544 psig at 103 °C. The results of the transferrals are presented on page 1.

Compositional Determination

The hydrocarbon composition of the MDT sample from DA-16 was determined through dodecanes plus using isothermal flash/chromatographic techniques. This result is reported on page 2.

Pressure Volume Relations

A known volume of the reservoir fluid sample was charged to a high pressure visual cell and thermally expanded to the reported reservoir temperature of 217 °F (103 °C). The fluid was then subjected to a constant composition expansion, during which, the bubble point pressure was found to be 2542 psig. The pressure volume relations were then measured. The volumetric data and the pressure volume relation measurements are presented on pages 5 and 6 with graphical representations on Figures A-1 and A-2.

Flash Test

Upon completion of the pressure volume measurements, the sample was equilibrated in single phase and then subjected to density determination and a flash test. From the flash test a gas to oil ratio of 489 scf/ST bbl was measured. The pour point, wax content and API was determined on the flashed oil and are reported along with the flash data on page 4 of this report.

Fingerprint Analysis

A portion of the oil from the flash test was injected into a temperature programmed chromatograph for fingerprint analysis. The results of the analysis are reported on pages 7 and 8 with the resultant chromatogram attached in the appendix.

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**Turrum #5
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General Well Information

Company.....	Esso Australia Ltd.
Well Name.....	Turrum #5
API Well Number.....	N/A
File Number.....	AFL 95033
Date Sample Collected.....	*
Sample Type.....	Bottom Hole
Geographical Location.....	Bass Strait
Field.....	Turrum

Well Description

Formation.....	Turrum - Intra-Latrobe	
Pool (or Zone).....	*	
Date Completed.....	*	
Elevation.....	*	ft
Producing Interval.....	*	ft
Total Depth.....	*	ft
Tubing Size.....	*	in
Tubing Depth.....	*	ft
Casing Size.....	*	in
Casing Depth.....	*	ft

Pressure Survey Data

Data from Original Discovery Well

Date	*	
Reservoir Pressure	*	psig
Gas / Oil Contact.....	*	ft
Oil / Water Contact.....	*	ft

Data at Sample Collection

Date.....	17-Sep-95	
Reservoir Pressure.....	3722	psia
Reservoir Temperature.....	217	°F
Pressure Tool.....	MDT	
Flowing Bottom-Hole Pressure.....	*	psig
Gas / Oil Contact.....	*	ft
Oil / Water Contact.....	*	ft

* Data not forwarded to Core Laboratories.

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PRELIMINARY QUALITY CHECKS
PERFORMED ON SAMPLES RECEIVED IN LABORATORY

Sample I.D.	Sampling Depth (m mdrkb)	Opening Conditions		Bubblepoint Conditions		Approximate Sample Volume (cc)	Water Recovered
		psig	°C	psig	°C		
AA162	2206.0	0	16	N/A	N/A	Empty	-
AA192	2392.2	0	16	N/A	N/A	Empty	-
AA160	2527.5	0	16	N/A	N/A	Empty	-
DA-16*	2548.6	105	16	2544	103	100	250

* Sample was heated to 140 °F and stabilised at 5700 psig for 3 days prior to transfer to a laboratory cylinder

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Cylinder # MRSC-DA-16

Component	Mol %	Weight %
Hydrogen Sulfide	0.00	0.00
Carbon Dioxide	4.54	1.70
Nitrogen	1.89	0.45
Methane	31.67	4.31
Ethane	4.07	1.04
Propane	3.81	1.43
Iso-Butane	0.88	0.43
N-Butane	2.05	1.01
Iso-Pentane	0.98	0.60
N-Pentane	1.21	0.74
Hexanes	1.84	1.31
Heptanes	3.32	2.70
Octanes	4.65	4.22
Nonanes	3.31	3.39
Decanes	2.59	2.94
Undecanes	2.02	2.52
Dodecanes Plus	31.17	71.21
Total	100.00	100.00

Properties of Heptanes Plus

°API Gravity at 60 °F 38.7
Density, gm/cc at 60 °F 0.8307
Molecular Weight 218

Properties of Dodecanes Plus

°API Gravity at 60 °F 35
Density, gm/cc at 60 °F 0.8488
Molecular Weight 269

Average Total Molecular Weight of Sample = 117.91

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Flash to Stock Tank of Sample from MRSC-DA-16

Flash Conditions		Gas/Oil Ratio (scf/bbl) (A)	Gas/Oil Ratio (scf/STbbl) (B)	Stock Tank Oil Gravity at 60 °F (°API)	Liquid Shrinkage Factor (C)	Specific Gravity of Flashed Gas (Air=1.000)	Oil Phase Density (gm/cc)
psig	°F						
3707	217				.7641		
0	86	483	489	40.1	.9869	0.921	0.8132
			Rsfb = 489				

Physical Properties of Stock Tank Oil

Pour Point (ASTM D97) 24.0°C
 Wax Content (UOP-A-46) 24.57%

(A) Cubic Feet of gas at 14.696 psia and 60 °F per barrel of oil at indicated pressure and temperature.

(B) Cubic Feet of gas at 14.696 psia and 60 °F per barrel of stock tank oil at 60 °F.

(C) Barrels of stock tank oil at 60 °F per barrel of oil at indicated pressure and temperature.

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VOLUMETRIC DATA

(at 217 °F)

Saturation Pressure (Psat)	2542	psig
Density at Psat	0.6949	gm/cc
Thermal Exp @ 5000 psig	1.08542	V at 217 °F / V at 60 °F

AVERAGE SINGLE-PHASE COMPRESSIBILITIES

Pressure Range psig	Single-Phase Compressibility v/v/psi
------------------------	--

5000	to	4500	10.07 E -6
4500	to	3707	11.01 E -6
3707	to	3000	12.08 E -6
3000	to	2542	12.99 E -6

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PRESSURE-VOLUME RELATIONS

(at 217 °F)

Pressure psig	Relative Volume (A)	Y-Function (B)	Density gm/cc	Instantaneous Compressibility v/v/psi (C)
5000	0.9722		0.7148	9.69 E -6
4500	0.9771		0.7112	10.40 E -6
4000	0.9824		0.7074	11.11 E -6
r»3707	0.9857		0.7050	11.52 E -6
3500	0.9881		0.7033	11.81 E -6
3000	0.9941		0.6991	12.55 E -6
2800	0.9966		0.6973	12.89 E -6
2600	0.9992		0.6955	13.29 E -6
b»2542	1.0000		0.6949	
2535	1.0008			
2523	1.0023			
2511	1.0038			
2498	1.0054			
2473	1.0087			
2408	1.0175			
2285	1.0360	3.102		
2091	1.0715	2.995		
1865	1.1254	2.872		
1631	1.2018	2.743		
1429	1.2928	2.633		
1224	1.4222	2.520		
1042	1.5864	2.421		
873	1.8076	2.328		
708	2.1342	2.238		
519	2.7763	2.134		

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

(B) Where: Y-Function $(P_{sat} - P) / [(P_{abs}) * (V/V_{sat} - 1)]$

(C) Where: Instantaneous Compressibility = $-dV / dP$

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Flashed Oil - Relative Ratio Data (* = nC13)

Ratio of Components	Relative Ratio Data
nC6/*	0.72
MCP/nC7	0.64
CH/nC7	1.05
nC7/*	0.73
MCH/NC8	2.76
Toluene/nC8	1.64
nC8/*	0.63
Ethyl BZ/nC9	0.17
P&M Xylene/nC9	1.46
O-Xylene/nC9	0.38
nC9/*	0.71
i-Propyl BZ/nC10	0.04
n-Propyl BZ/nC10	0.11
1,2,4 Trimethyl BZ/nC10	0.45
nC10/*	0.79
IM3 Propyl BZ/nC11	0.14
Butyl BZ/nC11	0.07
1,3, Dim 4 ET BZ/nC11	0.17
nC11/*	0.87
nC12/*	0.90
nC13/*	1.00
Farnesane/nC14	0.27
nC14/*	1.12
nC15/*	1.17
nC16/*	1.17
nC17/*	1.30
Pristane/nC17	0.87
nC18/*	1.35
Pytane/nC18	0.24
nC19/*	1.39
nC20/*	1.46
nC21/*	1.61
nC22*	1.50
nC23/*	1.30
nC24/*	1.15
nC25/*	1.23
nC26/*	0.86
nC27/*	0.80
nC28/*	0.57
nC29/*	0.46
nC30/*	0.29

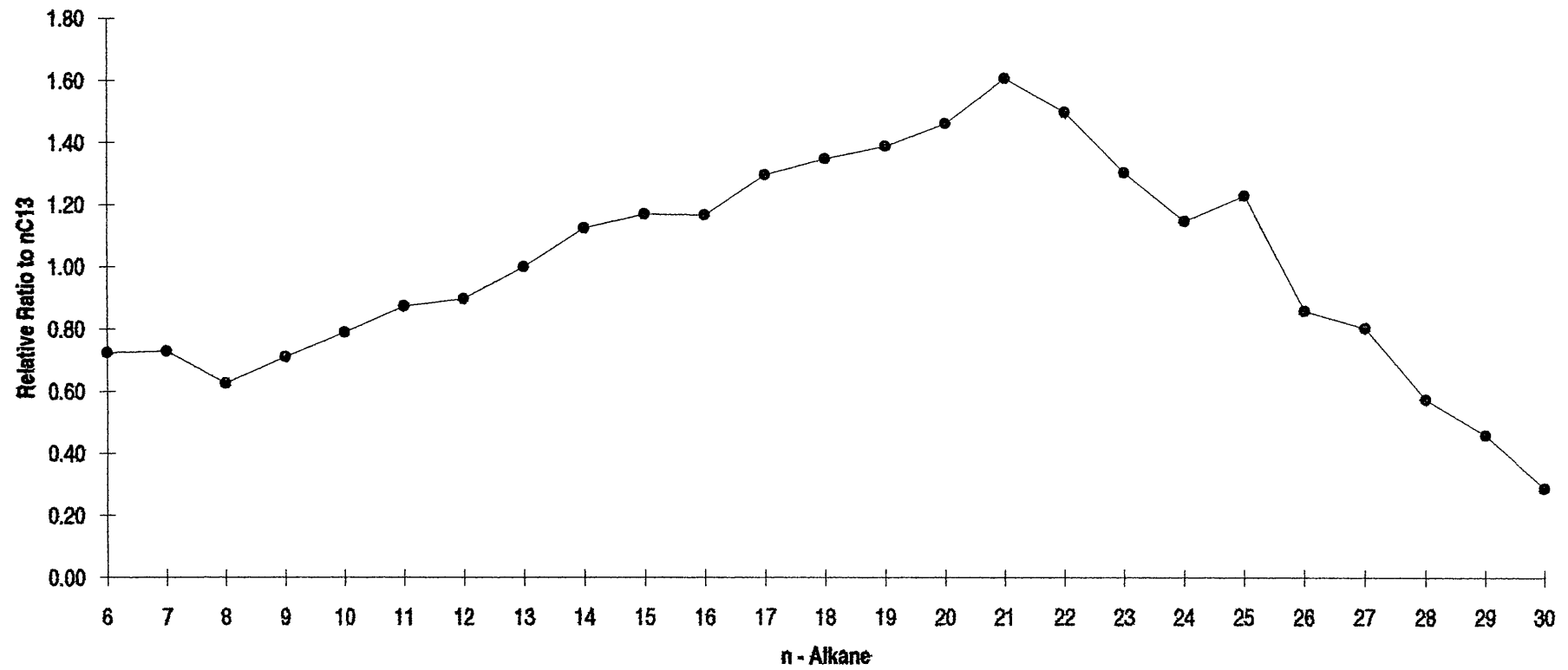
1

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FINGERPRINT DATA OF STOCK TANK OIL FROM FLASH

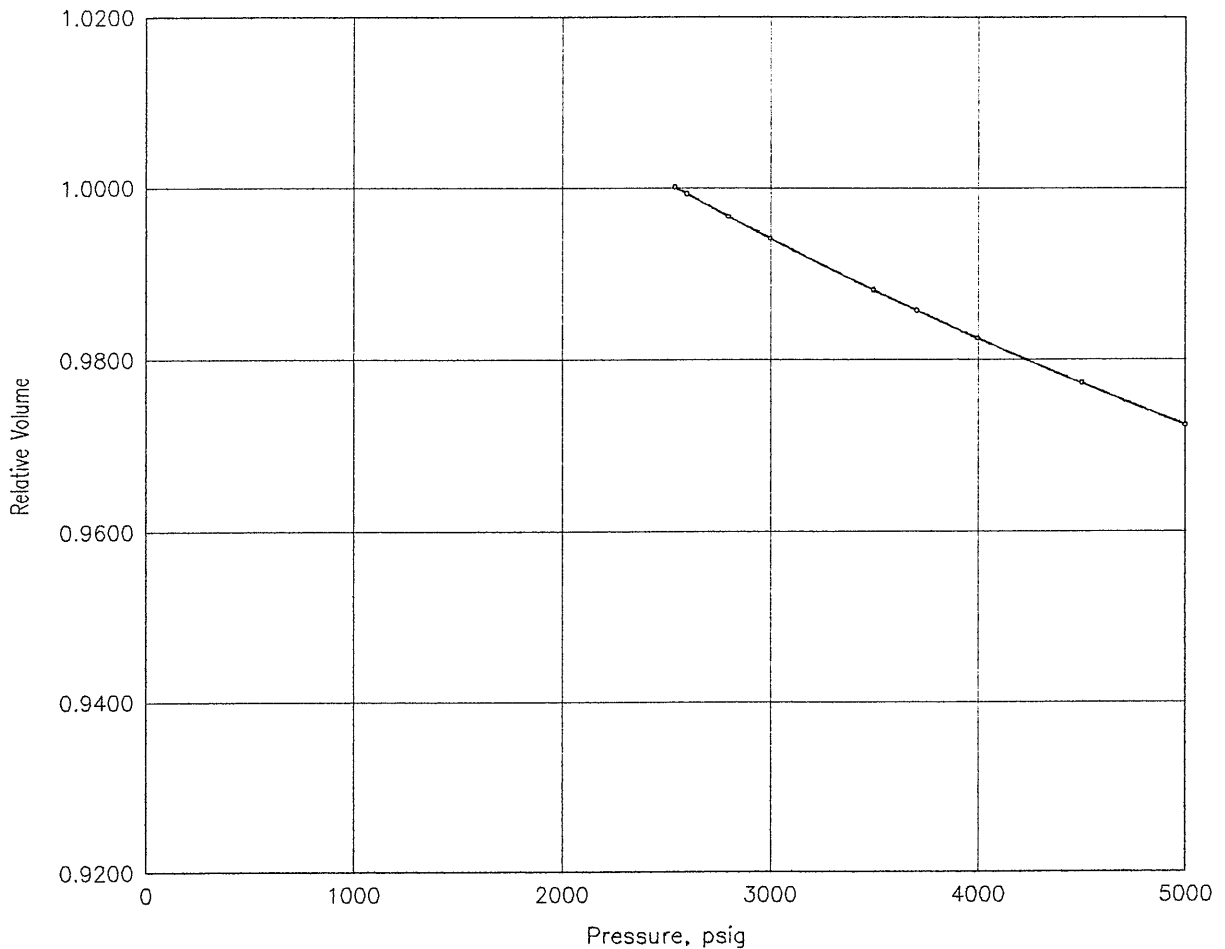


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RELATIVE VOLUME
(at 217 °F)



<p>Relative Volume Expression:</p> $y = a + b (X_d)^i + c (X_d)^j + d \log(X_d)^k$	<p>LEGEND</p> <p>○ Laboratory Data</p> <p>--- Confidence Limits</p> <p>— Analytical Expression</p> <p>Saturation Pressure: 2542 psig</p> <p>Current Reservoir Pressure: 3707 psig</p>								
<p>where:</p> <table> <tr> <td>a= 1.05549e+ 00</td> <td>i= 0.700</td> </tr> <tr> <td>b= -5.91071e- 02</td> <td>j= 2.000</td> </tr> <tr> <td>c= 3.61897e- 03</td> <td>k= 2.500</td> </tr> <tr> <td>d= -5.01050e- 02</td> <td></td> </tr> </table> <p>Note: X_d (dimensionless 'X') = P_i / P_{sat}, psig</p>	a= 1.05549e+ 00	i= 0.700	b= -5.91071e- 02	j= 2.000	c= 3.61897e- 03	k= 2.500	d= -5.01050e- 02		
a= 1.05549e+ 00	i= 0.700								
b= -5.91071e- 02	j= 2.000								
c= 3.61897e- 03	k= 2.500								
d= -5.01050e- 02									
<p>Confidence level: 99 %</p> <p>Confidence interval: +/- 0.00001</p> <p>'r squared': .999999</p>	<p>Pressure-Volume Relations</p> <p>Figure A-1</p>								

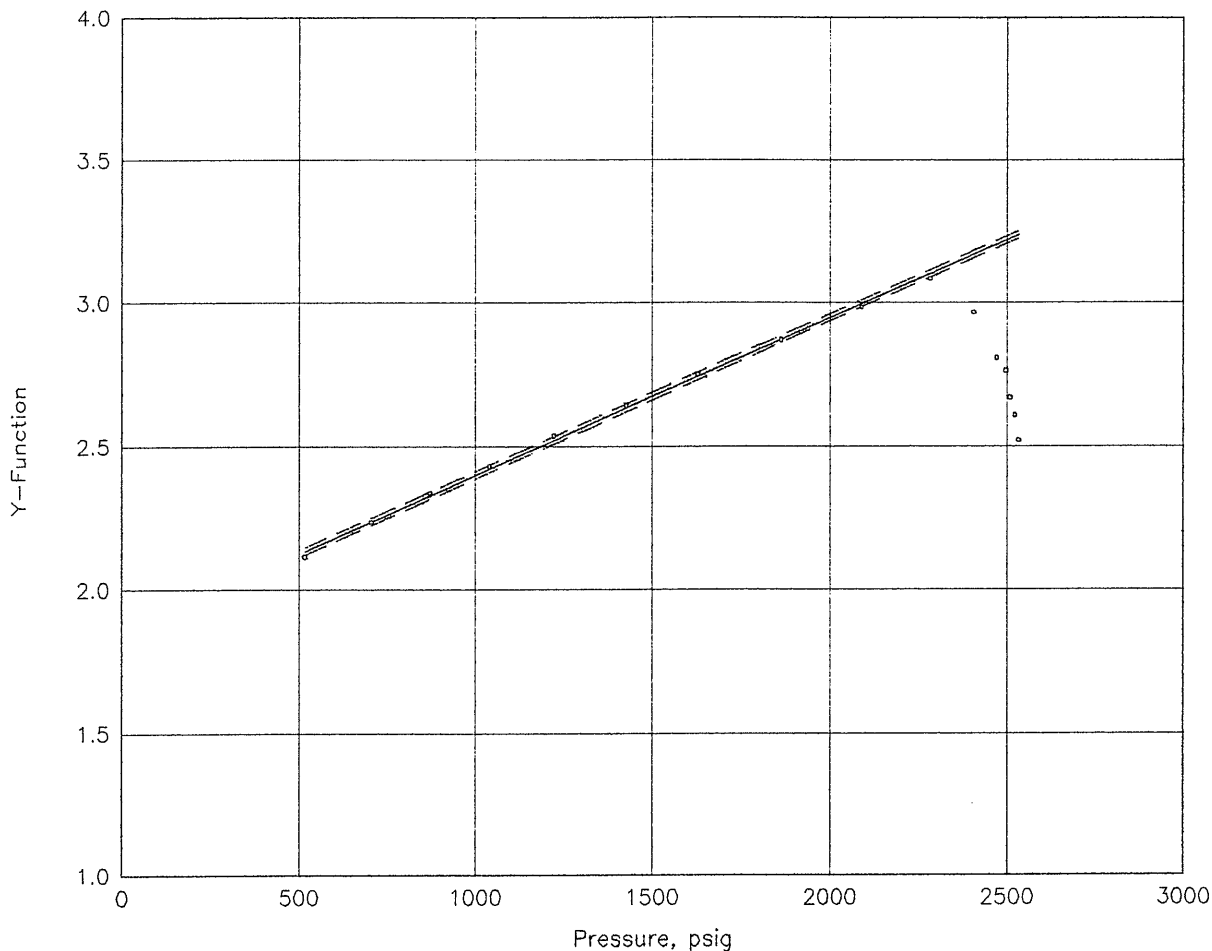
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Y-FUNCTION
(at 217 °F)



<p>Y-Function Expression: $y = a + b (X_d)^{-i}$</p>	<p>LEGEND</p>
<p>where: a= 1.84955e+ 00 i= 1.000 b= 1.39299e+ 00</p> <p>Note: X_d (dimensionless 'X') = P_i / P_{sat}, psig</p>	<p>○ Laboratory Data - - - Confidence Limits — Analytical Expression</p> <p>Saturation Pressure: 2542 psig Current Reservoir Pressure: 3707 psig</p>
<p>Confidence level: 99 % Confidence interval: +/- 0.01288 'r squared': .999256</p>	<p>Pressure-Volume Relations Figure A-2</p>

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APPENDIX

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CHART SPEED 0.6 CM/MIN
ATTEN: 64 ZERO: 10%

Chromatogram of Stock Tank Oil
from Flash

