



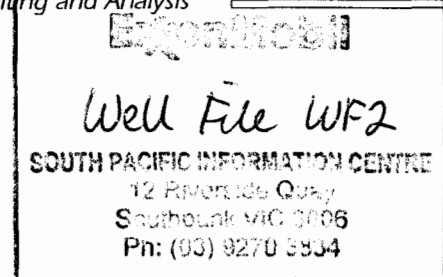
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Esso Australia Limited
G. P. O. Box 400C
Melbourne
VIC 3001

Subject: PVT Study
Well : WMoonfish # 1
File : E - 25004

Attention: Mr. Peter Larden

Dear Sirs,

In January 2005, four MDT bottom hole samples collected from two different depths by Schlumberger, were received in our Adelaide laboratory to be used in a PVT study. The results of this study are presented in the following report.

Upon arrival, the contents of the MPSR chambers were transferred, in single phase, into laboratory storage cylinders.

Subsequent validity checks on the bottom hole samples consisted out of compositional analyses on the two gas condensate and bubble point determinations at room temperature on the two black oil reservoir fluid samples. The composition of the most representative oil sample was thereupon determined.

The compositions of the bottom hole reservoir fluids were determined by flashing the samples under atmospheric conditions into two phases. Through measurements of densities, molecular weights, quantities produced and compositions of the evolved stock tank gases and liquids from the flash experiments, we were able to mathematically recombine these products into the desired fluid compositions. The reservoir fluid compositions were extended to C-12+ by means of Capillary Column Chromatography.

Saturation pressure measurements on the most representative gas condensate and oil reservoir fluids at the reservoir temperature of 94 °C indicated that both, the oil and the gas samples were supersaturated and sampled close to or inside the transition zone. Even though the measured dew point pressure of 3312 psig @ 94 °C of the gas condensate reservoir fluid was 447 psig above the reservoir pressure, this fluid is considered to be still quite representative since the amount of retrograde drop out at the reservoir pressure was negligible.

The measured bubble point of 4380 psig @ 94 °C of the oil reservoir fluid however indicated that an excess of gas was sampled and for the determination of PVT properties of this zone we adjusted the reservoir fluid to be saturated at the reservoir pressure of 2865 psig.

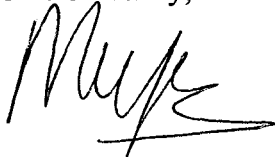
The adjusted oil reservoir fluid was then introduced into a high pressure PVT cell and thermally expanded to the reservoir temperature of 201 °F. During a constant composition expansion at this temperature, the bubble point of 2865 psig was confirmed. Other data obtained during this pressure - volume relations experiment, include relative volume versus pressure, oil thermal expansion and compressibility above bubble point and calculated Y- function below it.

The viscosity of the oil phase of the reservoir fluid was determined in a rolling ball viscosimeter during pressure depletion at the reservoir temperature of 2865 °F. The viscosity of the fluid was found to vary from a minimum of 0.52 centipoise at the bubble point to a maximum of 1.72 centipoise at atmospheric pressure.

A single stage separator tests was performed to determine the effects of separator pressure and temperature upon gas - oil ratio, stock tank oil gravity and formation volume factor.

We thank Esso Australia Limited for the opportunity to be of service. Please do not hesitate in contacting us should you require any further information or if we can assist you in any other way.

Yours Sincerely,

A handwritten signature in black ink, appearing to read 'Jan G. Bon', with a long horizontal flourish extending to the right.

p.p. Jan G. Bon
Manager



Company : Esso Australia Limited
Well : West Moonfish # 1

File : E - 25004

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SUMMARY OF RESULTS

CONSTANT MASS DATA :

Reservoir Temperature (°F)	:	201.2
Saturation Pressure (psig)	:	2865
Thermal Expansion of Saturated Oil		
@ 201 °F AND 2865 PSIG (*10 ⁴ /°F)	:	6.39
(*10 ⁴ /°C)	:	11.50
Compressibility of Saturated Oil		
@ 201 °F AND 2865 PSIG (*10 ⁶ /psi)	:	10.63

SATURATED OIL @ 201 °F AND 2865 PSIG :

Oil density (gm/cc)	:	0.7094
Specific Volume (ft ³ /lb)	:	0.0226
Viscosity (cp)	:	0.52

RESIDUAL OIL :

Oil density (gm/cc) @ 60 °F	:	0.8416
API Gravity @ 60 °F	:	36.5
Density @ 201 °F (gm/cc)	:	0.7912
Kinematic Viscosity @ 201 °F (cSt)	:	2.18
Viscosity @ 201 °F (cP)	:	1.72

FLASH DATA :

1st Separator Pressure (psig)	:	233
1st Separator Temperature (°F)	:	171
2nd Separator Pressure (psig)	:	--
2nd Separator Temperature (°F)	:	--
Stock Tank Pressure (psig)	:	0
Stock Tank Temperature (°F)	:	70
Oil Volume Factor (rbbl/stbbl)	:	1.332
1st Separator GOR (scf/bbl)	:	544
2nd Separator GOR (scf/bbl)	:	--
Stock Tank GOR (scf/bbl)	:	49
Total GOR (scf/bbl)	:	593
1st Separator Gas Gravity (Air=1)	:	0.809
2nd Separator Gas Gravity (Air=1)	:	--
Stock Tank Gas Gravity (Air=1)	:	1.121
Stock Tank Oil Density (gm/cc)	:	0.8369
Stock Tank Oil Gravity (°API)	:	37.4

SATURATED OIL @ 201 °F AND 2865 PSIG :

Solution GOR (SCF/Bbl)	:	Rs	544
Formation Volume Factor (Resbbl/STbbl)	:	Bo	1.3320



Company : Esso Australia Limited
 Well : West Moonfish # 1

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 File : E - 25004

FIELD CHARACTERISTICS:

Field Name	: West Moonfish
Formation Name	: Latrobe Group (L-balmei)
Date first well completed	: n/a (West Moonfish 1 P&A'd Feb 2005)
Original reservoir pressure (psia)	: 2880
@ datum (m TVDss)	: 2050 (2121 mMDRT)
Liquid gravity (°API @ 60 °F)	:

WELL CHARACTERISTICS:

Depth datum (m TVDss)	: 2050 (2121 mMDRT)
Kelly Bushing (m)	: 39.2
Total depth (m TVDss)	: 3329.8 (3369 mMDRT)
Perforated interval	: n/a
Tubing size	: n/a
Tubing shoe	: n/a
Reservoir temperature (°F)	: 201
Last reservoir pressure (psia)	: 2880
@ datum (m TVDss)	: 2050 (2121 mMDRT)
date	: February, 2005
Status of well	: P & A

TRANSFER DETAILS OF MDT BOTTOM HOLE SAMPLES:

Transferred on January 26, 2005
 @ 5000 psig & 86 °F

Sample Number	MPSR Number	Depth Sampled (mMD)	Opening Pressure (psig)	Sample Volume Transferred (ccs)	Transferred into Petrolab Cylinder Number
1	0113	2106.0	3800	380	L - 194
2	0123	2106.0	4000	385	L - 183
3	0066	2121.0	3000	390	L - 079
4	0122	2121.0	1400	400	L - 193



Bottom Hole Samples Validity Check in Laboratory

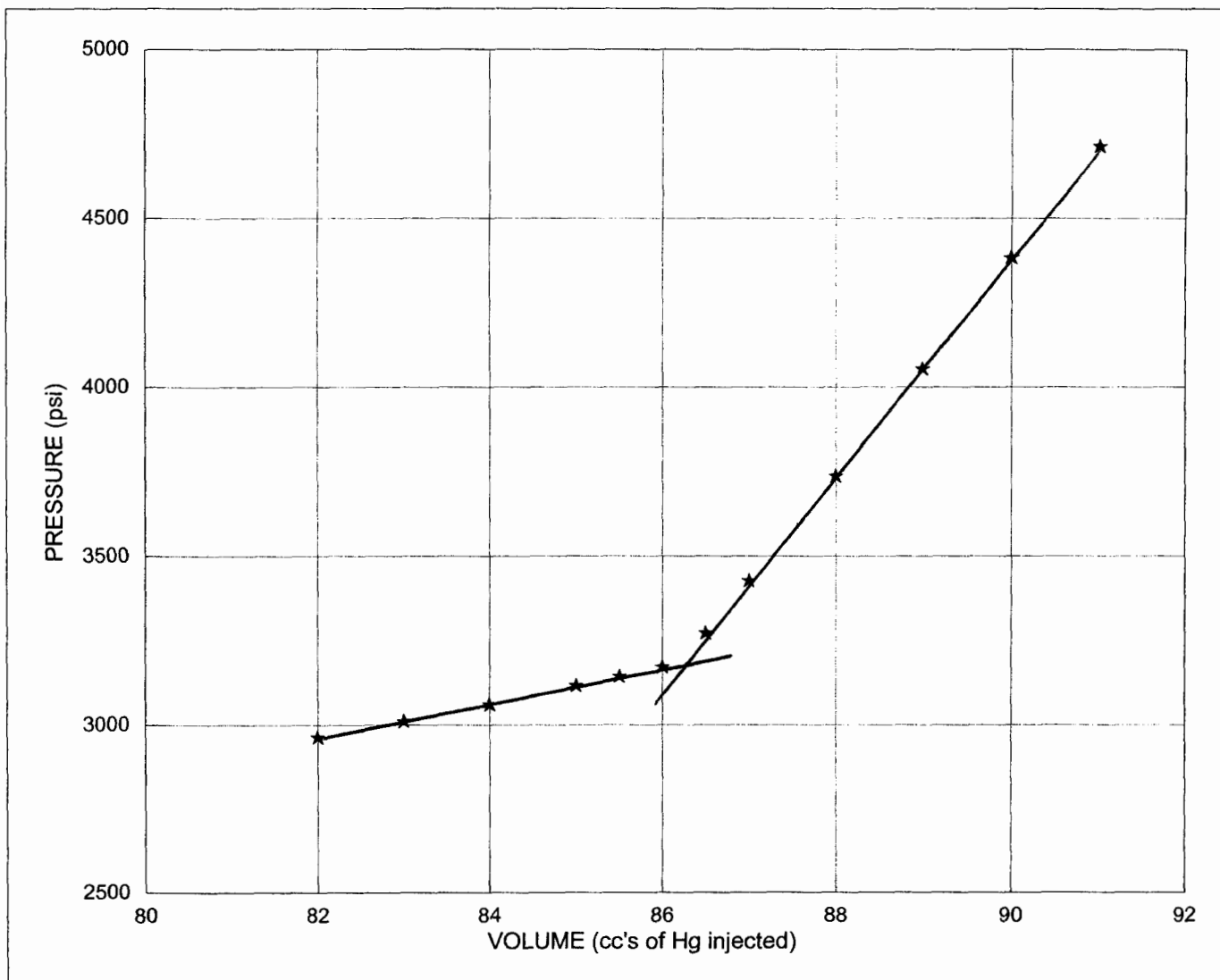
Saturation Pressure : 3180 psig @ 86 ° F

Bottom Hole Sample # 3

Sampling Conditions

Date sampled	:	January, 2005
Depth sampled (mSS)	:	2121.0
Reservoir Pressure (psig)	:	2865.0
Reservoir Temperature (°F)	:	201.2
Tool	:	MDT
Chamber #	:	MPSR 0066
Opening Pressure (psig)	:	3000
Transfer Pressure (psig)	:	5000
Transferred to storage cylinder No. :		L - 079

Volume (cc's)	Pressure (psi)
82.00	2964
83.00	3012
84.00	3061
85.00	3117
85.50	3145
86.00	3173
86.50	3273
87.00	3428
88.00	3736
89.00	4054
90.00	4385
91.00	4715





Bottom Hole Samples Validity Check in Laboratory

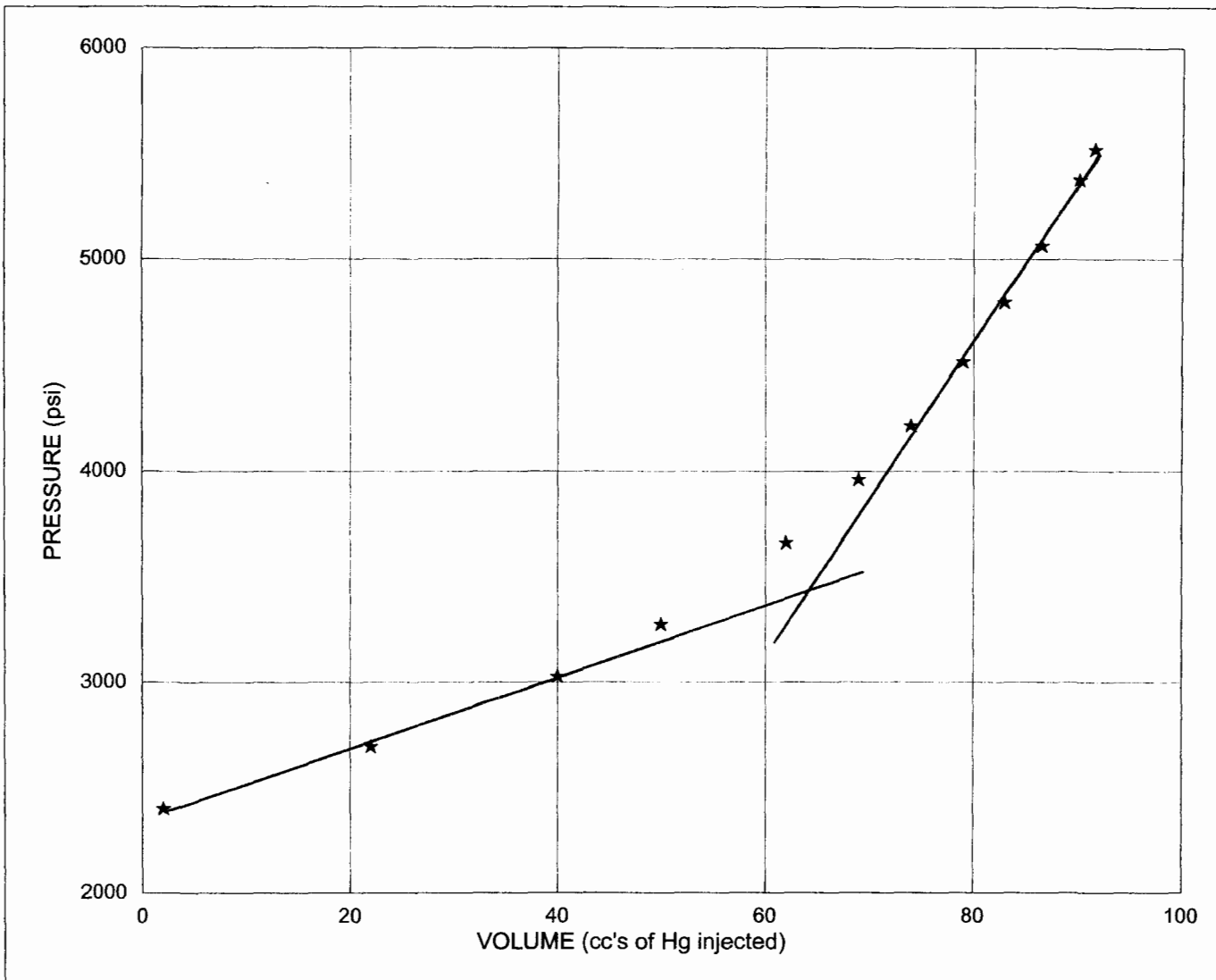
Saturation Pressure : -- psig @ 86 ° F
No Saturation Pressure - Sampled with Gas Cap

Bottom Hole Sample # 4

Sampling Conditions

Date sampled	:	January, 2005
Depth sampled (mSS)	:	2121
Reservoir Pressure (psig)	:	2865
Reservoir Temperature (°F)	:	201.2
Tool	:	MDT
Chamber #	:	MPSR 0122
Opening Pressure (psig)	:	1400
Transfer Pressure (psig)	:	5000
Transferred to storage cylinder No. :	:	L - 193

Volume (cc's)	Pressure (psi)
2.00	2401
22.00	2696
40.00	3028
50.00	3277
62.00	3663
69.00	3961
74.00	4214
79.00	4517
83.00	4798
86.50	5064
90.00	5378
91.50	5523





Bottom Hole Samples Validity Check in Laboratory

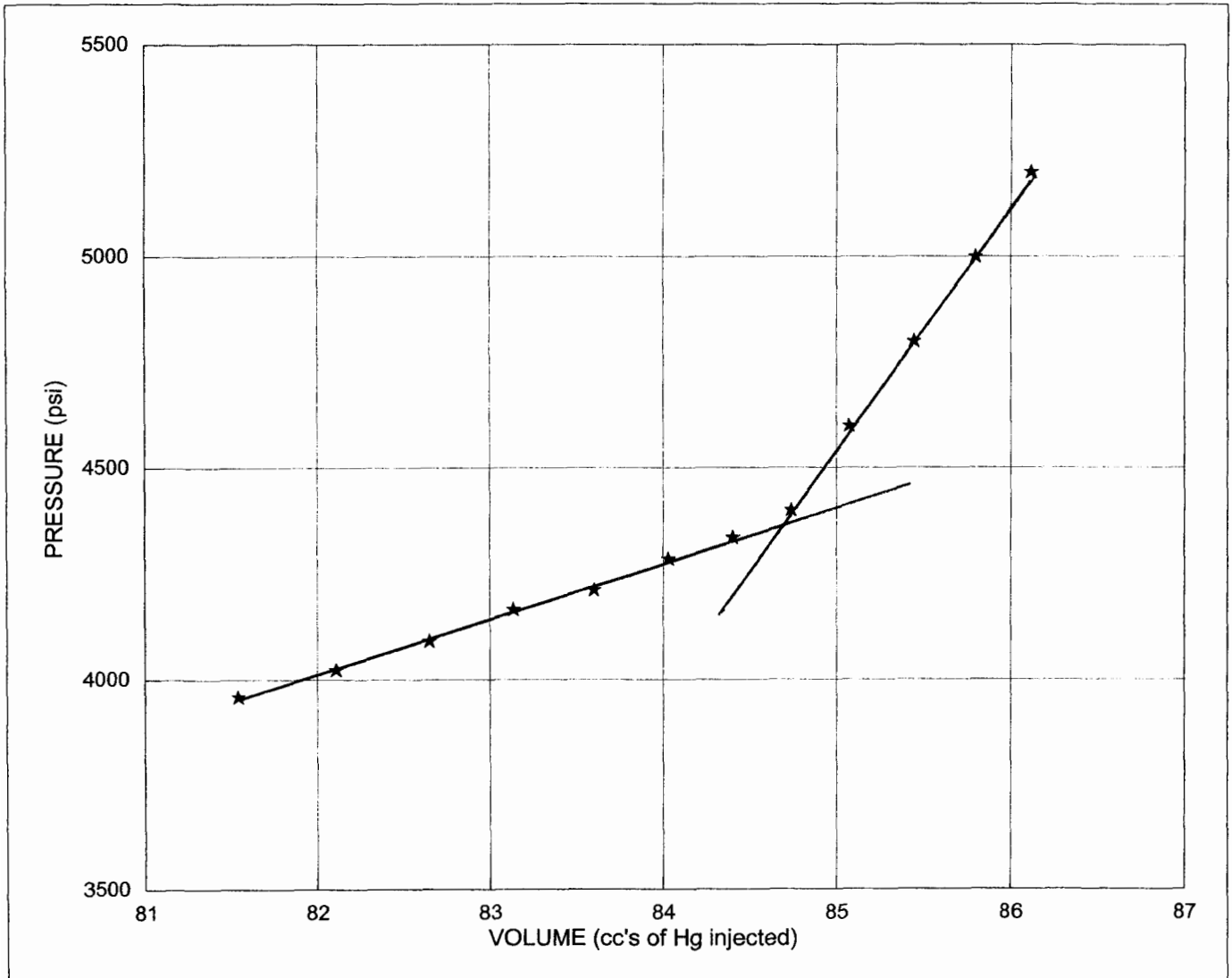
Saturation Pressure : 4380 psig @ 94 °C

Bottom Hole Sample # 3

Sampling Conditions

Date sampled	:	January, 2005
Depth sampled (mSS)	:	2121.0
Reservoir Pressure (psig)	:	2865.0
Reservoir Temperature (°F)	:	201.2
Tool	:	MDT
Chamber #	:	MPSR 0066
Opening Pressure (psig)	:	3000
Transfer Pressure (psig)	:	5000
Transferred to storage cylinder No:	:	L - 079

Volume (cc's)	Pressure (psi)
81.54	3960
82.11	4024
82.65	4092
83.13	4166
83.60	4212
84.03	4285
84.40	4335
84.73	4400
85.07	4600
85.45	4800
85.80	5000
86.11	5200





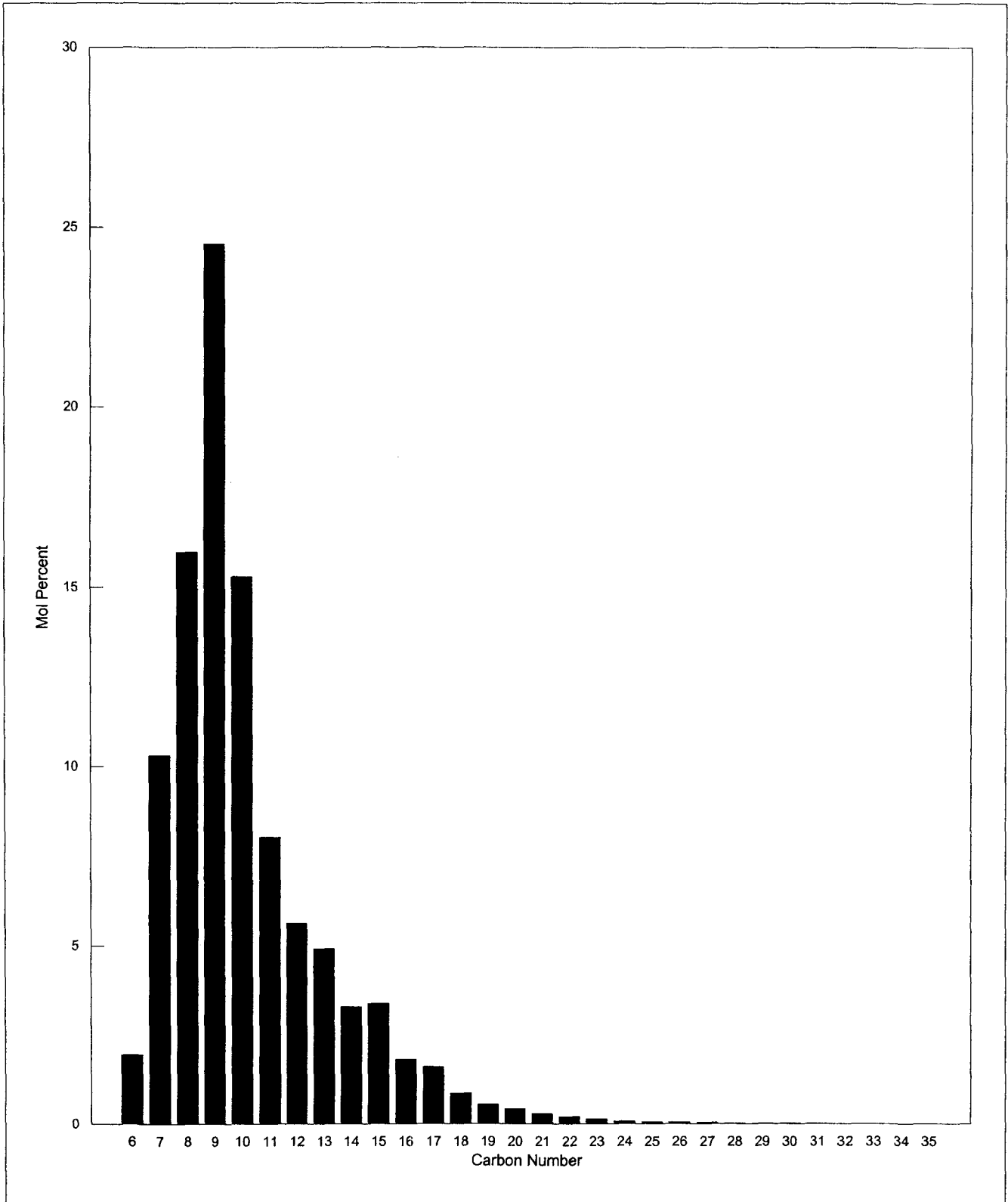
FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
On Stock Tank Oil from atmospheric flash of sample in cylinder # L-194

Component	Mol %
Hexanes minus	C6- 0.53
Hexanes	C6 1.95
Heptanes	C7 10.30
Octanes	C8 15.97
Nonanes	C9 24.54
Decanes	C10 15.29
Undecanes	C11 8.03
Dodecanes	C12 5.63
Tridecanes	C13 4.92
Tetradecanes	C14 3.29
Pentadecanes	C15 3.38
Hexadecanes	C16 1.81
Heptadecanes	C17 1.61
Octadecanes	C18 0.86
Nonadecanes	C19 0.55
Eicosanes	C20 0.42
Heneicosanes	C21 0.29
Docosanes	C22 0.20
Tricosanes	C23 0.13
Tetracosanes	C24 0.08
Pentacosanes	C25 0.06
Hexacosanes	C26 0.05
Heptacosanes	C27 0.04
Octacosanes	C28 0.02
Nonacosanes	C29 0.02
Triacotanes	C30 0.02
Hentriacotanes	C31 0.01
Dotriacotanes	C32 0.00
Tritriacotanes	C33 0.00
Tetratriacontanes	C34 0.00
Pentatriacontanes Plus	C35+ 0.00
TOTAL	100.00

Molecular Weight Calculated *	:	138.3
Density @ 60 °F Calculated *	:	0.7807
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.7807

*Calculation based on generalized properties as published by Katz and Firoozabadi

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
On Stock Tank Oil from atmospheric flash of sample in cylinder # L-194



COMPOSITIONAL ANALYSIS OF BOTTOM HOLE RESERVOIR FLUID

Cylinder # L-194 ex MPSR Chamber 0113

Component	Stock Tank		Reservoir
	Liquid	Gas	Fluid
	Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S 0.00	0.00	0.00
Carbon Dioxide	CO2 0.18	12.32	12.28
Nitrogen	N2 0.00	0.08	0.08
Methane	C1 0.46	78.70	78.43
Ethane	C2 0.18	5.09	5.07
Propane	C3 0.20	1.57	1.57
Iso-Butane	iC4 0.08	0.26	0.26
N-Butane	nC4 0.21	0.44	0.44
Iso-Pentane	iC5 0.19	0.15	0.15
N-Pentane	nC5 0.24	0.15	0.15
Hexanes	C6 1.93	0.23	0.24
Heptanes	C7 10.17	0.37	0.40
Octanes	C8 15.78	0.29	0.34
Nonanes	C9 24.24	0.26	0.34
Decanes	C10 15.10	0.08	0.13
Undecanes	C11 7.93	0.01	0.04
Dodecanes Plus	C12+ 23.10	0.00	0.08
TOTAL	100.00	100.00	100.00

Ratios

Molar Ratio	:	0.0035	0.9965	1.0000
Mass Ratio	:	0.0211	0.9789	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	—	-- @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	217051 SCF	--

Stream Properties

Molecular Weight	:	136.1	22.21	22.6
Density obs. (gm/cc)	:	0.7795 @ 60 °F	—	-- @ PT*
Gravity (AIR = 1.000)	:	49.8 °API @ 60 °F	0.769	—
GHV (BTU/scf)	:	—	1036	—

Hexanes Plus Properties

Mol %	:	98.26	1.24	1.57
Molecular Weight	:	137.8	104.5	111.7
Density (gm/cc @ 60 °F)	:	0.7816	0.6949	0.7162
Gravity (°API @ 60 °F)	:	49.4	71.9	65.9

Heptanes Plus Properties

Mol %	:	96.33	1.01	1.33
Molecular Weight	:	138.8	109.1	116.6
Density (gm/cc @ 60 °F)	:	0.7829	0.7006	0.7233
Gravity (°API @ 60 °F)	:	49.1	70.3	63.9

Decanes Plus Properties

Mol %	:	46.14	0.09	0.25
Molecular Weight	:	168.5	135.4	156.2
Density (gm/cc @ 60 °F)	:	0.8080	0.7292	0.7816
Gravity (°API @ 60 °F)	:	43.5	62.4	49.4

Undecanes Plus Properties

Mol %	:	31.03	0.01	0.12
Molecular Weight	:	185.4	146.9	182.1
Density (gm/cc @ 60 °F)	:	0.8191	0.7399	0.8132
Gravity (°API @ 60 °F)	:	41.1	59.6	42.3

Dodecanes Plus Properties

Mol %	:	23.10	0.00	0.08
Molecular Weight	:	198.5	—	198.5
Density (gm/cc @ 60 °F)	:	0.8271	—	0.8271
Gravity (°API @ 60 °F)	:	39.4	—	39.4

* (P)ressure : 2865 psig * (T)emperature : 201 °F

Measured Dew Point Pressure @ 94 °C = 3312 psig

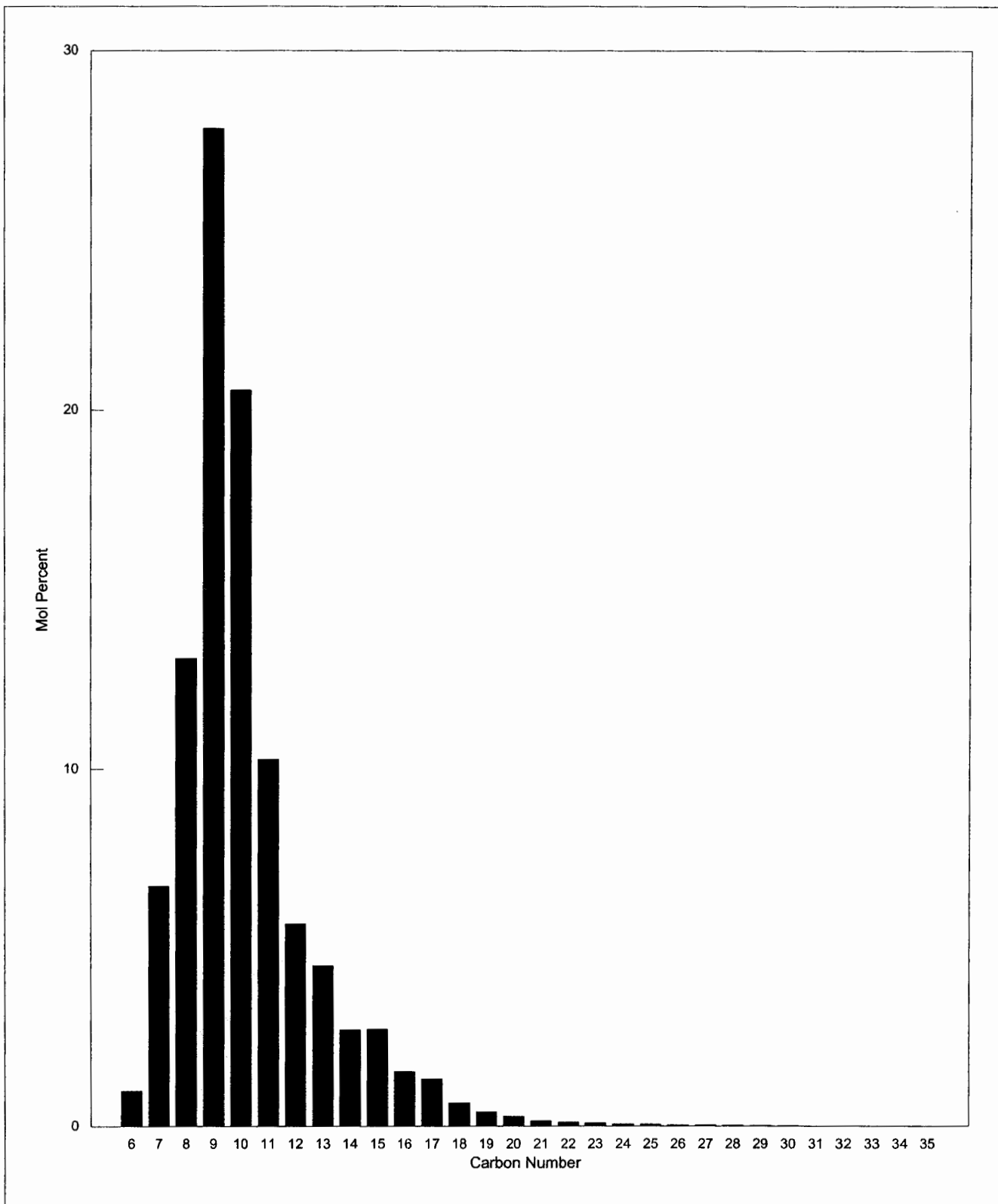
**FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
On Stock Tank Oil from atmospheric flash of sample in cylinder # L-183**

Component	Mol %
Hexanes minus	C6- 0.20
Hexanes	C6 0.99
Heptanes	C7 6.73
Octanes	C8 13.08
Nonanes	C9 27.84
Decanes	C10 20.56
Undecanes	C11 10.27
Dodecanes	C12 5.68
Tridecanes	C13 4.50
Tetradecanes	C14 2.70
Pentadecanes	C15 2.71
Hexadecanes	C16 1.53
Heptadecanes	C17 1.32
Octadecanes	C18 0.65
Nonadecanes	C19 0.40
Eicosanes	C20 0.27
Heneicosanes	C21 0.15
Docosanes	C22 0.11
Tricosanes	C23 0.09
Tetracosanes	C24 0.06
Pentacosanes	C25 0.05
Hexacosanes	C26 0.03
Heptacosanes	C27 0.03
Octacosanes	C28 0.02
Nonacosanes	C29 0.02
Triacontanes	C30 0.01
Hentriacontanes	C31 0.00
Dotriacontanes	C32 0.00
Tritriacontanes	C33 0.00
Tetracontanes	C34 0.00
Pentatriacontanes Plus	C35+ 0.00
TOTAL	100.00

Molecular Weight Calculated *	:	138.2
Density @ 60 °F Calculated *	:	0.7810
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.7810

*Calculation based on generalized properties as published by Katz and Firoozabadi

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
On Stock Tank Oil from atmospheric flash of sample in cylinder # L-183



COMPOSITIONAL ANALYSIS OF BOTTOM HOLE RESERVOIR FLUID

Cylinder # L-183 ex MPSR Chamber 0123

Component		Stock Tank	Stock Tank	Reservoir
		Liquid Mol %	Gas Mol %	Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.19	12.46	12.42
Nitrogen	N2	0.00	0.07	0.07
Methane	C1	0.46	78.62	78.34
Ethane	C2	0.18	5.15	5.13
Propane	C3	0.21	1.63	1.62
Iso-Butane	iC4	0.08	0.25	0.25
N-Butane	nC4	0.19	0.40	0.40
Iso-Pentane	iC5	0.16	0.13	0.13
N-Pentane	nC5	0.21	0.13	0.13
Hexanes	C6	0.98	0.21	0.21
Heptanes	C7	6.63	0.34	0.36
Octanes	C8	12.89	0.28	0.33
Nonanes	C9	27.43	0.27	0.37
Decanes	C10	20.26	0.06	0.13
Undecanes	C11	10.12	0.00	0.04
Dodecanes Plus	C12+	20.03	0.00	0.07
TOTAL		100.00	100.00	100.00

Ratios

Molar Ratio	:	0.0036	0.9964	1.0000
Mass Ratio	:	0.0218	0.9782	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	-- @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	210174 SCF	--

Stream Properties

Molecular Weight	:	135.9	22.16	22.6
Density obs. (gm/cc)	:	0.7794 @ 60 °F	--	-- @ PT*
Gravity (AIR = 1.000)	:	49.9 °API @ 60 °F	0.767	--
GHV (BTU/scf)	:	--	1030	--

Hexanes Plus Properties

Mol %	:	98.32	1.16	1.51
Molecular Weight	:	137.4	104.3	112.1
Density (gm/cc @ 60 °F)	:	0.7814	0.6946	0.7176
Gravity (°API @ 60 °F)	:	49.4	72.0	65.5

Heptanes Plus Properties

Mol %	:	97.35	0.95	1.30
Molecular Weight	:	138.0	108.7	116.7
Density (gm/cc @ 60 °F)	:	0.7821	0.7002	0.7245
Gravity (°API @ 60 °F)	:	49.3	70.4	63.6

Decanes Plus Properties

Mol %	:	50.40	0.06	0.24
Molecular Weight	:	160.6	134.0	154.1
Density (gm/cc @ 60 °F)	:	0.8019	0.7278	0.7847
Gravity (°API @ 60 °F)	:	44.8	62.7	48.7

Undecanes Plus Properties

Mol %	:	30.15	0.00	0.11
Molecular Weight	:	178.5	--	178.5
Density (gm/cc @ 60 °F)	:	0.8144	--	0.8144
Gravity (°API @ 60 °F)	:	42.1	--	42.1

Dodecanes Plus Properties

Mol %	:	20.03	0.00	0.07
Molecular Weight	:	194.5	--	194.5
Density (gm/cc @ 60 °F)	:	0.8246	--	0.8246
Gravity (°API @ 60 °F)	:	39.9	--	39.9

* (P)ressure : 2865 psig * (T)emperature : 201 °F

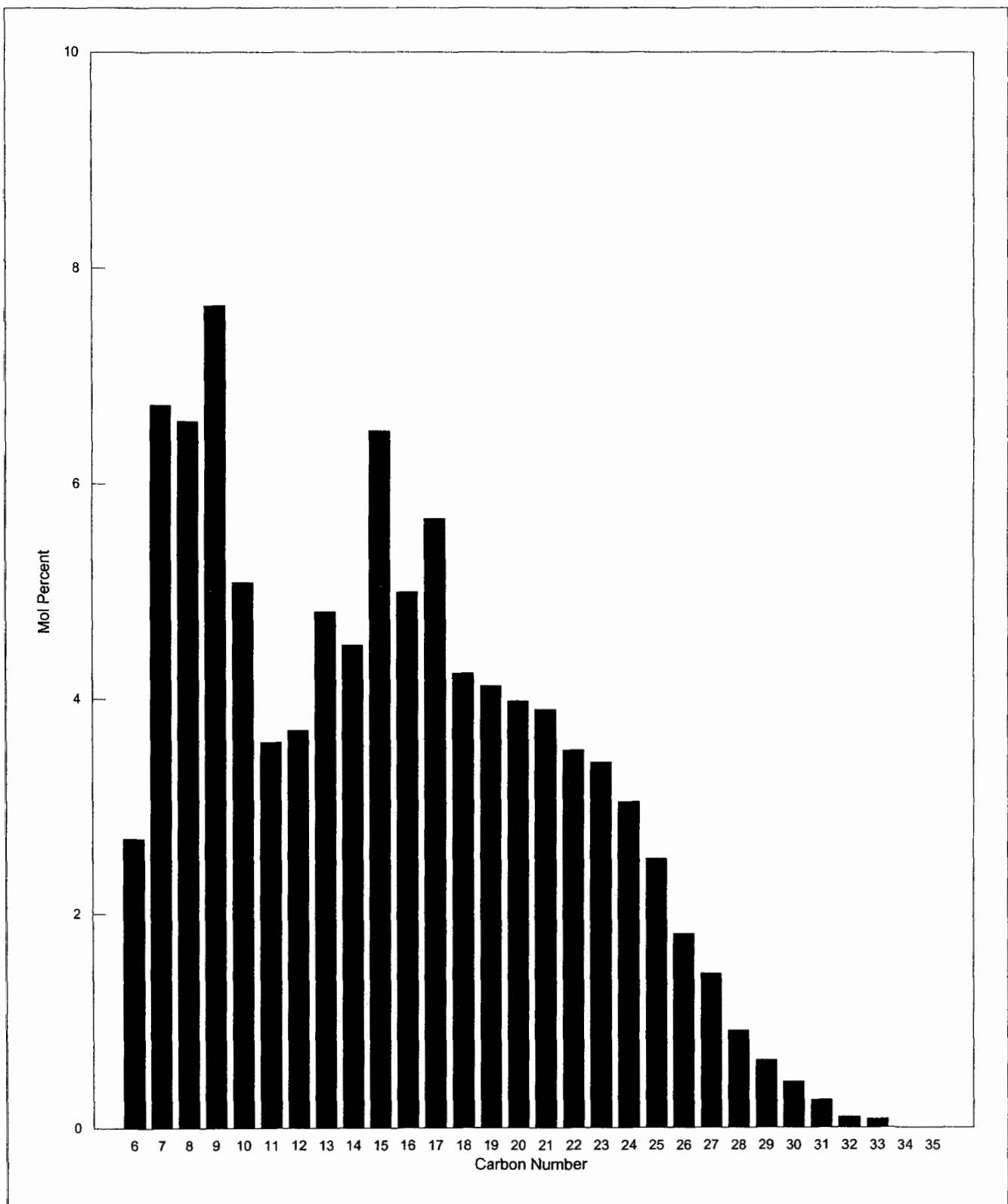
**FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
On Stock Tank Oil from atmospheric flash of sample in cylinder # L-079**

Component	Mol %
Hexanes minus	C6- 3.11
Hexanes	C6 2.70
Heptanes	C7 6.73
Octanes	C8 6.58
Nonanes	C9 7.65
Decanes	C10 5.08
Undecanes	C11 3.60
Dodecanes	C12 3.71
Tridecanes	C13 4.81
Tetradecanes	C14 4.50
Pentadecanes	C15 6.49
Hexadecanes	C16 4.99
Heptadecanes	C17 5.67
Octadecanes	C18 4.24
Nonadecanes	C19 4.12
Eicosanes	C20 3.98
Heneicosanes	C21 3.90
Docosanes	C22 3.52
Tricosanes	C23 3.41
Tetracosanes	C24 3.04
Pentacosanes	C25 2.51
Hexacosanes	C26 1.81
Heptacosanes	C27 1.44
Octacosanes	C28 0.91
Nonacosanes	C29 0.63
Triacontanes	C30 0.43
Hentriacontanes	C31 0.26
Dotriacontanes	C32 0.10
Tritriacontanes	C33 0.08
Tettratriacontanes	C34 0.00
Pentatriacontanes Plus	C35+ 0.00
TOTAL	100.00

Molecular Weight Calculated *	:	205.9
Density @ 60 °F Calculated *	:	0.8322
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.8418

*Calculation based on generalized properties as published by Katz and Firoozabadi

**FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY**
On Stock Tank Oil from atmospheric flash of sample in cylinder # L-079



COMPOSITIONAL ANALYSIS OF BOTTOM HOLE RESERVOIR FLUID

Cylinder # L-079 ex MPSR Chamber 0066

Component	Stock Tank		Reservoir
	Liquid	Gas	Fluid
	Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00
Carbon Dioxide	CO2	0.22	9.59
Nitrogen	N2	0.00	0.04
Methane	C1	0.40	44.26
Ethane	C2	0.26	4.97
Propane	C3	0.45	2.50
Iso-Butane	iC4	0.21	0.50
N-Butane	nC4	0.55	0.99
Iso-Pentane	iC5	0.49	0.45
N-Pentane	nC5	0.61	0.48
Hexanes	C6	2.70	1.27
Heptanes	C7	6.72	2.74
Octanes	C8	6.57	2.52
Nonanes	C9	7.64	2.84
Decanes	C10	5.08	1.87
Undecanes	C11	3.60	1.32
Dodecanes Plus	C12+	64.49	23.66
TOTAL		100.00	100.00

Ratios

Molar Ratio	:	0.3667	0.6333	1.0000
Mass Ratio	:	0.8289	0.1711	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	1.5205 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	932 SCF	--

Stream Properties

Molecular Weight	:	205.2	24.52	90.8
Density obs. (gm/cc)	:	0.8326 @ 60 °F	--	0.6611 @ PT*
Gravity (AIR = 1.000)	:	38.3 °API @ 60 °F	0.850	82.3
GHV (BTU/scf)	:	--	1093	--

Hexanes Plus Properties

Mol %	:	96.81	1.12	36.22
Molecular Weight	:	210.2	94.5	208.0
Density (gm/cc @ 60 °F)	:	0.8359	0.6817	0.8342
Gravity (°API @ 60 °F)	:	37.6	75.9	38.0

Heptanes Plus Properties

Mol %	:	94.10	0.67	34.95
Molecular Weight	:	213.8	101.6	212.5
Density (gm/cc @ 60 °F)	:	0.8379	0.6912	0.8369
Gravity (°API @ 60 °F)	:	37.2	73.0	37.4

Decanes Plus Properties

Mol %	:	73.16	0.01	26.85
Molecular Weight	:	244.0	133.9	243.9
Density (gm/cc @ 60 °F)	:	0.8513	0.7277	0.8513
Gravity (°API @ 60 °F)	:	34.5	62.8	34.6

Undecanes Plus Properties

Mol %	:	68.09	0.00	24.98
Molecular Weight	:	252.2	--	252.2
Density (gm/cc @ 60 °F)	:	0.8545	--	0.8545
Gravity (°API @ 60 °F)	:	33.9	--	33.9

Dodecanes Plus Properties

Mol %	:	64.49	0.00	23.66
Molecular Weight	:	258.0	--	258.0
Density (gm/cc @ 60 °F)	:	0.8568	--	0.8568
Gravity (°API @ 60 °F)	:	33.5	--	33.5

* (P)ressure : 2865 psig * (T)emperature : 201 °F

Measured Bubble Point Pressure @ 94 °C = 4380 psig

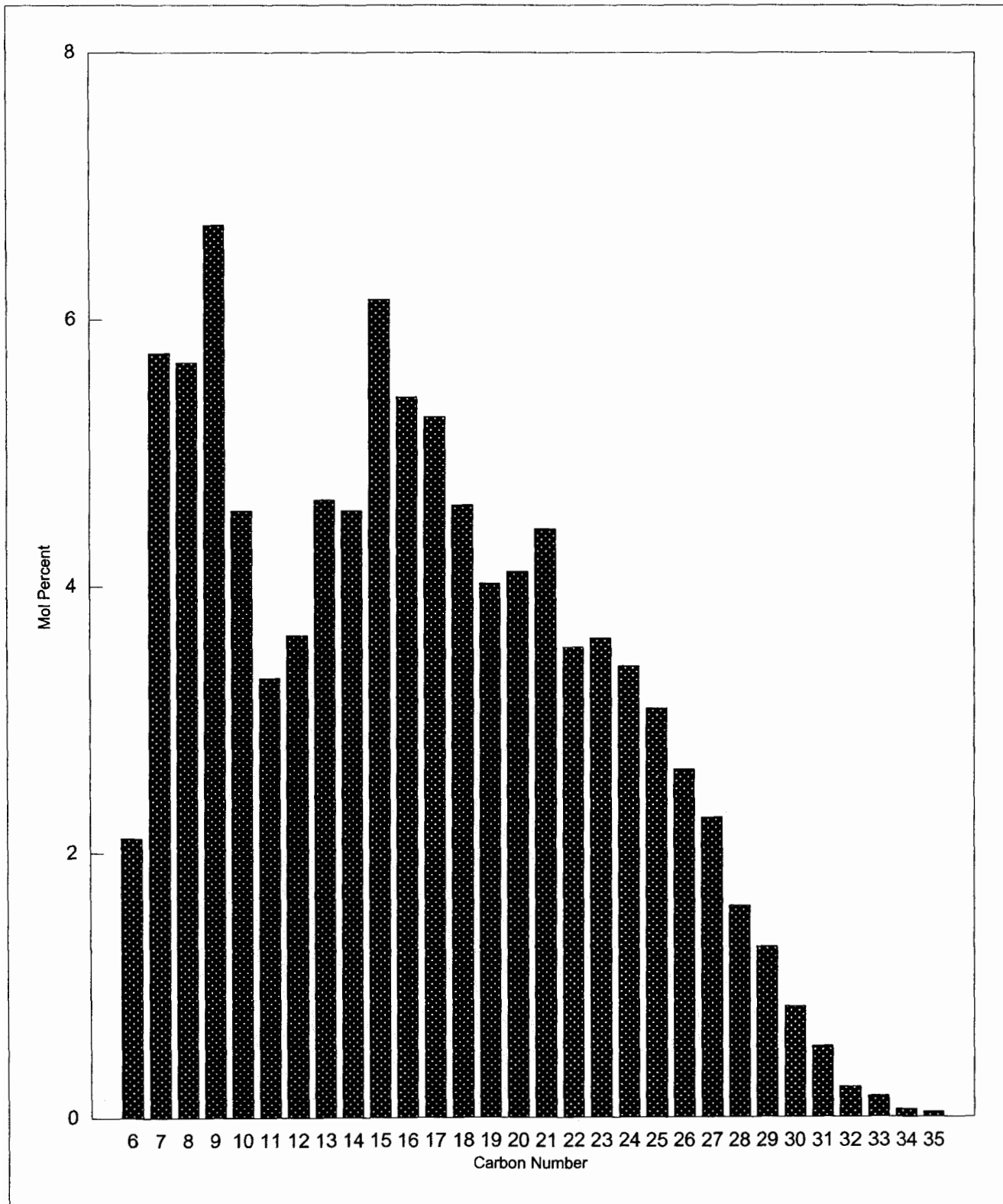
FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
ADJUSTED TO BE SATURATED AT RESERVOIR CONDITIONS
On Stock Tank Oil from atmospheric flash of sample in cylinder # L-079

Component		Mol %
Hexanes minus	C6-	1.74
Hexanes	C6	2.11
Heptanes	C7	5.75
Octanes	C8	5.68
Nonanes	C9	6.71
Decanes	C10	4.57
Undecanes	C11	3.31
Dodecanes	C12	3.63
Tridecanes	C13	4.65
Tetradecanes	C14	4.57
Pentadecanes	C15	6.15
Hexadecanes	C16	5.42
Heptadecanes	C17	5.27
Octadecanes	C18	4.61
Nonadecanes	C19	4.02
Eicosanes	C20	4.11
Heneicosanes	C21	4.43
Docosanes	C22	3.54
Tricosanes	C23	3.61
Tetracosanes	C24	3.40
Pentacosanes	C25	3.08
Hexacosanes	C26	2.62
Heptacosanes	C27	2.26
Octacosanes	C28	1.60
Nonacosanes	C29	1.29
Triacontanes	C30	0.84
Hentriacontanes	C31	0.54
Dotriacontanes	C32	0.23
Tritriacontanes	C33	0.16
Tetratriacontanes	C34	0.06
Pentatriacontanes Plus	C35+	0.04
TOTAL		100.00

Molecular Weight Calculated *	:	221.6
Density @ 60 °F Calculated *	:	0.8413

*Calculation based on generalized properties as published by Katz and Firoozabadi

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
ADJUSTED TO BE SATURATED AT RESERVOIR CONDITIONS
On Stock Tank Oil from atmospheric flash of sample in cylinder # L-079





COMPOSITIONAL ANALYSIS OF BOTTOM HOLE RESERVOIR FLUID ADJUSTED TO BE SATURATED AT RESERVOIR CONDITIONS

Cylinder # L-079 ex MPSR Chamber 0066

Component	Stock Tank		Reservoir
	Liquid	Gas	Fluid
	Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00
Carbon Dioxide	CO2	0.23	8.01
Nitrogen	N2	0.00	0.03
Methane	C1	0.41	36.86
Ethane	C2	0.27	4.16
Propane	C3	0.49	2.18
Iso-Butane	iC4	0.23	0.48
N-Butane	nC4	0.61	0.96
Iso-Pentane	iC5	0.55	0.49
N-Pentane	nC5	0.70	0.55
Hexanes	C6	2.07	1.22
Heptanes	C7	5.65	2.90
Octanes	C8	5.58	2.73
Nonanes	C9	6.59	3.15
Decanes	C10	4.49	2.13
Undecanes	C11	3.25	1.54
Dodecanes Plus	C12+	68.88	32.61
TOTAL		100.00	100.00

Ratios

Molar Ratio	:	0.4734	0.5266	1.0000
Mass Ratio	:	0.8887	0.1113	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	1.3328 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	570 SCF	--

Stream Properties

Molecular Weight	:	218.1	24.55	116.2
Density obs. (gm/cc)	:	0.8397 @ 60 °F	--	0.7094 @ PT*
Gravity (AIR = 1.000)	:	36.8 °API @ 60 °F	0.851	67.8
GHV (BTU/scf)	:	--	1096	--

Hexanes Plus Properties

Mol %	:	96.51	1.12	46.28
Molecular Weight	:	224.0	94.5	222.4
Density (gm/cc @ 60 °F)	:	0.8432	0.6817	0.8422
Gravity (°API @ 60 °F)	:	36.1	75.9	36.4

Heptanes Plus Properties

Mol %	:	94.44	0.67	45.06
Molecular Weight	:	227.1	101.6	226.1
Density (gm/cc @ 60 °F)	:	0.8448	0.6912	0.8442
Gravity (°API @ 60 °F)	:	35.8	73.0	36.0

Decanes Plus Properties

Mol %	:	76.62	0.01	36.28
Molecular Weight	:	254.6	133.9	254.6
Density (gm/cc @ 60 °F)	:	0.8561	0.7277	0.8561
Gravity (°API @ 60 °F)	:	33.6	62.8	33.6

Undecanes Plus Properties

Mol %	:	72.13	0.00	34.15
Molecular Weight	:	262.1	--	262.1
Density (gm/cc @ 60 °F)	:	0.8588	--	0.8588
Gravity (°API @ 60 °F)	:	33.1	--	33.1

Dodecanes Plus Properties

Mol %	:	68.88	0.00	32.61
Molecular Weight	:	267.6	--	267.6
Density (gm/cc @ 60 °F)	:	0.8608	--	0.8608
Gravity (°API @ 60 °F)	:	32.7	--	32.7

* (P)ressure : 2865 psig * (T)emperature : 201 °F

Measured Bubble Point Pressure @ 94 °C = 2865 psig



CONSTANT MASS STUDY
@ 201 °F
On Adjusted Saturated Reservoir Fluid

Pressure (psig)	Relative Volume (V/Vsat)	Oil Compressibility ($\times 10^{-6}$)(psig ⁻¹)	Y Function (psig ⁻¹)	Thermal Expansion ($\times 10^{-4}$)(°F ⁻¹)	Oil Viscosity (Centipoise)
	(1)	(2)	(3)	(4)	(4)
5000	0.9796	8.61		5.84	0.58
4500	0.9840	9.00		5.96	0.57
4000	0.9886	9.40		6.07	0.55
3750	0.9910	9.60		6.13	0.54
3500	0.9935	9.84		6.19	0.54
3250	0.9960	10.09		6.26	0.53
3000	0.9986	10.42		6.34	0.52
2865	*	1.0000		6.39	0.52
2750	1.0121		3.47		0.53
2600	1.0302		3.37		0.55
2350	1.0681		3.22		0.58
2100	1.1192		3.06		0.62
1850	1.1892		2.90		0.66
1600	1.2885		2.74		0.72
1350	1.4367		2.57		0.78
1100	1.6630		2.42		0.86
850	2.0513		2.26		0.95
600	2.7976		2.10		1.05
350	4.6850		1.95		1.22
0					1.72

* Saturation Pressure = Reservoir Pressure

- (1) Barrels at indicated pressure per barrel at saturation pressure
- (2) Oil Compressibility = $-(1/V) * (dV/dP)$
- (3) Y Function = $(P_{sat} - P) / (P) * (V/V_{sat}-1)$
- (4) Thermal Expansion = $-(1/V) * (dV/dT)$



SEPARATOR TEST On Adjusted Saturated Reservoir Fluid

SEPARATOR		GAS/OIL	DENSITY		VOLUME	SHRINKAGE	GAS
Pressure (psig)	Temperature (°F)	Ratio (1)	°API	(@ 60 °F) (gm/cc)	Factor (2)	Factor (3)	Gravity (Air = 1)
Test # 1							
233	171	544				0.919	0.809
TO							
0	70	49	37.4	0.8369	1.332	0.996	1.121
Total GOR		593					

- (1) Gas/Oil Ratio is reported as cubic feet of gas @ 14.696 psia and 60 °F per barrel of stock tank oil @ 60 °F
- (2) Formation Volume Factor is reported as barrels of saturated oil @ 2865 psig and 201°F per barrel of stock tank oil @ 60 °F
- (3) Shrinkage Factor is reported as barrels of stock tank oil at @ 60 °F per barrel of separator liquid at separator conditions

RELATIVE VOLUME

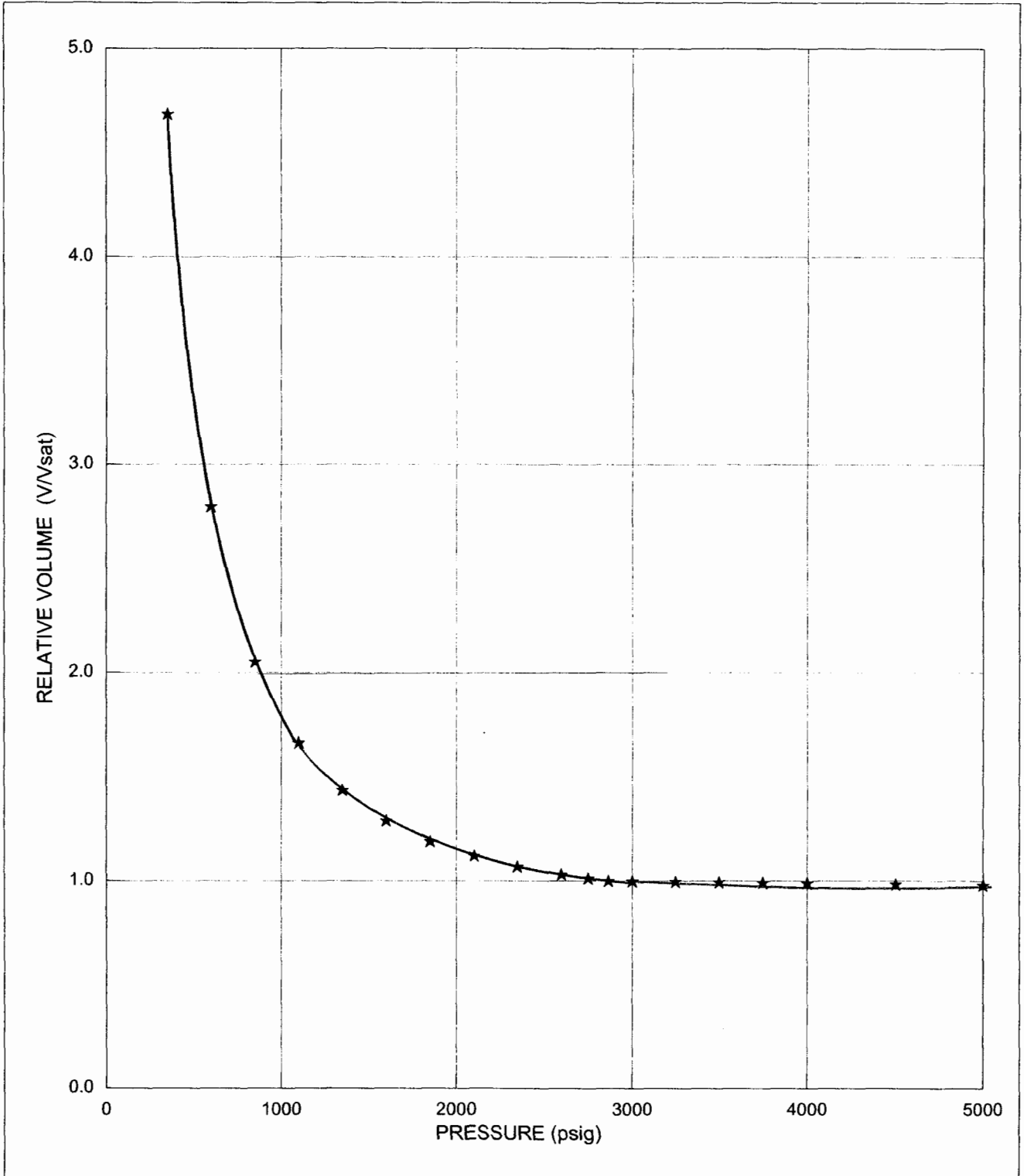
Equation of best fit

ABOVE Psat

$$RV = +1.05E+00 -2.99E-05 * P +6.66E-09 * P^2 -1.00E-12 * P^3 +6.00E-17 * P^4$$

BELOW Psat

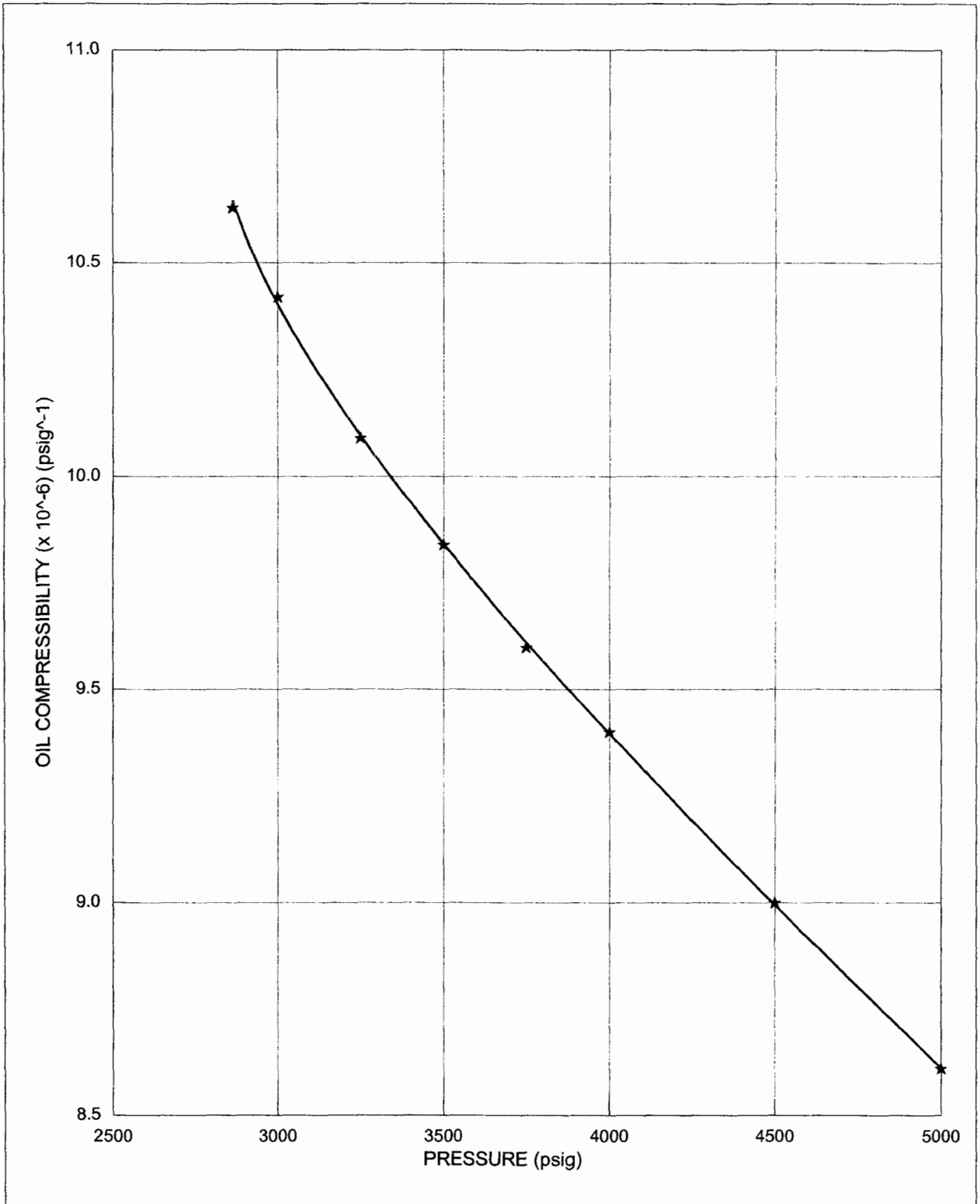
$$RV = +9.06E+00 +-1.69E-02 * P +1.39E-05 * P^2 +-5.11E-09 * P^3 +6.84E-13 * P^4$$



OIL COMPRESSIBILITY

Equation of best fit

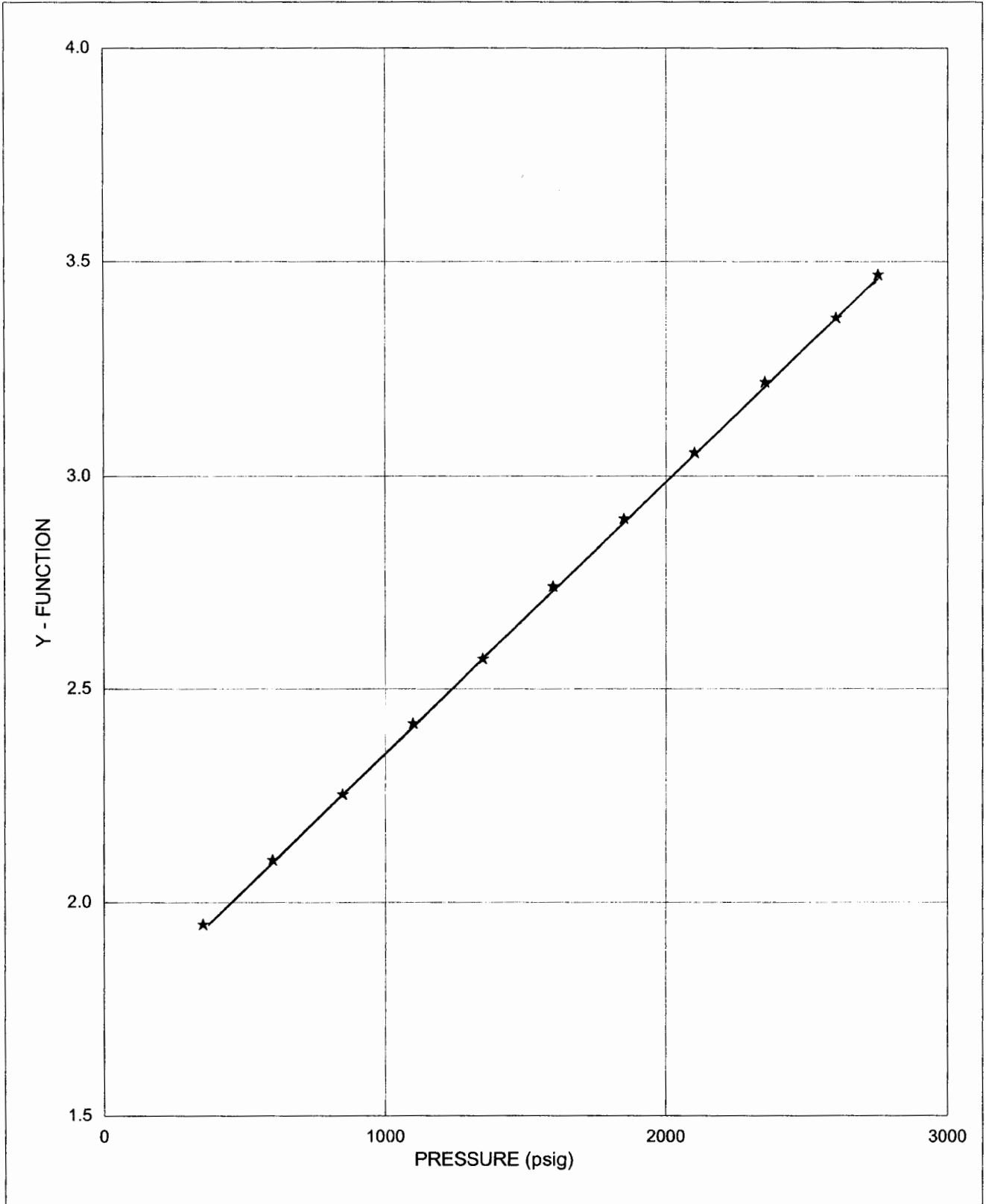
$$C_o = +3.60E+01 - 2.22E-02 * P + 7.33E-06 * P^2 - 1.12E-09 * P^3 + 6.38E-14 * P^4$$



Y - FUNCTION

Equation of best fit

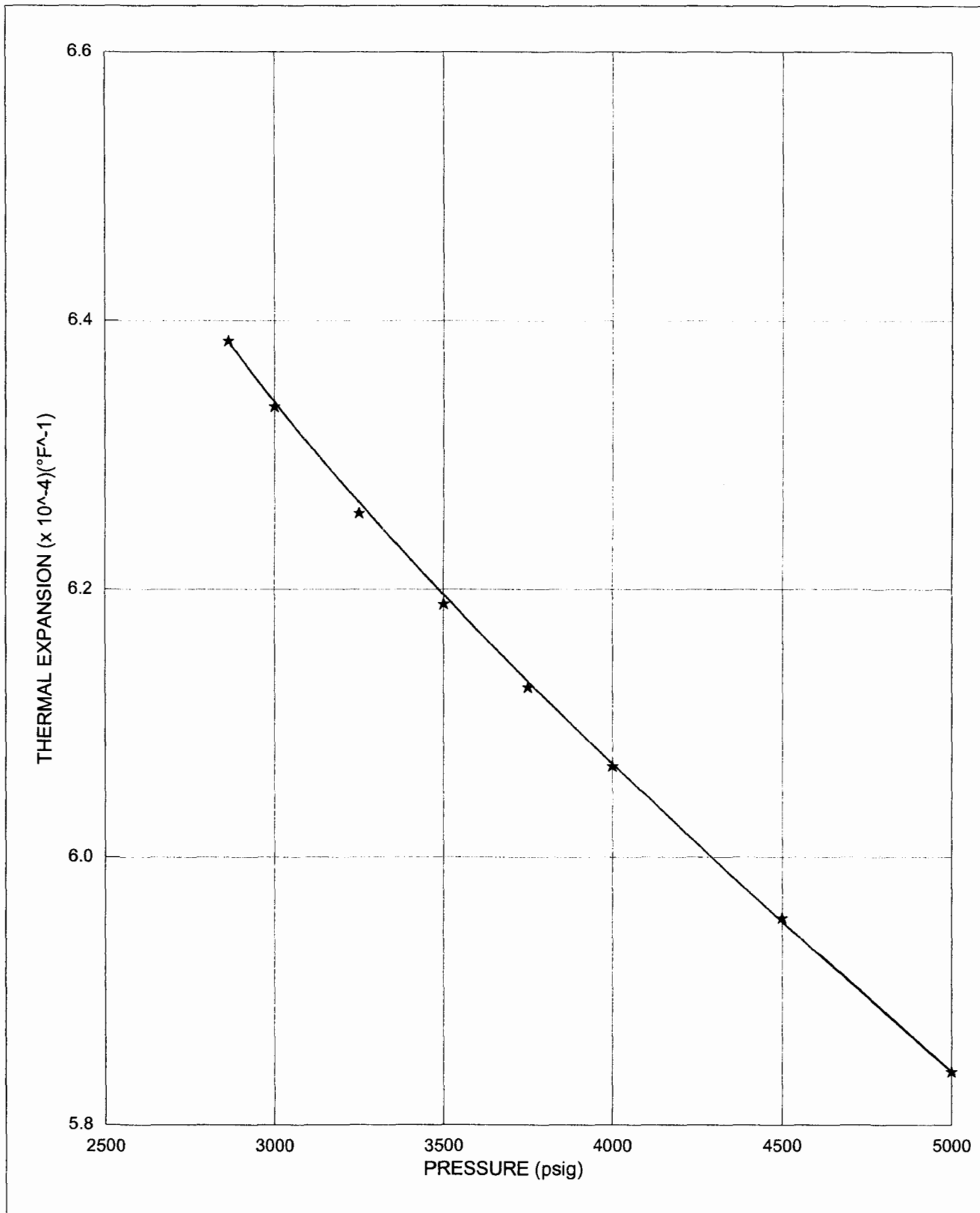
$$Y = +1.72E+00 + 6.34E-04 * P$$



OIL THERMAL EXPANSION

Equation of best fit

$$TE = +1.06E+01 -3.47E-03 * P +1.08E-06 * P^2 -1.59E-10 * P^3 +8.76E-15 * P^4$$



OIL VISCOSITY

Equation of best fit

ABOVE Psat

$$\mu_o = -3.08E-01 + 8.41E-04 * P - 3.30E-07 * P^2 + 5.89E-11 * P^3 - 3.90E-15 * P^4$$

BELOW Psat

$$\mu_o = +1.51E+00 + -1.00E-03 * P + 5.15E-07 * P^2 + -1.52E-10 * P^3 + 1.84E-14 * P^4$$

