PETROLAB

A. C. N. # 008 130 667
Adelaide, February 1, 2010
P. O. Box 410
Magill
S. A. 5072

Esso Australia Limited
GPO Box 400C
Melbourne VIC 3001

Subject: PVT Study
Well : SnapperA21-A
File : E - 28005

Attention: Ms. Margaret Hall

Dear Margaret,

On March 19, 2008, we received 8 MPSR MDT bottom hole samples from 5 different zones taken by Schlumberger from the subject well. We also received 4 stock tank oil and condensate samples drained from larger MDT chambers from 3 different zones and OBM mud and filtrate samples. After pressurising the samples into single phase, the contents of the MPSR chambers were transferred, into laboratory storage cylinders. The report of the reservoir fluid analyses using the above samples follows.

The validity of the bottom hole samples was determined by analysing the composition of four gas condensate samples from two different depths and bubble point at room temperature on the three black oil reservoir fluid samples from two different depths. The compositions of the most representative oil samples were then determined.

The compositions of the bottom hole samples 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 gas and liquid from the flash experiments, we were able to mathematically recombine these products into the desired fluid compositions. The compositions were extended to $C_{12}+$ and fingerprinted to $C_{36}+$ by means of Capillary Column Gas Chromatography on the flashed stock tank liquids. All recovered stock tank oils and condensates showed contamination with Oil Based Mud (OBM).

We then continued with fingerprinting the OBM, filtrate and other stock tank samples received to establish a baseline for quantifying the contamination in the bottom hole samples. The OBM used has five major peaks in the chromatograph appearing at carbon numbers C_{14}, C_{16}, C_{18}, C_{21} and C_{23}. Each flashed stock tank liquid was corrected by removing these OBM peaks after normalising the amounts charged to the Chromatograph. Absolute weights recovered during the flashes were corrected at the same time for the weights of the removed mud resulting in an increase of the measured Gas Liquid Ratios. All the measured compositions have been reported with and without OBM. All subsequent PVT work has been performed on the contaminated samples since physically removing the contaminants is impossible.

Water Zone 2669.5 m

The sample from zone 2669.5mMD contained water. This sample was flashed to obtain a gas-water ratio and the water was analysed.

Gas Zones depths 2764.5 and 3036.0 m

After the determinations of the compositions with and without OBM, sample from each zone was charged to a visual PVT cell and thermally expanded to their reservoir temperature. During constant composition expansions at these temperatures, their dew point pressures were measured to be 6050 psig and 5800 psig respectively. Other data obtained during these Pressure - Volume relations' experiments, include relative volume versus pressure, gas compressibility, specific volume and gas expansion above the dew point and the distribution of retrograde liquid versus pressure below it. From simple modelling it can be concluded that these reservoir fluids when cleaned up, will probably be wet gases, with no saturation pressures at reservoir temperatures.

Oil Zones 2890.2 and 3014.2 m

After the determinations of the compositions with and without OBM and extending the reservoir fluid composition for depth 3014.2 m to $C_{20}+$ by means of a High Temperature Vacuum Distillation, sample from each zone was charged to Black Oil PVT cells and thermally expanded to their reservoir temperature. During constant composition expansions at these temperatures, the measured bubble points were found to be to be 2800 psig and 3205 psig respectively. Other data obtained during the pressure - volume relations experiments, include relative volume versus pressure, oil thermal expansion and compressibility above bubble point and calculated Y- function below it.

The solution gas in the reservoir fluids was then differentially vaporised and in steps removed from the oil phase at decreasing pressures in the system. During these experiments GOR, relative oil volume factor, oil density and compositions of the evolved gases were measured during each point of the pressure depletions.

During a similar pressure depletion at the reservoir temperatures, the viscosity of the oil phase of the reservoir fluids were determined in a rolling ball viscosimeter as a function of the pressure.

A single stage separator test was also 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 Ltd 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,

Jan G. Bon
Manager

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Company : Esso Australia Pty. Ltd.
Well : Snapper A21-A File : E - 28005

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SUMMARY OF OIL PVT RESULTS

CONSTANT MASS DATA :		Oil Zone @ 2890.2 m	Oil Zone @ 3014.2 m
Reservoir Temperature (°F)	:	264	271
Saturation Pressure (psig)	:	2800	3205
Thermal Expansion of Saturated Oil			
@ Res Temp and Ps (*10^4/°F)	:	6.50	6.18
(*10^4/°C)	:	11.70	11.12
Compressibility of Saturated Oil			
@ Res Temp and Ps (*10^6/psi)	:	13.93	17.89

DIFFERENTIAL VAPORIZATION DATA :

SATURATED OIL @ Reservoir Temperature and Saturation Pressure :

Solution GOR (SCF/Bbl)	:	542	608
Formation Volume Factor	:	1.3594	1.3980
Oil density (gm/cc)	:	0.6891	0.6901
Specific Volume (ft^3/lb)	:	0.0232	0.0232
Viscosity (cp)	:	0.467	0.383

RESIDUAL OIL :

API Gravity @ 60 °F	:	37.3	34.8
Formation Volume Factor	:	1.0941	1.0933
Density @ Reservoir Temperature (gm/cc)	:	0.7654	0.7773
Viscosity @ Reservoir Temperature (cp)	:	0.967	1.420

FLASH DATA :

1st Separator Pressure (psig)	:	1290	1290
1st Separator Temperature (°F)	:	131	131
2nd Separator Pressure (psig)	:	--	--
2nd Separator Temperature (°F)	:	--	--
Stock Tank Pressure (psig)	:	0	0
Stock Tank Temperature (°F)	:	100	100
Oil Volume Factor (rbbl/stbbl)	:	1.374	1.396
1st Separator GOR (scf/bbl)	:	293	384
2nd Separator GOR (scf/bbl)	:	--	--
Stock Tank GOR (scf/bbl)	:	304	276
Total GOR (scf/bbl)	:	597	660
1st Separator Gas Gravity (Air=1)	:	0.739	0.755
2nd Separator Gas Gravity (Air=1)	:	--	--
Stock Tank Gas Gravity (Air=1)	:	0.940	0.949
Stock Tank Oil Density (gm/cc)	:	0.8403	0.8401
Stock Tank Oil Gravity (°API)	:	36.7	36.8

DIFFERENTIAL DATA CORRECTED WITH FLASH DATA :

SATURATED OIL @ Reservoir Temperature and Saturation Pressure :

Solution GOR (SCF/Bbl)	**Rs :**	**597**	**660**
Formation Volume Factor (Resbbl/STbbl)	**Bo :**	**1.374**	**1.396**

SUMMARY OF GAS PVT RESULTS

SATURATED VAPOUR:		Gas Zone @ 2764.5 m	Gas Zone @ 3036 m
Reservoir Temperature (°F)	:	253	266
Dew Point Pressure (psig)	:	6050	5800
Gas Formation Volume Factor (Bg)	:	0.00335	0.00335
Gas Expansion Factor (E)	:	298.07	298.43
Gas Deviation Factor (Z)	:	1.014	0.952
Specific Volume (CFT/LB)	:	0.04261	0.05370
Density (gm/cc)	:	0.3759	0.2983
Viscosity (centipoise)	:	0.0536	0.0380
Molecular Weight	:	30.20	23.70
Gas Gravity (Air = 1.000)	:	0.947	0.808
Gross Heating Value (BTU/ft3)	:	1364	952

COMPOUND SPECIFIC ISOTOPE ANALYSIS (GC-IRMS)

			Gas Zone @ 2764.5 m		Gas Zone @ 3036 m	
COMPOUND:			$d^{13}C$	**SD**	$d^{13}C$	**SD**
Methane	*(C1)*	:	-35.06	0.1	-31.11	0.13
Ethane	*(C2)*	:	-29.12	0.3	-25.17	0.02
Propane	*(C3)*	:	-28.1	0.1	-23.69	0.21
i-Butane	*(iC4)*	:	-27.69	0.1	nd	nd
n-Butane	*(nC4)*	:	-27	0.1	-24.72	0.34
i-Pentane	*(iC5)*	:	-26.41	0.1	nd	nd
n-Pentane	*(nC5)*	:	-25.13	0.2	nd	nd
Carbon Dioxide	*(CO2)*	:	-7.07	0.2	2.07	0.01

ANALYSIS OF STABLE CARBON ISOTOPES IN BULK FRACTIONS

		Oil Zone @ 2890.2 m	Oil Zone @ 3014.2 m
Saturates (‰)	:	-29.2	-28.6
Aromatics (‰)	:	-25.3	-25.1
NSOs (‰)	:	-28.7	nd
Topped Oil(‰)	:	-28.5	-28.6
Asphaltenes (‰)	:	-29.7	-26.9

FIELD CHARACTERISTICS :

Field Name	:	SNAPPER
Formation Name	:	F205-T140
Well Name	:	SNA A-21A
Date first well completed	:	27 March 2008
Original reservoir pressure (psia)	:	See Transfer Details below
Reservoir temperature (°F)	:	See Transfer Details below
@ Sample depth (mMD)	:	See Transfer Details below

WELL CHARACTERISTICS :

Depth datum	:	
Elevation above MSL (m)	:	41.68 m
Total depth (mMD)	:	3347.0 mMDRT
Perforated interval	:	N/A
Tubing size (inch)	:	N/A - NOT COMPLETED TO THIS DEPTH
Tubing shoe (mRT)	:	N/A - NOT COMPLETED TO THIS DEPTH
Casing size (inch)	:	7" LINER TO TD
Reservoir temperature (°F)	:	See Transfer Details below
Last reservoir pressure (psia)	:	See Transfer Details below
date	:	See Transfer Details below
Status of well	:	DEEP ZONES ARE CASED OFF

TRANSFER DETAILS
Transferred on March 20, 2008 @ 6000 psig & 23 °C

Sample ID #	MDT MPSR #	Depth (mMD)	Reservoir Pressure (1) (psia)	Reservoir Temp. (2) (ºC)	Opening Pressure (psig)	Transferred to Petrolab Cylinder	Fluid Phase Transferred
1	3303	2669.5	3586	119 (3)	68	812401	water
2	3304	2764.5	3828	123	3364	812664	gas cond
3	3305	2764.5	3828	123	3260	812660	gas cond
4	3348	2890.2	3984	129	1850	812672	oil
5	3349	2890.2	3984	129	1800	812650	oil
7	3350	3014.2	4236	133	1920	812417	oil
9	286	3036.0	4270 (3)	130	3097	812641	gas cond
10	497	3036.0	4270 (3)	130	3430	812485	gas cond

(1) Quartz gauge reservoir pressure from MDT run on drillpipe

(2) Temperature gauge from MDT run on drillpipe

(3) Data obtained from MDT run on wireline, in the abscence of data from the MDT run on drillpipe

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
GAS BOTTOM HOLE SAMPLES

	Sample ID	MPSR 3304	MPSR 3305	MPSR 0497	MUD FILTRATE
	Depth	2764.5 A	2764.5 B	3036 B	3347 F
	Fluid	Gas	Gas	Gas	--
Component		Mol %	Mol %	Mol %	Mol %
Hexanes minus	C6-	1.90	1.75	0.17	0.00
Hexanes	C6	1.58	1.14	0.09	0.01
Heptanes	C7	3.00	2.40	0.41	0.06
Octanes	C8	1.85	1.60	0.47	0.00
Nonanes	C9	1.37	1.21	0.50	0.01
Decanes	C10	0.77	0.76	0.30	0.00
Undecanes	C11	1.02	1.01	1.57	0.06
Dodecanes	C12	1.04	1.01	1.51	0.62
Tridecanes	C13	0.40	0.44	0.53	0.49
Tetradecanes	C14	37.32	36.51	49.34	31.79
Pentadecanes	C15	0.70	0.69	1.17	2.20
Hexadecanes	C16	27.17	27.86	28.45	28.10
Heptadecanes	C17	1.50	1.51	1.48	2.53
Octadecanes	C18	5.49	5.80	4.49	6.49
Nonadecanes	C19	1.13	1.22	0.90	1.64
Eicosanes	C20	0.20	0.23	0.16	0.24
Heneicosanes	C21	10.91	11.57	6.60	18.77
Docosanes	C22	0.05	0.11	0.08	0.14
Tricosanes	C23	2.08	2.45	1.16	4.66
Tetracosanes	C24	0.04	0.06	0.07	0.98
Pentacosanes	C25	0.39	0.49	0.24	0.20
Hexacosanes	C26	0.02	0.04	0.06	0.09
Heptacosanes	C27	0.04	0.07	0.08	0.09
Octacosanes	C28	0.01	0.02	0.05	0.11
Nonacosanes	C29	0.01	0.01	0.03	0.14
Triacontanes plus	C30	0.01	0.01	0.02	0.26
Hentriacontanes	C31	0.00	0.01	0.02	0.19
Dotriacontanes	C32	0.00	0.01	0.01	0.08
Tritriacontanes	C33	0.00	0.00	0.01	0.04
Tetratriacontanes	C34	0.00	0.00	0.01	0.01
Pentatriacontanes Plus	C35+	0.00	0.01	0.02	0.00
TOTAL		100.00	100.00	100.00	100.00

Molecular Weight Calculated *	:	207.9	211.4	210.1	234.5
Density @ 60 °F Calculated *	:	0.8321	0.8340	0.8337	0.8460
Molecular Weight Measured (gr/mol)	:	--	--	--	--
Density @ 60 °F Measured (gr/cc)	:	--	--	--	--
Wax Content (% wt)	:	--	--	--	--
Asphaltene Content (% wt)	:	--	--	--	--
Cloud Point (°C)	:	--	--	--	--
Pour Point (°C)	:	--	--	--	--

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

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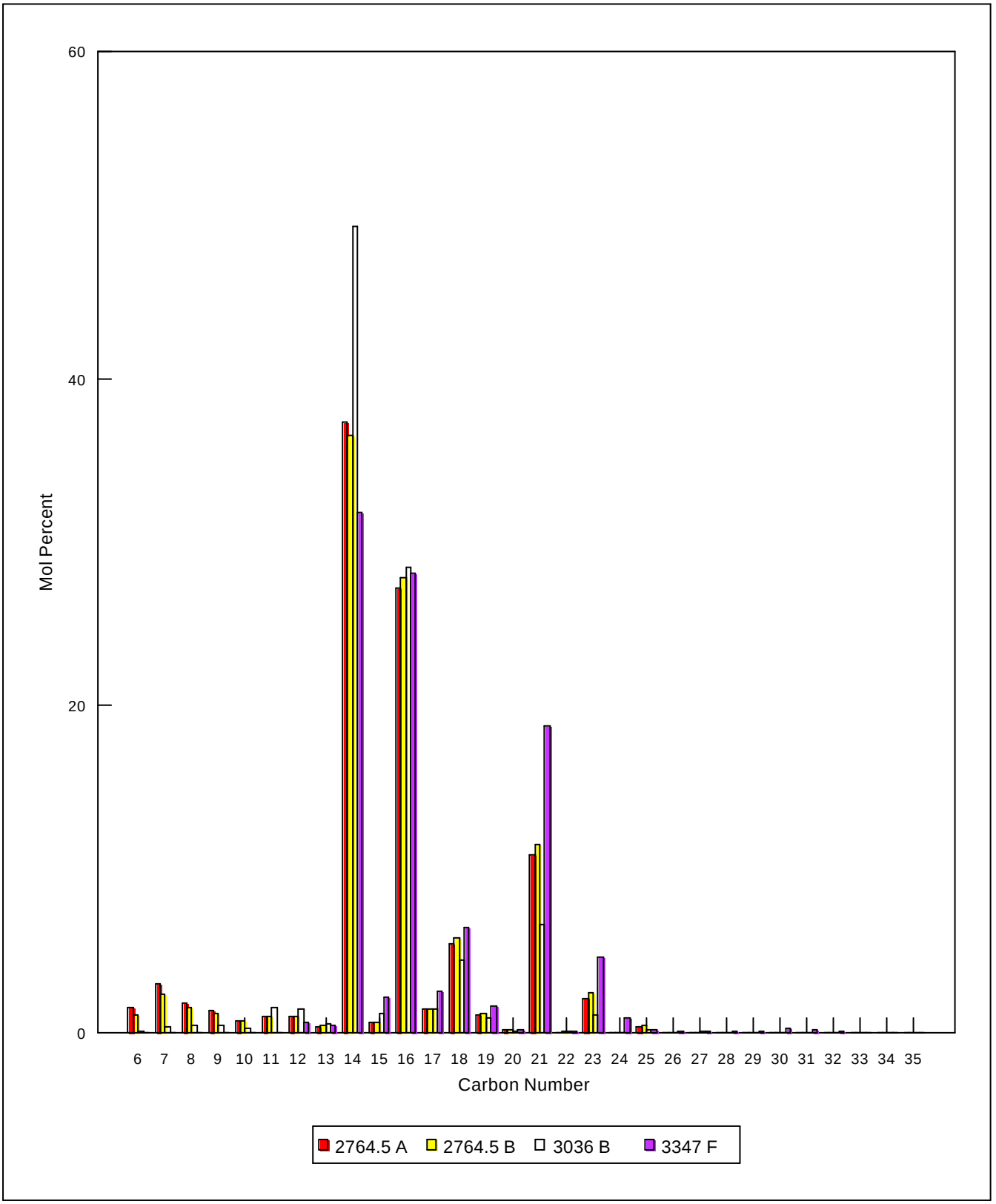
BY CAPILLARY GAS CHROMATOGRAPHY
GAS BOTTOM HOLE SAMPLES



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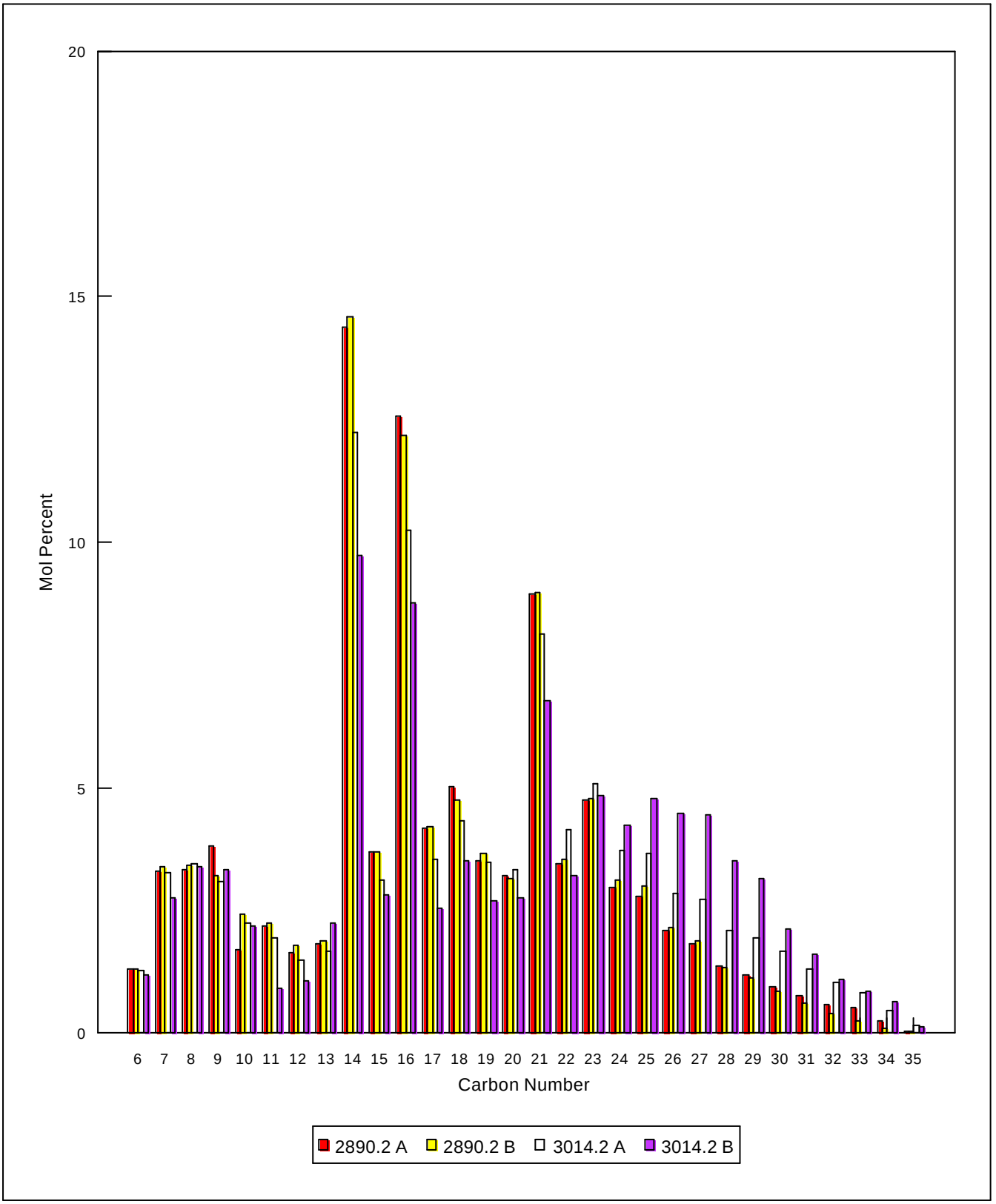
OIL BOTTOM HOLE SAMPLES

	Sample ID	MPSR 3348	MPSR 3349	MPSR 3350	MDT SC-02
	Depth	2890.2 A	2890.2 B	3014.2 A	3014.2 B
	Fluid	Oil	Oil	Oil	Oil
Component		Mol %	Mol %	Mol %	Mol %
Hexanes minus	C6-	1.89	1.91	1.52	4.17
Hexanes	C6	1.31	1.31	1.27	1.20
Heptanes	C7	3.29	3.39	3.28	2.76
Octanes	C8	3.34	3.43	3.44	3.39
Nonanes	C9	3.80	3.21	3.10	3.33
Decanes	C10	1.70	2.43	2.25	2.19
Undecanes	C11	2.17	2.24	1.94	0.93
Dodecanes	C12	1.63	1.79	1.49	1.08
Tridecanes	C13	1.82	1.88	1.68	2.24
Tetradecanes	C14	14.39	14.59	12.24	9.73
Pentadecanes	C15	3.68	3.68	3.12	2.81
Hexadecanes	C16	12.58	12.19	10.24	8.77
Heptadecanes	C17	4.17	4.22	3.55	2.56
Octadecanes	C18	5.03	4.76	4.34	3.53
Nonadecanes	C19	3.50	3.65	3.47	2.69
Eicosanes	C20	3.20	3.14	3.33	2.75
Heneicosanes	C21	8.96	8.97	8.12	6.78
Docosanes	C22	3.45	3.56	4.14	3.21
Tricosanes	C23	4.75	4.78	5.07	4.85
Tetracosanes	C24	2.96	3.12	3.72	4.23
Pentacosanes	C25	2.80	2.99	3.66	4.79
Hexacosanes	C26	2.08	2.16	2.85	4.47
Heptacosanes	C27	1.82	1.89	2.74	4.44
Octacosanes	C28	1.38	1.33	2.10	3.51
Nonacosanes	C29	1.19	1.14	1.94	3.15
Triacontanes plus	C30	0.94	0.85	1.66	2.13
Hentriacontanes	C31	0.76	0.62	1.30	1.60
Dotriacontanes	C32	0.57	0.39	1.02	1.09
Tritriacontanes	C33	0.53	0.25	0.82	0.85
Tetratriacontanes	C34	0.26	0.10	0.45	0.63
Pentatriacontanes Plus	C35+	0.05	0.03	0.15	0.14
TOTAL		100.00	100.00	100.00	100.00

Molecular Weight Calculated *	:	237.6	235.6	251.4	259.9
Density @ 60 °F Calculated *	:	0.8484	0.8474	0.8549	0.8583
Molecular Weight Measured (gr/mol)	:	--	--	--	219.2
Density @ 60 °F Measured (gr/cc)	:	--	--	--	0.8282
Wax Content (% wt)	:	--	--	--	30.1
Asphaltene Content (% wt)	:	--	--	--	0.28
Cloud Point (°C)	:	--	--	--	too dark
Pour Point (°C)	:	--	--	--	36

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

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
OIL BOTTOM HOLE SAMPLES



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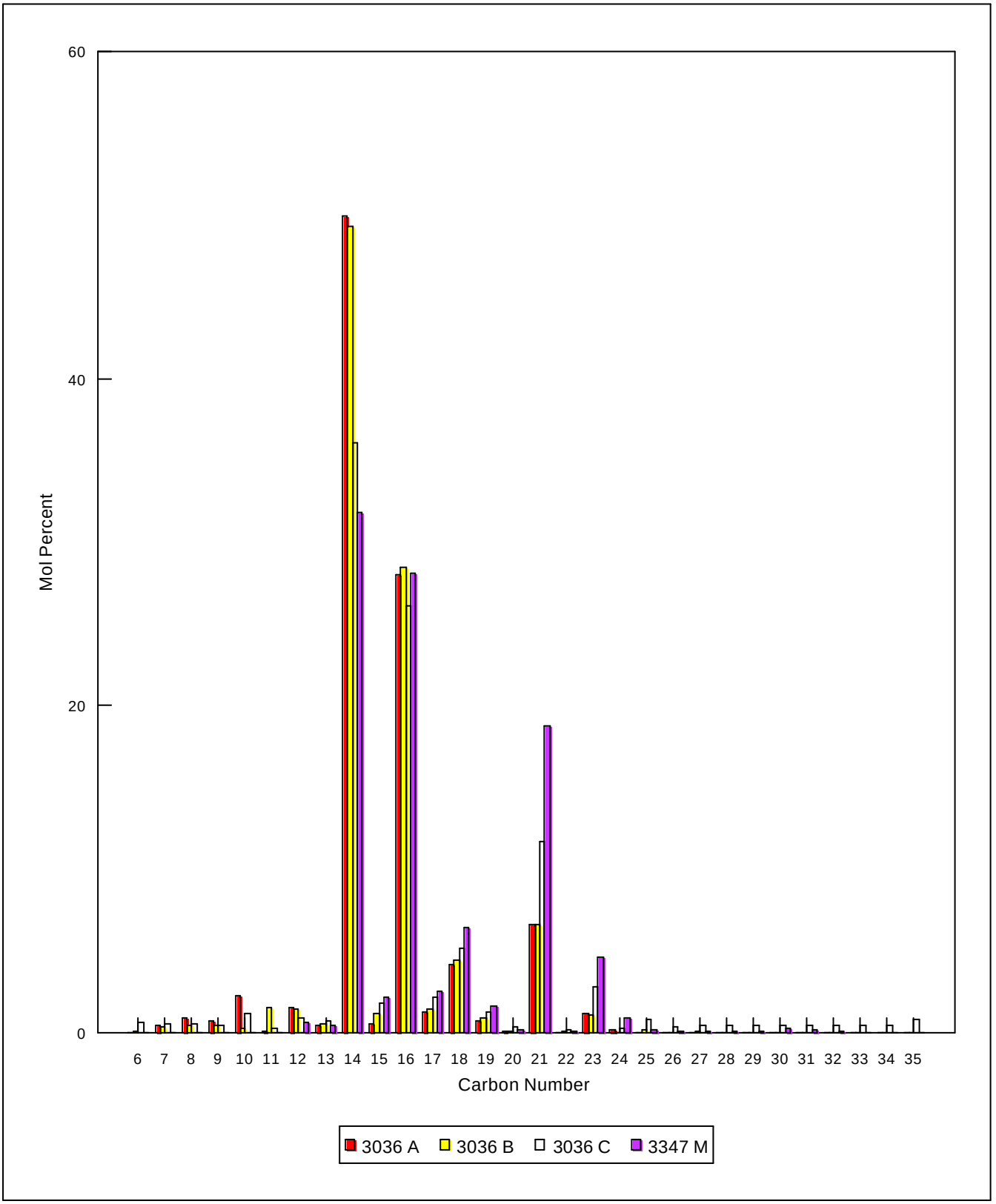
FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
GAS BOTTOM HOLE SAMPLES

	Sample ID	MPSR 0286	MPSR 0497	MDT SC-03	MUD FILTRATE
	Depth	3036 A	3036 B	3036 C	3347 M
	Fluid	Gas	Gas	Gas	--
Component		Mol %	Mol %	Mol %	Mol %
Hexanes minus	C6-	0.01	0.17	0.16	0.00
Hexanes	C6	0.07	0.09	0.66	0.01
Heptanes	C7	0.48	0.41	0.61	0.06
Octanes	C8	0.94	0.47	0.60	0.00
Nonanes	C9	0.76	0.50	0.48	0.01
Decanes	C10	2.31	0.30	1.24	0.00
Undecanes	C11	0.16	1.57	0.27	0.06
Dodecanes	C12	1.54	1.51	0.93	0.62
Tridecanes	C13	0.49	0.53	0.73	0.49
Tetradecanes	C14	49.98	49.34	36.07	31.79
Pentadecanes	C15	0.58	1.17	1.88	2.20
Hexadecanes	C16	27.99	28.45	26.12	28.10
Heptadecanes	C17	1.28	1.48	2.20	2.53
Octadecanes	C18	4.22	4.49	5.22	6.49
Nonadecanes	C19	0.80	0.90	1.30	1.64
Eicosanes	C20	0.12	0.16	0.39	0.24
Heneicosanes	C21	6.65	6.60	11.67	18.77
Docosanes	C22	0.03	0.08	0.25	0.14
Tricosanes	C23	1.17	1.16	2.81	4.66
Tetracosanes	C24	0.20	0.07	0.32	0.98
Pentacosanes	C25	0.02	0.24	0.88	0.20
Hexacosanes	C26	0.04	0.06	0.41	0.09
Heptacosanes	C27	0.03	0.08	0.52	0.09
Octacosanes	C28	0.02	0.05	0.47	0.11
Nonacosanes	C29	0.02	0.03	0.50	0.14
Triacontanes plus	C30	0.02	0.02	0.47	0.26
Hentriacontanes	C31	0.02	0.02	0.50	0.19
Dotriacontanes	C32	0.02	0.01	0.47	0.08
Tritriacontanes	C33	0.01	0.01	0.51	0.04
Tetratriacontanes	C34	0.01	0.01	0.49	0.01
Pentatriacontanes Plus	C35+	0.01	0.02	0.87	0.00
TOTAL		100.00	100.00	100.00	100.00

Molecular Weight Calculated *	:	208.2	210.1	230.8	234.5
Density @ 60 °F Calculated *	:	0.8327	0.8337	0.8449	0.8460
Molecular Weight Measured (gr/mol)	:	--	--	242.9	--
Density @ 60 °F Measured (gr/cc)	:	--	--	0.8232	--
Wax Content (% wt)	:	--	--	7.4	--
Asphaltene Content (% wt)	:	--	--	0.22	--
Cloud Point (°C)	:	--	--	41	--
Pour Point (°C)	:	--	--	32	--

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

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
GAS BOTTOM HOLE SAMPLES



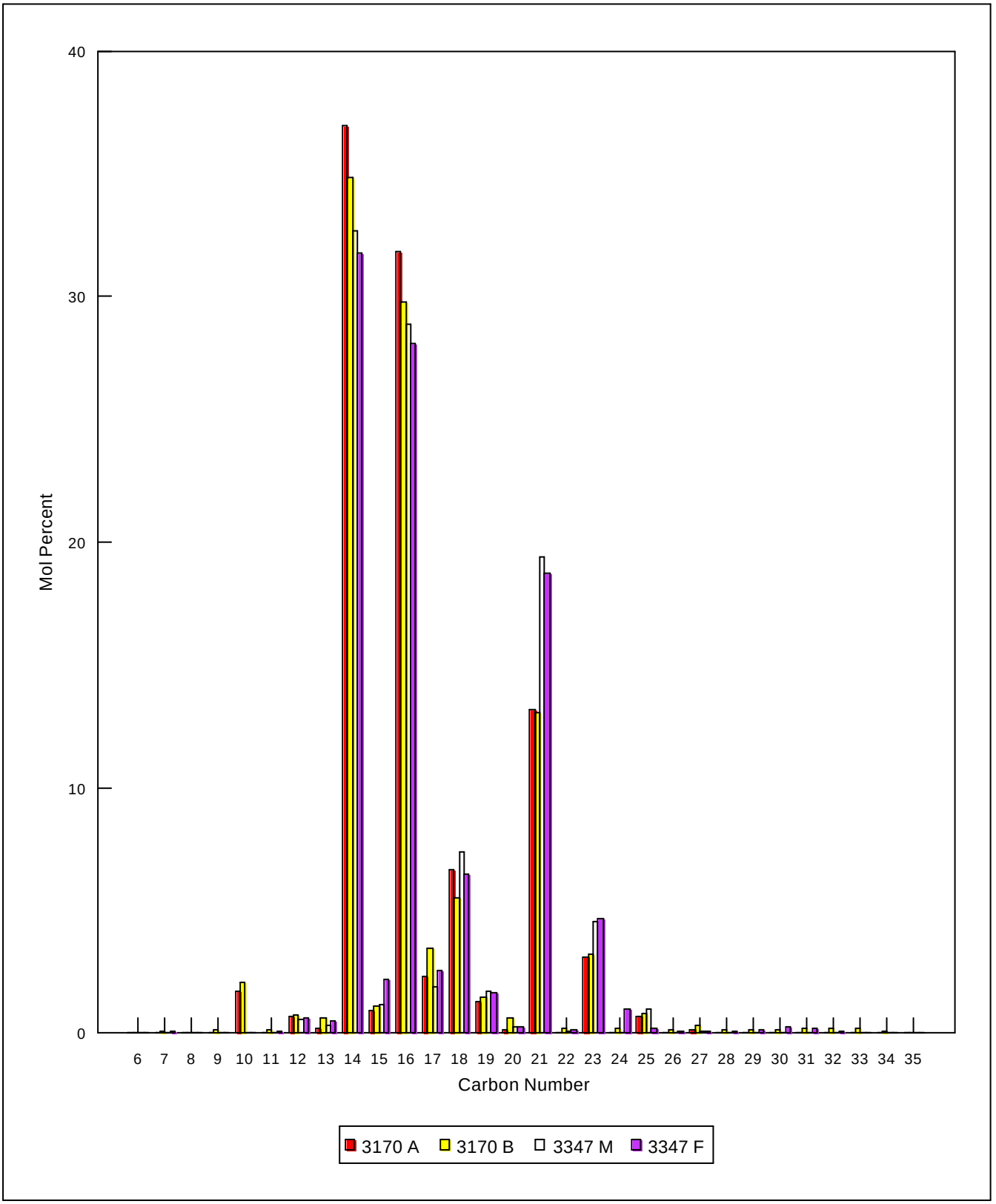
FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
BOTTOM HOLE SAMPLES

	Sample ID	MDT SC-01 a	MDT SC-01 b	MUD	MUD FILTRATE
	Depth	3170 A	3170 B	3347 M	3347 F
	Fluid	--	--	--	--
Component		Mol %	Mol %	Mol %	Mol %
Hexanes minus	C6-	0.00	0.21	0.00	0.00
Hexanes	C6	0.00	0.02	0.00	0.01
Heptanes	C7	0.01	0.07	0.00	0.06
Octanes	C8	0.00	0.05	0.00	0.00
Nonanes	C9	0.00	0.17	0.00	0.01
Decanes	C10	1.69	2.06	0.00	0.00
Undecanes	C11	0.03	0.17	0.00	0.06
Dodecanes	C12	0.71	0.75	0.54	0.62
Tridecanes	C13	0.21	0.65	0.34	0.49
Tetradecanes	C14	36.99	34.84	32.66	31.79
Pentadecanes	C15	0.93	1.09	1.17	2.20
Hexadecanes	C16	31.85	29.79	28.90	28.10
Heptadecanes	C17	2.30	3.47	1.90	2.53
Octadecanes	C18	6.65	5.52	7.37	6.49
Nonadecanes	C19	1.26	1.45	1.72	1.64
Eicosanes	C20	0.12	0.60	0.25	0.24
Heneicosanes	C21	13.18	13.07	19.40	18.77
Docosanes	C22	0.03	0.22	0.08	0.14
Tricosanes	C23	3.12	3.22	4.52	4.66
Tetracosanes	C24	0.01	0.20	0.05	0.98
Pentacosanes	C25	0.70	0.79	0.98	0.20
Hexacosanes	C26	0.01	0.16	0.01	0.09
Heptacosanes	C27	0.17	0.30	0.09	0.09
Octacosanes	C28	0.01	0.15	0.01	0.11
Nonacosanes	C29	0.01	0.14	0.01	0.14
Triacontanes plus	C30	0.01	0.16	0.00	0.26
Hentriacontanes	C31	0.00	0.20	0.00	0.19
Dotriacontanes	C32	0.00	0.18	0.00	0.08
Tritriacontanes	C33	0.00	0.18	0.00	0.04
Tetratriacontanes	C34	0.00	0.08	0.00	0.01
Pentatriacontanes Plus	C35+	0.00	0.04	0.00	0.00
TOTAL		100.00	100.00	100.00	100.00

Molecular Weight Calculated *	:	224.2	226.8	233.4	234.5
Density @ 60 °F Calculated *	:	0.8409	0.8424	0.8453	0.8460
Molecular Weight Measured (gr/mol)	:	232.6	233.0	--	--
Density @ 60 °F Measured (gr/cc)	:	0.8144	0.8069	--	--
Wax Content (% wt)	:	0.9	--	--	--
Asphaltene Content (% wt)	:	0.10	--	--	--
Cloud Point (°C)	:	<-6.0	<-6.0	--	--
Pour Point (°C)	:	too dark	too dark	--	--

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

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
BOTTOM HOLE SAMPLES



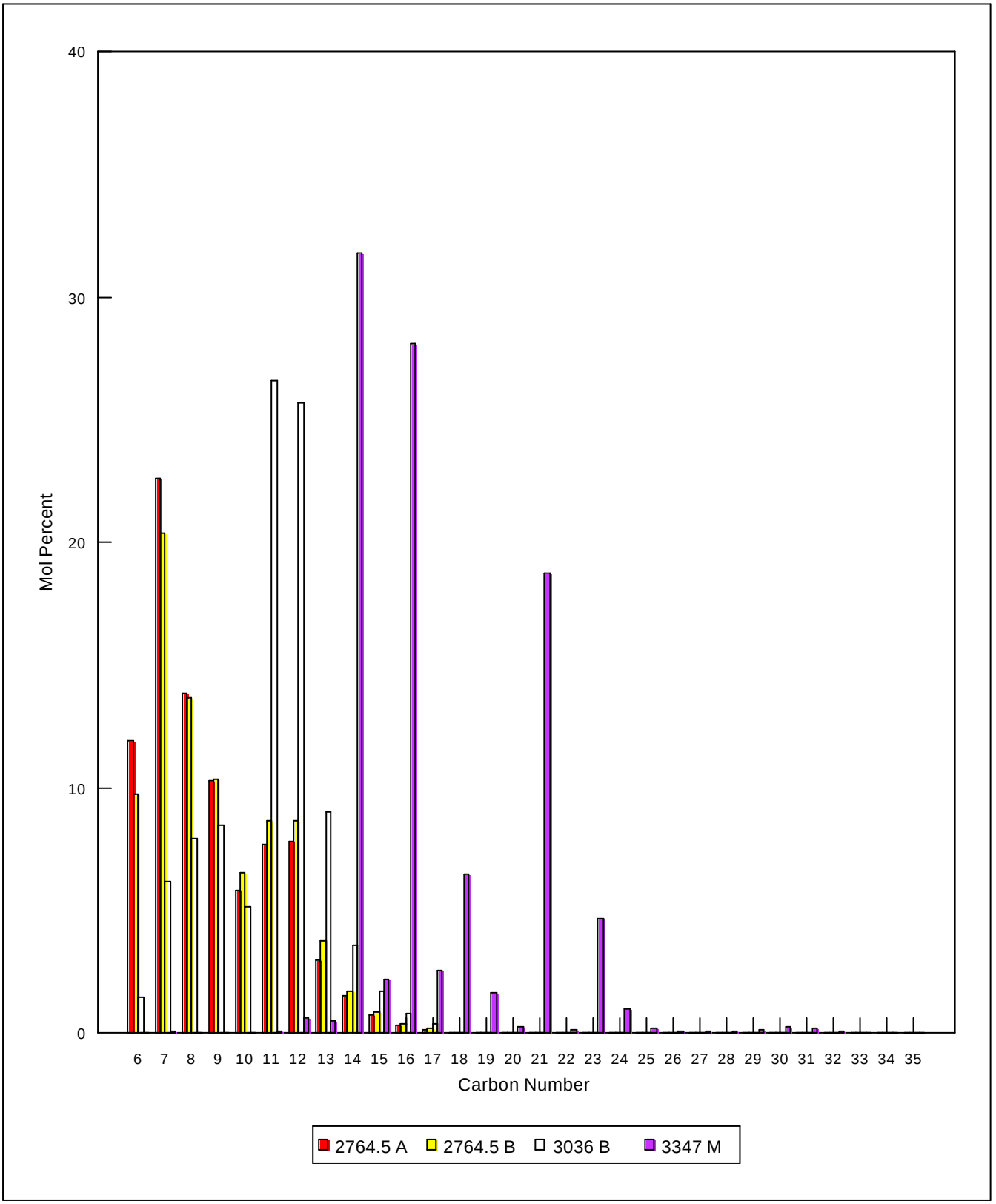
FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
GAS BOTTOM HOLE SAMPLES - CLEANED UP

	Sample ID	MPSR 3304	MPSR 3305	MPSR 0497	MUD FILTRATE
	Depth	2764.5 A	2764.5 B	3036 B	3347 M
	Fluid	Gas	Gas	Gas	--
Component		Mol %	Mol %	Mol %	Mol %
Hexanes minus	C6-	14.23	15.02	2.97	0.00
Hexanes	C6	11.91	9.77	1.48	0.01
Heptanes	C7	22.59	20.40	6.19	0.06
Octanes	C8	13.88	13.69	7.93	0.00
Nonanes	C9	10.28	10.33	8.49	0.01
Decanes	C10	5.80	6.52	5.13	0.00
Undecanes	C11	7.67	8.65	26.57	0.06
Dodecanes	C12	7.80	8.69	25.68	0.62
Tridecanes	C13	2.98	3.77	9.03	0.49
Tetradecanes	C14	1.56	1.72	3.57	31.79
Pentadecanes	C15	0.76	0.84	1.74	2.20
Hexadecanes	C16	0.36	0.40	0.82	28.10
Heptadecanes	C17	0.17	0.19	0.39	2.53
Octadecanes	C18	0.01	0.01	0.01	6.49
Nonadecanes	C19	0.00	0.00	0.00	1.64
Eicosanes	C20	0.00	0.00	0.00	0.24
Heneicosanes	C21	0.00	0.00	0.00	18.77
Docosanes	C22	0.00	0.00	0.00	0.14
Tricosanes	C23	0.00	0.00	0.00	4.66
Tetracosanes	C24	0.00	0.00	0.00	0.98
Pentacosanes	C25	0.00	0.00	0.00	0.20
Hexacosanes	C26	0.00	0.00	0.00	0.09
Heptacosanes	C27	0.00	0.00	0.00	0.09
Octacosanes	C28	0.00	0.00	0.00	0.11
Nonacosanes	C29	0.00	0.00	0.00	0.14
Triacontanes plus	C30	0.00	0.00	0.00	0.26
Hentriacontanes	C31	0.00	0.00	0.00	0.19
Dotriacontanes	C32	0.00	0.00	0.00	0.08
Tritriacontanes	C33	0.00	0.00	0.00	0.04
Tetratriacontanes	C34	0.00	0.00	0.00	0.01
Pentatriacontanes Plus	C35+	0.00	0.00	0.00	0.00
TOTAL		100.00	100.00	100.00	100.00

Molecular Weight Calculated *	:	111.3	112.9	144.4	234.5
Density @ 60 °F Calculated *	:	0.7391	0.7410	0.7851	0.8460
Molecular Weight Measured (gr/mol)	:	--	--	--	--
Density @ 60 °F Measured (gr/cc)	:	--	--	--	--
Wax Content (% wt)	:	--	--	--	--
Asphaltene Content (% wt)	:	--	--	--	--
Cloud Point (°C)	:	--	--	--	--
Pour Point (°C)	:	--	--	--	--

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

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
GAS BOTTOM HOLE SAMPLES - CLEANED UP



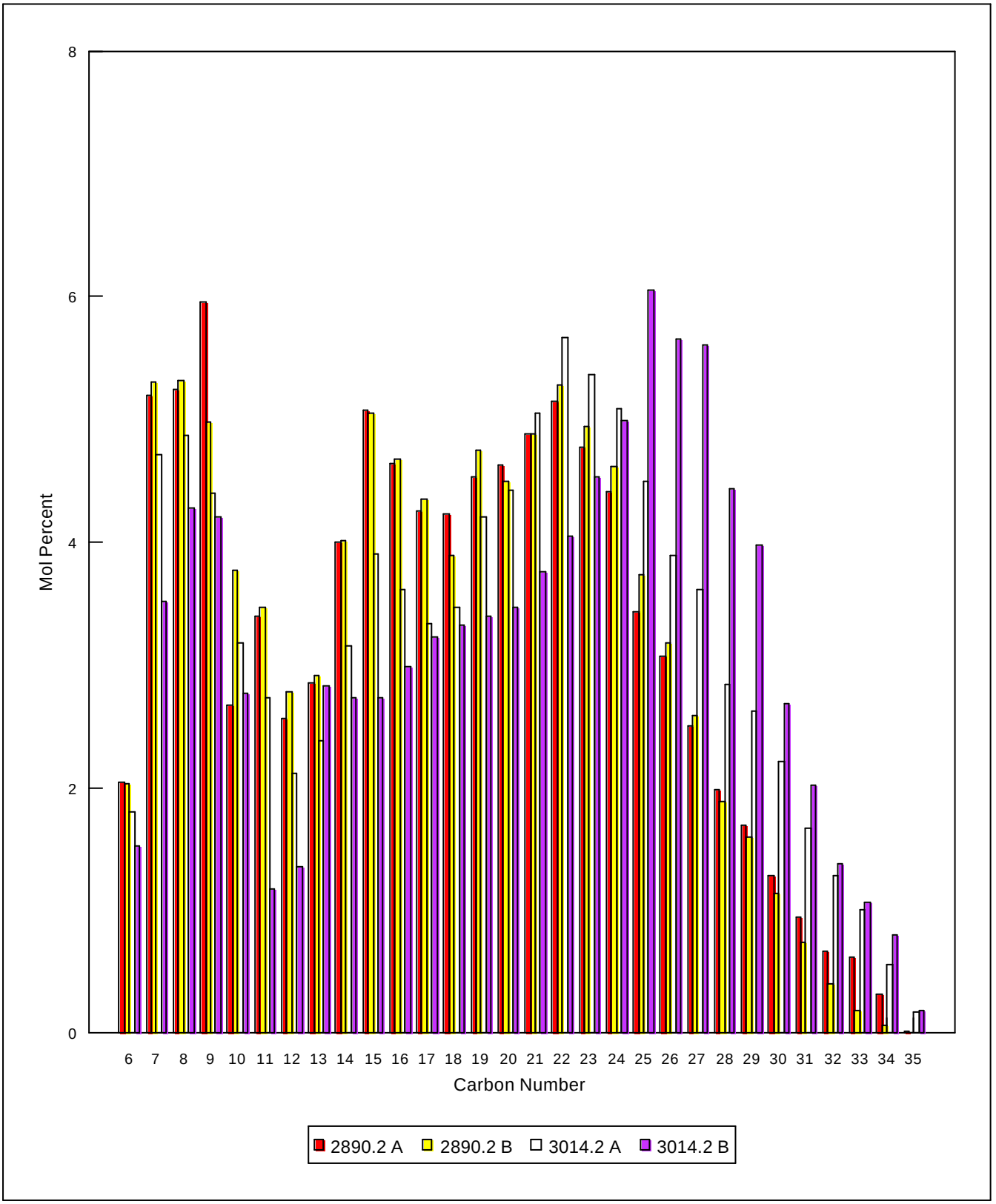
FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
OIL BOTTOM HOLE SAMPLES - CLEANED UP

	Sample ID	MPSR 3348	MPSR 3349	MPSR 3350	MDT SC-02
	Depth	2890.2 A	2890.2 B	3014.2 A	3014.2 B
	Fluid	Oil	Oil	Oil	Oil
Component		Mol %	Mol %	Mol %	Mol %
Hexanes minus	C6-	2.95	2.95	2.13	5.26
Hexanes	C6	2.05	2.03	1.80	1.52
Heptanes	C7	5.20	5.31	4.71	3.52
Octanes	C8	5.24	5.32	4.87	4.28
Nonanes	C9	5.96	4.98	4.40	4.21
Decanes	C10	2.67	3.77	3.18	2.77
Undecanes	C11	3.40	3.47	2.74	1.17
Dodecanes	C12	2.56	2.78	2.12	1.36
Tridecanes	C13	2.85	2.91	2.38	2.83
Tetradecanes	C14	4.00	4.01	3.16	2.74
Pentadecanes	C15	5.08	5.05	3.91	2.73
Hexadecanes	C16	4.64	4.68	3.61	2.99
Heptadecanes	C17	4.25	4.35	3.34	3.23
Octadecanes	C18	4.23	3.89	3.47	3.32
Nonadecanes	C19	4.53	4.75	4.21	3.40
Eicosanes	C20	4.63	4.50	4.43	3.47
Heneicosanes	C21	4.88	4.88	5.05	3.76
Docosanes	C22	5.15	5.28	5.67	4.05
Tricosanes	C23	4.77	4.94	5.37	4.53
Tetracosanes	C24	4.41	4.62	5.09	4.99
Pentacosanes	C25	3.44	3.74	4.50	6.05
Hexacosanes	C26	3.07	3.18	3.89	5.65
Heptacosanes	C27	2.50	2.59	3.61	5.61
Octacosanes	C28	1.98	1.89	2.84	4.44
Nonacosanes	C29	1.69	1.60	2.62	3.98
Triacontanes plus	C30	1.29	1.14	2.21	2.69
Hentriacontanes	C31	0.95	0.74	1.67	2.02
Dotriacontanes	C32	0.67	0.40	1.28	1.38
Tritriacontanes	C33	0.62	0.19	1.01	1.07
Tetratriacontanes	C34	0.32	0.06	0.56	0.80
Pentatriacontanes Plus	C35+	0.02	0.00	0.17	0.18
TOTAL		100.00	100.00	100.00	100.00

Molecular Weight Calculated *	:	236.2	233.6	256.6	267.5
Density @ 60 °F Calculated *	:	0.8483	0.8469	0.8576	0.8616
Molecular Weight Measured (gr/mol)	:	--	--	--	--
Density @ 60 °F Measured (gr/cc)	:	--	--	--	--
Wax Content (% wt)	:	--	--	--	--
Asphaltene Content (% wt)	:	--	--	--	--
Cloud Point (°C)	:	--	--	--	--
Pour Point (°C)	:	--	--	--	--

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

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY
OIL BOTTOM HOLE SAMPLES - CLEANED UP



Validity Check on Cylinder 812672 EX MPSR-3348 Taken at 2890.2 m

Saturation Pressure : 2200 psig @ 75 ° F

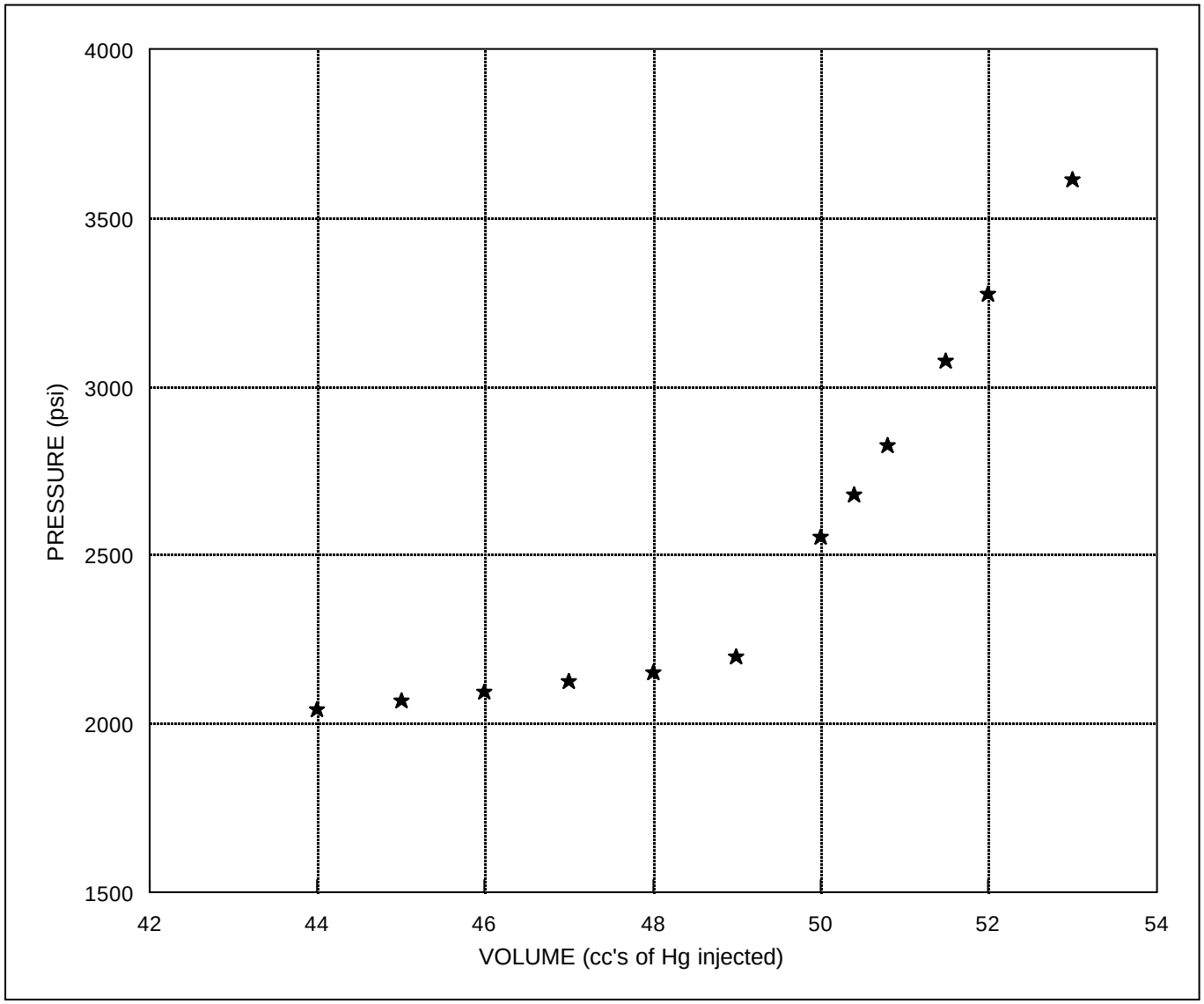
Sample # 4

Transfer Conditions

Sampled	:	March 20, 2008
Sampler ID	:	MPSR-3348
Opening Pressure (psig)	:	1850

Transferred into Cylinder #	:	812672
Amount Transferred (ccs)	:	750
Transfer Pressure (psig)	:	5000

Volume (cc's)	Pressure (psi)
44.0	2044
45.0	2072
46.0	2098
47.0	2127
48.0	2155
49.0	2200
50.0	2553
50.4	2680
50.8	2827
51.5	3075
52.0	3275
53.0	3614



Validity Check on Cylinder 812650 EX MPSR-3349 Taken at 2890.2 m

Saturation Pressure : 2225 psig @ 75 ° F

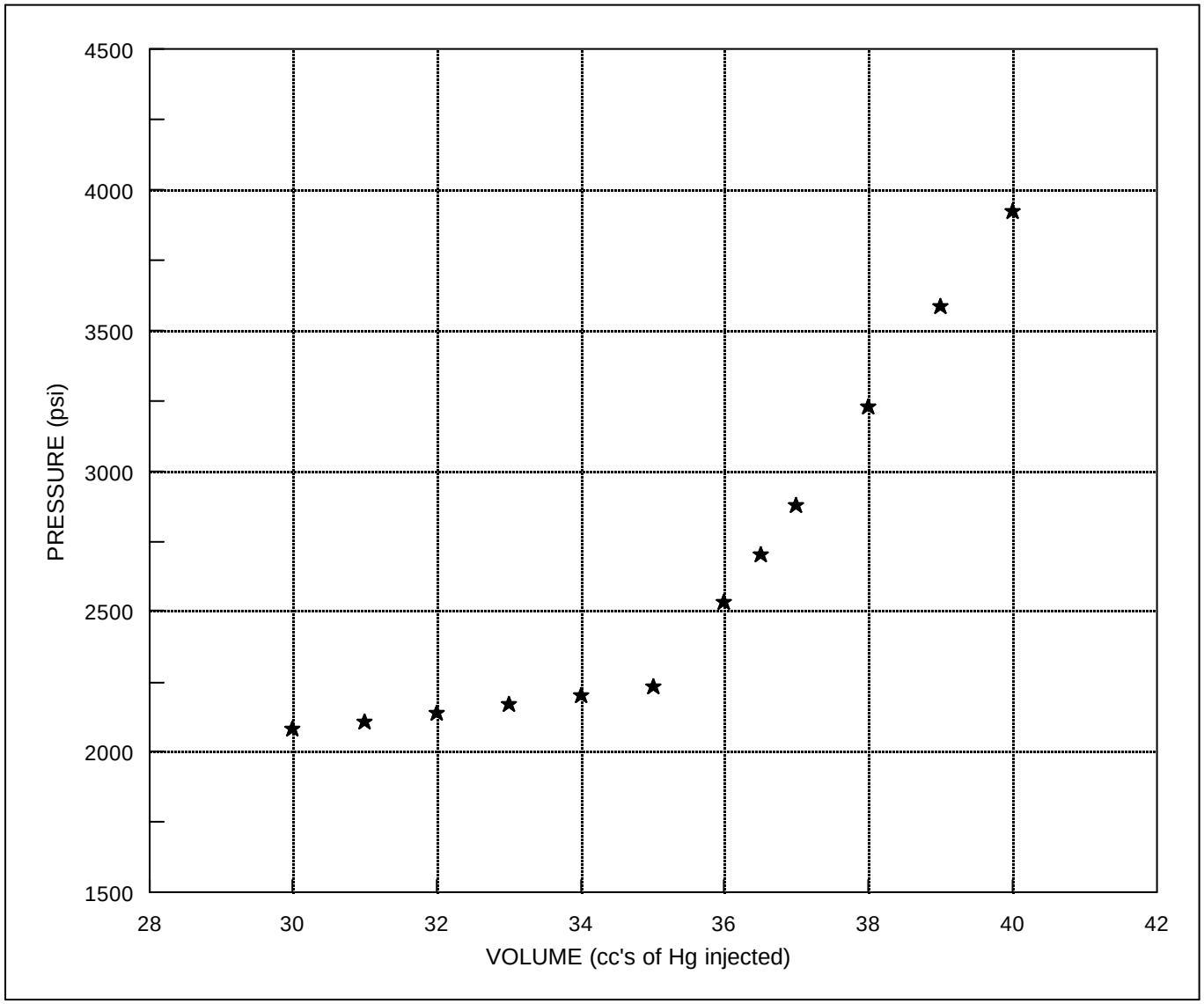
Sample # 5

Sampling Conditions

Sampled	:	March 20, 2008
Sampler ID	:	MPSR-3349
Opening Pressure (psig)	:	1800

Transferred into Cylinder #	:	812650
Amount Transferred (ccs)	:	750
Transfer Pressure (psig)	:	5000

Volume (cc's)	Pressure (psi)
30.0	2085
31.0	2111
32.0	2139
33.0	2170
34.0	2200
35.0	2235
36.0	2535
36.5	2703
37.0	2877
38.0	3227
39.0	3587
40.0	3923



Validity Check on Cylinder 812417 EX MPSR-3350 Taken at 3014.2 m

Saturation Pressure : 2830 psig @ 75 ° F

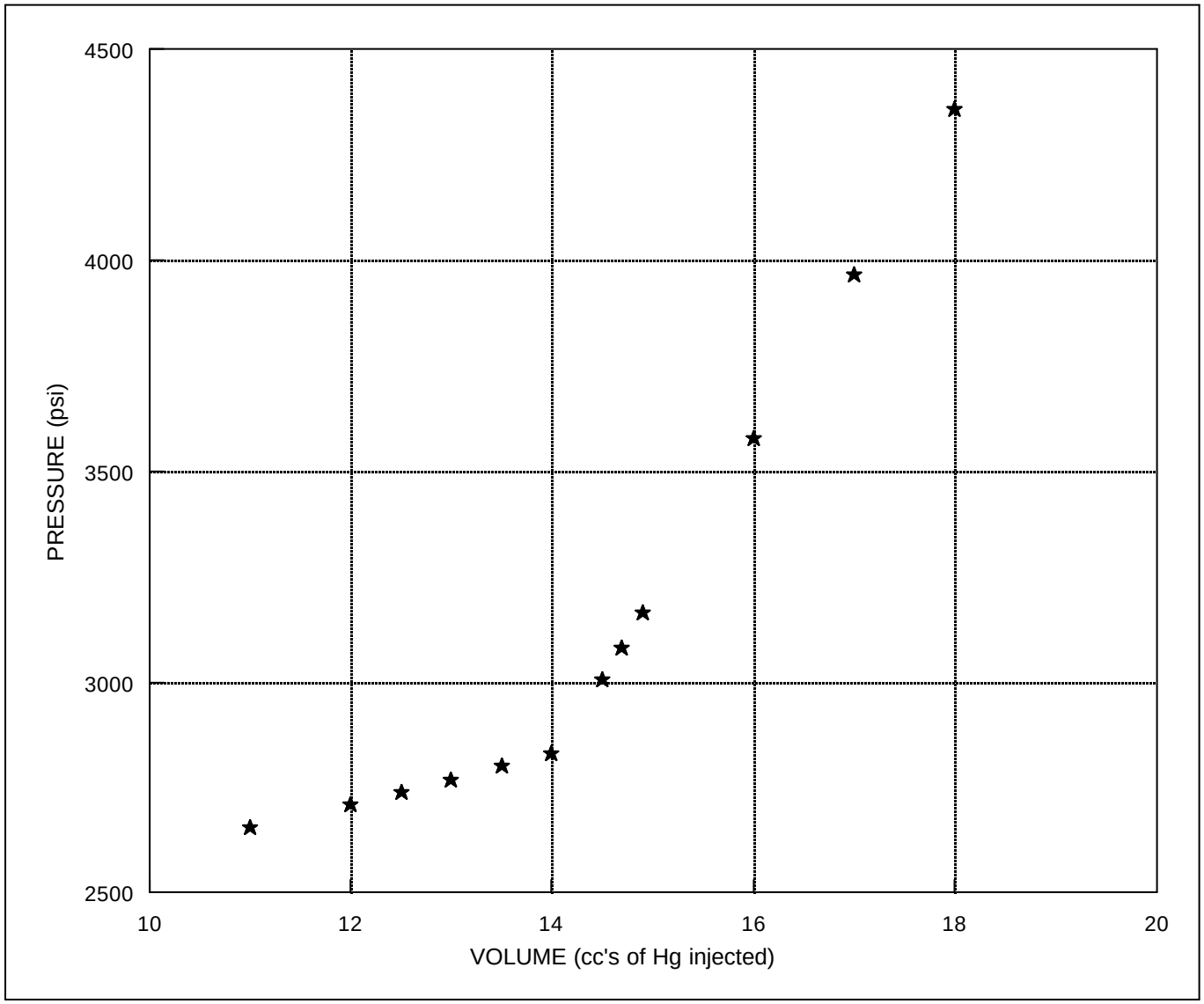
Sample # 7

Sampling Conditions

Sampled	:	March 20, 2008
Sampler ID	:	MPSR-3350
Opening Pressure (psig)	:	1920

Transferred into Cylinder #	:	812417
Amount Transferred (ccs)	:	750
Transfer Pressure (psig)	:	5000

Volume (cc's)	Pressure (psi)
11.0	2658
12.0	2711
12.5	2740
13.0	2770
13.5	2801
14.0	2830
14.5	3008
14.7	3083
14.9	3164
16.0	3579
17.0	3966
18.0	4359



PETROLAB

Company : Esso Australia Pty. Ltd.	Page : 19 of 136
Well : Snapper A21-A	File : E - 28005

STOCK TANK WATER ANALYSIS

SAMPLE 1, FROM CYLINDER NUMBER 812401 Ex MPSR 3303

Resistivity	:	0.196	Ohm.M @ 25 °C
Conductivity (E.C)	:	54371	micro-S/cm @ 25 °C
pH	:	5.9	
Density	:	1.0245	gm/cc @ 25 °C
Total alkalinity	:	360	Each as CaCO3

Cations

		mg/l	meq/l
Calcium	(Ca):	1400.0	69.86
Magnesium	(Mg):	200.0	16.46
Sodium	(Na):	9600.0	417.57
Potassium	(K):	500.0	12.79

Anions

		mg/l	meq/l
Hydroxide	(OH):	0.0	0.00
Carbonate	(CO3):	0.0	0.00
Bi-Carbonate	(HCO3):	438.9	7.19
Sulphate	(SO4):	30.0	0.62
Chloride	(Cl):	17000.0	479.55
Nitrate	(NO3):	2.0	0.03

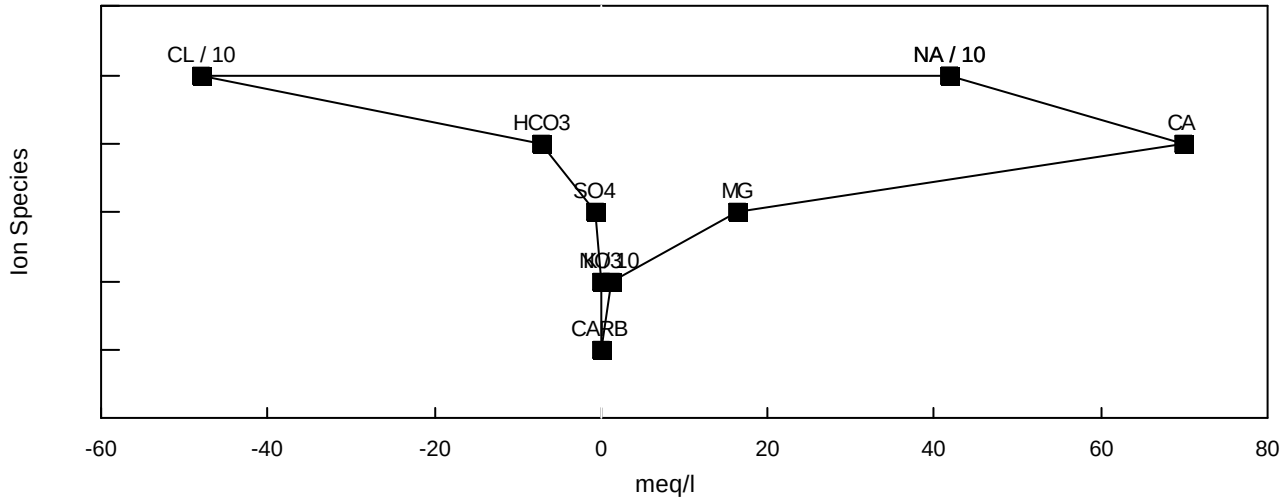
Total dissolved solids

		mg/l
Calculated (HCO3=CO3)	:	28948
From Conductivity	:	32283
Salinity	:	30685

Hardness

Carbonate	:	360
Non-Carbonate	:	3960
Total	:	4320

STIFF DIAGRAM



COMPOSITIONAL ANALYSIS OF GAS IN WATER SOLUTION

SAMPLE 1, FROM CYLINDER NUMBER 812401 Ex MPSR 3303

Component		Mol %	GPM
Hydrogen Sulphide	H2S	0.00	
Carbon Dioxide	CO2	19.46	
Nitrogen	N2	0.11	
Methane	C1	68.18	
Ethane	C2	7.07	1.892
Propane	C3	3.57	0.984
Iso-Butane	iC4	0.36	0.118
N-Butane	nC4	0.75	0.237
Iso-Pentane	iC5	0.14	0.051
N-Pentane	nC5	0.14	0.051
Hexanes	C6	0.18	0.070
Heptanes	C7	0.04	0.017
Octanes	C8	0.00	0.000
Nonanes	C9	0.00	0.000
Decanes	C10	0.00	0.000
Undecanes	C11	0.00	0.000
Dodecanes Plus	C12+	0.00	0.000
TOTAL		100.00	3.420

Pressure Base	:	14.696
Zsc	:	0.997
Mol Weight	:	24.27
Gas Gravity	:	0.841
Pc	:	743.6
Tc	:	416.4
Mol Weight C6+	:	86.2
Density C6+	:	0.6694
Mol Weight C7+	:	96.0
Density C7+	:	0.6837
Mol Weight C10+	:	--
Density C10+	:	--
Mol Weight C11+	:	--
Density C11+	:	--
Mol Weight C12+	:	--
Density C12+	:	--
Heating Value (BTU/ft3)		
Gross	:	967
Nett	:	876
Wobbe Index	:	1055
Zpt *	:	1.000

Gas Water Ratio: 14.7 Scf / Bbl

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812664 Ex MPSR 3304

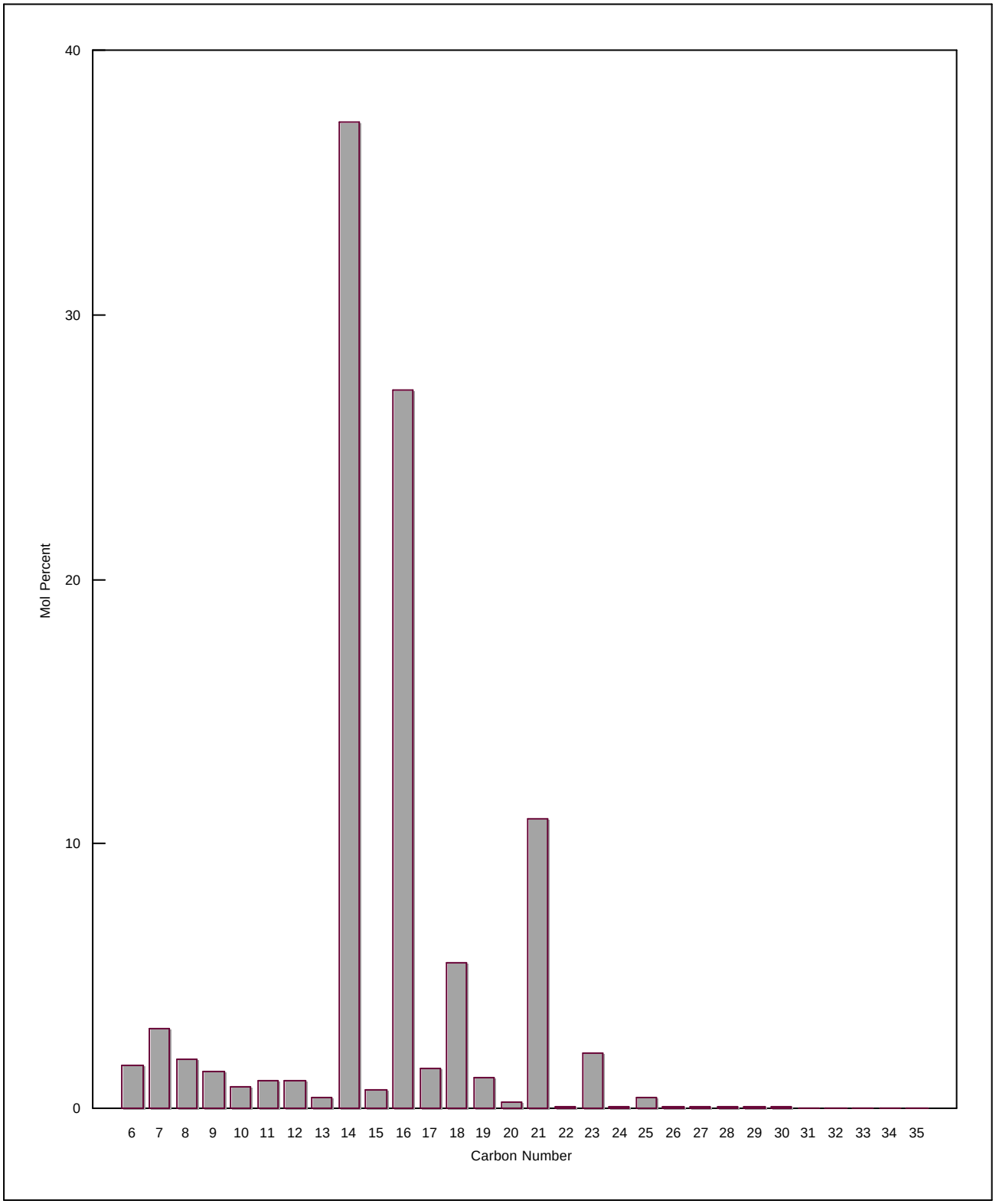
Component		Mol %
Hexanes minus	C6-	1.89
Hexanes	C6	1.58
Heptanes	C7	3.01
Octanes	C8	1.85
Nonanes	C9	1.37
Decanes	C10	0.77
Undecanes	C11	1.02
Dodecanes	C12	1.04
Tridecanes	C13	0.40
Tetradecanes	C14	37.32
Pentadecanes	C15	0.70
Hexadecanes	C16	27.17
Heptadecanes	C17	1.50
Octadecanes	C18	5.49
Nonadecanes	C19	1.13
Eicosanes	C20	0.20
Heneicosanes	C21	10.91
Docosanes	C22	0.05
Tricosanes	C23	2.08
Tetracosanes	C24	0.04
Pentacosanes	C25	0.39
Hexacosanes	C26	0.02
Heptacosanes	C27	0.04
Octacosanes	C28	0.01
Nonacosanes	C29	0.01
Triacontanes	C30	0.01
Hentriacontanes	C31	0.00
Dotriacontanes	C32	0.00
Tritriacontanes	C33	0.00
Tetratriacontanes	C34	0.00
Pentatriacontanes Plus	C35+	0.00
TOTAL		100.00

Molecular Weight Calculated *	:	207.9
Density @ 60 °F Calculated *	:	0.8321
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.7884

*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 # 812664 Ex MPSR 3304



PETROLAB

Company : Esso Australia Pty. Ltd.	Page : 23 of 136
Well : Snapper A21-A	File : E - 28005

COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

2764.5 mMD depth

Sample 2, Cylinder # 812664 Ex MPSR 3304

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.15	10.51	10.15
Nitrogen	N2	0.00	0.10	0.10
Methane	C1	0.44	75.51	72.92
Ethane	C2	0.27	7.91	7.65
Propane	C3	0.47	3.91	3.79
Iso-Butane	iC4	0.09	0.31	0.30
N-Butane	nC4	0.31	0.72	0.71
Iso-Pentane	iC5	0.19	0.17	0.17
N-Pentane	nC5	0.29	0.20	0.20
Hexanes	C6	1.57	0.28	0.32
Heptanes	C7	3.00	0.24	0.34
Octanes	C8	1.84	0.09	0.15
Nonanes	C9	1.37	0.04	0.09
Decanes	C10	0.77	0.00	0.03
Undecanes	C11	1.02	0.01	0.04
Dodecanes Plus	C12+	88.23	0.00	3.04
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.0345	0.9655	1.0000
Mass Ratio	:	0.2854	0.7146	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	-- @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	12729 SCF	--
Stream Properties				
Molecular Weight	:	249.6	22.36	30.2
Density obs. (gm/cc)	:	0.8546 @ 60 °F	--	-- @ PT*
Gravity (AIR = 1.000)	:	33.9 °API @ 60 °F	0.775	--
GHV (BTU/scf)	:	--	1090	--
Hexanes Plus Properties				
Mol %	:	97.80	0.66	4.01
Molecular Weight	:	254.2	94.7	228.9
Density (gm/cc @ 60 °F)	:	0.8567	0.6819	0.8425
Gravity (°API @ 60 °F)	:	33.5	75.8	36.3
Heptanes Plus Properties				
Mol %	:	96.22	0.38	3.69
Molecular Weight	:	257.0	102.6	241.7
Density (gm/cc @ 60 °F)	:	0.8579	0.6925	0.8493
Gravity (°API @ 60 °F)	:	33.3	72.6	34.9
Decanes Plus Properties				
Mol %	:	90.01	0.01	3.11
Molecular Weight	:	267.5	146.9	267.1
Density (gm/cc @ 60 °F)	:	0.8616	0.7399	0.8614
Gravity (°API @ 60 °F)	:	32.6	59.6	32.6
Undecanes Plus Properties				
Mol %	:	89.25	0.01	3.08
Molecular Weight	:	268.7	146.9	268.3
Density (gm/cc @ 60 °F)	:	0.8620	0.7399	0.8618
Gravity (°API @ 60 °F)	:	32.5	59.6	32.5
Dodecanes Plus Properties				
Mol %	:	88.23	0.00	3.04
Molecular Weight	:	270.1	--	270.1
Density (gm/cc @ 60 °F)	:	0.8625	--	0.8625
Gravity (°API @ 60 °F)	:	32.4	--	32.4

* (P)ressure : 3769 psig * (T)emperature : 253 °F

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812664 Ex MPSR 3304

OBM Mathematically Cleaned Up

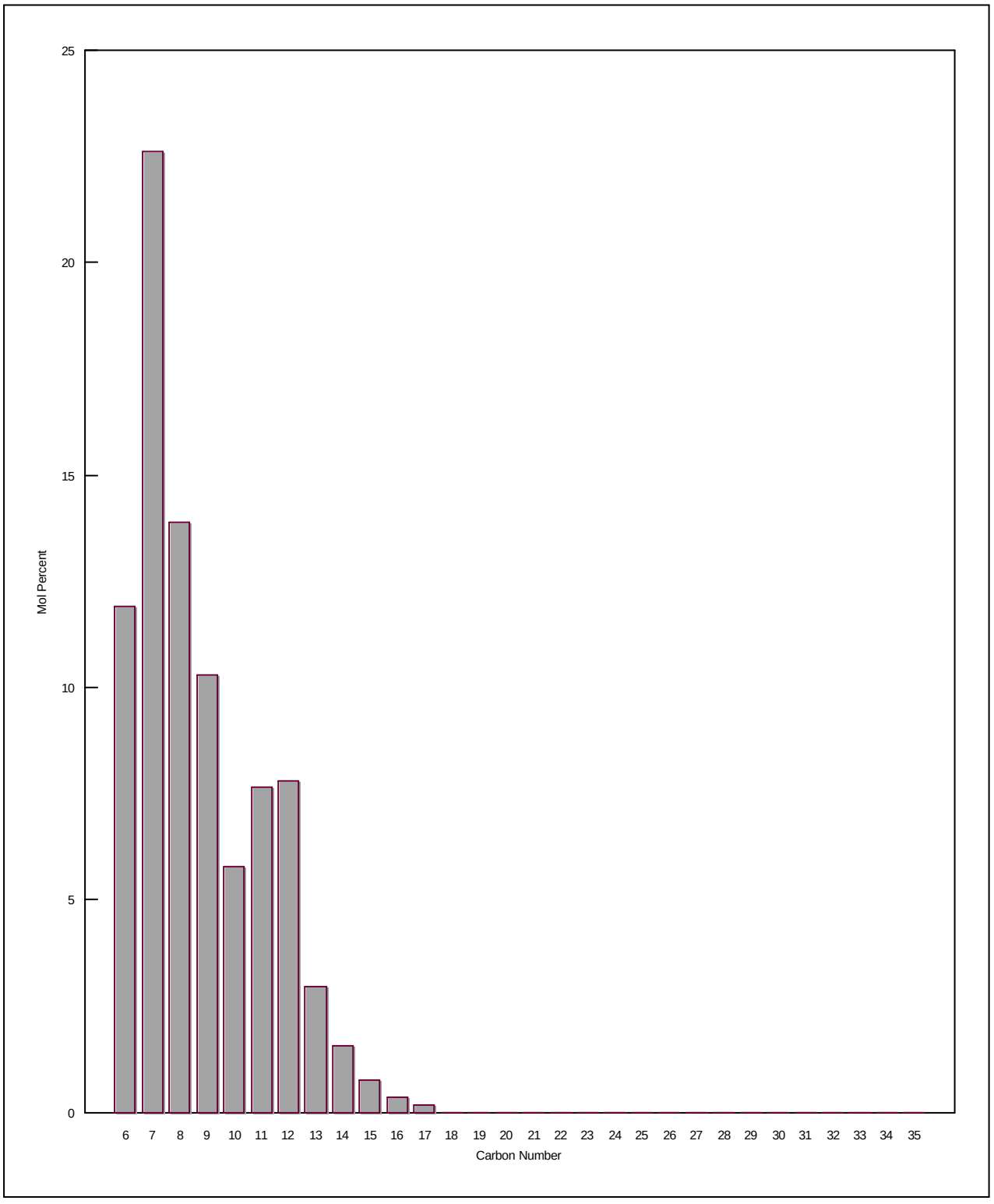
Component		Mol %
Hexanes minus	C6-	14.21
Hexanes	C6	11.91
Heptanes	C7	22.61
Octanes	C8	13.88
Nonanes	C9	10.28
Decanes	C10	5.80
Undecanes	C11	7.67
Dodecanes	C12	7.80
Tridecanes	C13	2.98
Tetradecanes	C14	1.56
Pentadecanes	C15	0.76
Hexadecanes	C16	0.36
Heptadecanes	C17	0.17
Octadecanes	C18	0.01
Nonadecanes	C19	0.00
Eicosanes	C20	0.00
Heneicosanes	C21	0.00
Docosanes	C22	0.00
Tricosanes	C23	0.00
Tetracosanes	C24	0.00
Pentacosanes	C25	0.00
Hexacosanes	C26	0.00
Heptacosanes	C27	0.00
Octacosanes	C28	0.00
Nonacosanes	C29	0.00
Triacontanes	C30	0.00
Hentriacontanes	C31	0.00
Dotriacontanes	C32	0.00
Tritriacontanes	C33	0.00
Tetratriacontanes	C34	0.00
Pentatriacontanes Plus	C35+	0.00
TOTAL		100.00

Molecular Weight Calculated *	:	111.3
Density @ 60 °F Calculated *	:	0.7391
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.7391

*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 # 812664 Ex MPSR 3304
OBM Mathematically Cleaned Up



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Well : Snapper A21-A	File : E - 28005

COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

2764.5 mMD depth - OBM Mathematically Cleaned Up

Sample 2, Cylinder # 812664 Ex MPSR 3304

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.15	10.51	10.46
Nitrogen	N2	0.00	0.10	0.10
Methane	C1	0.44	75.51	75.13
Ethane	C2	0.27	7.91	7.87
Propane	C3	0.47	3.91	3.89
Iso-Butane	iC4	0.09	0.31	0.31
N-Butane	nC4	0.31	0.72	0.72
Iso-Pentane	iC5	0.19	0.17	0.17
N-Pentane	nC5	0.29	0.20	0.20
Hexanes	C6	13.58	0.28	0.35
Heptanes	C7	25.77	0.24	0.37
Octanes	C8	15.82	0.09	0.17
Nonanes	C9	11.72	0.04	0.10
Decanes	C10	6.61	0.00	0.03
Undecanes	C11	8.74	0.01	0.05
Dodecanes Plus	C12+	15.55	0.00	0.08
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.0051	0.9949	1.0000
Mass Ratio	:	0.0262	0.9738	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	-- @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	167008 SCF	--
Stream Properties				
Molecular Weight	:	116.8	22.36	22.8
Density obs. (gm/cc)	:	0.7539 @ 60 °F	--	-- @ PT*
Gravity (AIR = 1.000)	:	56.0 °API @ 60 °F	0.775	--
GHV (BTU/scf)	:	--	1090	--
Hexanes Plus Properties				
Mol %	:	97.80	0.66	1.15
Molecular Weight	:	118.4	94.7	104.9
Density (gm/cc @ 60 °F)	:	0.7567	0.6819	0.7164
Gravity (°API @ 60 °F)	:	55.3	75.8	65.8
Heptanes Plus Properties				
Mol %	:	84.22	0.38	0.80
Molecular Weight	:	123.9	102.6	114.0
Density (gm/cc @ 60 °F)	:	0.7654	0.6925	0.7329
Gravity (°API @ 60 °F)	:	53.2	72.6	61.4
Decanes Plus Properties				
Mol %	:	30.91	0.01	0.16
Molecular Weight	:	157.1	146.9	155.7
Density (gm/cc @ 60 °F)	:	0.7980	0.7399	0.7941
Gravity (°API @ 60 °F)	:	45.6	59.6	46.5
Undecanes Plus Properties				
Mol %	:	24.29	0.01	0.13
Molecular Weight	:	163.3	146.9	162.1
Density (gm/cc @ 60 °F)	:	0.8026	0.7399	0.7981
Gravity (°API @ 60 °F)	:	44.6	59.6	45.6
Dodecanes Plus Properties				
Mol %	:	15.55	0.00	0.08
Molecular Weight	:	172.5	--	172.5
Density (gm/cc @ 60 °F)	:	0.8093	--	0.8093
Gravity (°API @ 60 °F)	:	43.2	--	43.2

* (P)ressure : 3769 psig * (T)emperature : 253 °F

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812660 Ex MPSR 3305

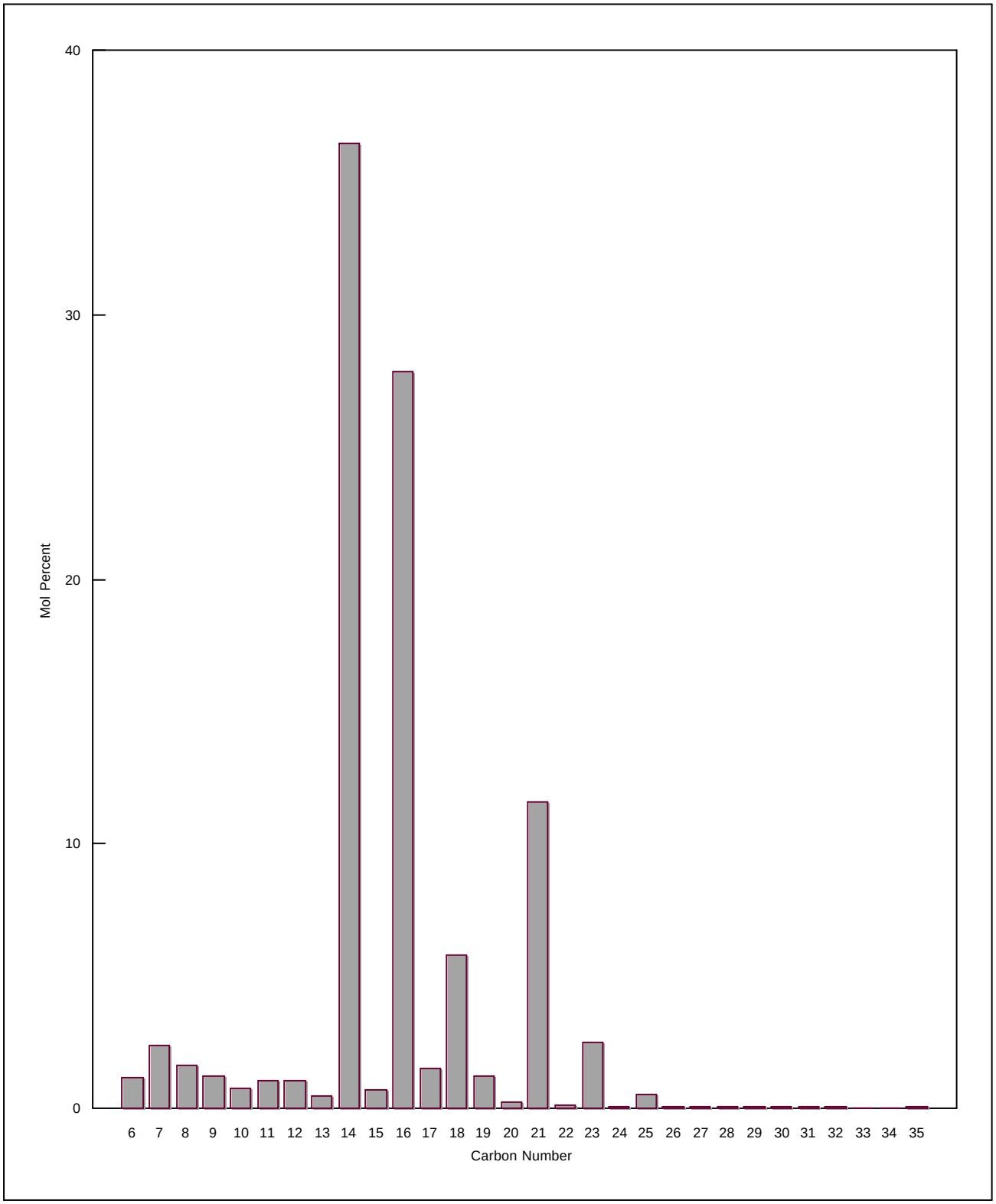
Component		Mol %
Hexanes minus	C6-	1.77
Hexanes	C6	1.14
Heptanes	C7	2.38
Octanes	C8	1.60
Nonanes	C9	1.21
Decanes	C10	0.76
Undecanes	C11	1.01
Dodecanes	C12	1.01
Tridecanes	C13	0.44
Tetradecanes	C14	36.51
Pentadecanes	C15	0.69
Hexadecanes	C16	27.86
Heptadecanes	C17	1.51
Octadecanes	C18	5.80
Nonadecanes	C19	1.22
Eicosanes	C20	0.23
Heneicosanes	C21	11.57
Docosanes	C22	0.11
Tricosanes	C23	2.45
Tetracosanes	C24	0.06
Pentacosanes	C25	0.49
Hexacosanes	C26	0.04
Heptacosanes	C27	0.07
Octacosanes	C28	0.02
Nonacosanes	C29	0.01
Triacontanes	C30	0.01
Hentriacontanes	C31	0.01
Dotriacontanes	C32	0.01
Tritriacontanes	C33	0.00
Tetratriacontanes	C34	0.00
Pentatriacontanes Plus	C35+	0.01
TOTAL		100.00

Molecular Weight Calculated *	:	211.4
Density @ 60 °F Calculated *	:	0.8340
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.8421

*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 # 812660 Ex MPSR 3305



PETROLAB

Company : Esso Australia Pty. Ltd. | Page : 29 of 136
Well : Snapper A21-A | File : E - 28005

COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

2764.5 mMD depth

Sample 3, Cylinder # 812660 Ex MPSR 3305

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.17	11.55	10.95
Nitrogen	N2	0.00	0.10	0.09
Methane	C1	0.41	71.60	67.83
Ethane	C2	0.24	7.08	6.72
Propane	C3	0.42	3.50	3.34
Iso-Butane	iC4	0.34	1.13	1.09
N-Butane	nC4	1.20	2.79	2.71
Iso-Pentane	iC5	0.81	0.72	0.72
N-Pentane	nC5	1.27	0.88	0.90
Hexanes	C6	1.10	0.29	0.33
Heptanes	C7	2.31	0.23	0.34
Octanes	C8	1.55	0.08	0.16
Nonanes	C9	1.17	0.03	0.09
Decanes	C10	0.74	0.02	0.06
Undecanes	C11	0.98	0.00	0.05
Dodecanes Plus	C12+	87.30	0.00	4.62
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.0530	0.9470	1.0000
Mass Ratio	:	0.3220	0.6780	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	-- @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	9571 SCF	--
Stream Properties				
Molecular Weight	:	206.5	24.32	34.0
Density obs. (gm/cc)	:	0.8310 @ 60 °F	--	-- @ PT*
Gravity (AIR = 1.000)	:	38.6 °API @ 60 °F	0.843	--
GHV (BTU/scf)	:	--	1170	--
Hexanes Plus Properties				
Mol %	:	95.14	0.65	5.65
Molecular Weight	:	214.1	94.3	201.1
Density (gm/cc @ 60 °F)	:	0.8360	0.6814	0.8264
Gravity (°API @ 60 °F)	:	37.6	76.0	39.6
Heptanes Plus Properties				
Mol %	:	94.04	0.36	5.32
Molecular Weight	:	215.6	102.6	208.4
Density (gm/cc @ 60 °F)	:	0.8368	0.6925	0.8314
Gravity (°API @ 60 °F)	:	37.4	72.6	38.5
Decanes Plus Properties				
Mol %	:	89.01	0.02	4.73
Molecular Weight	:	221.9	133.9	221.5
Density (gm/cc @ 60 °F)	:	0.8398	0.7277	0.8395
Gravity (°API @ 60 °F)	:	36.8	62.8	36.9
Undecanes Plus Properties				
Mol %	:	88.28	0.00	4.67
Molecular Weight	:	222.6	--	222.6
Density (gm/cc @ 60 °F)	:	0.8401	--	0.8401
Gravity (°API @ 60 °F)	:	36.8	--	36.8
Dodecanes Plus Properties				
Mol %	:	87.30	0.00	4.62
Molecular Weight	:	223.5	--	223.5
Density (gm/cc @ 60 °F)	:	0.8405	--	0.8405
Gravity (°API @ 60 °F)	:	36.7	--	36.7

* (P)ressure : 3769 psig * (T)emperature : 253 °F

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812660 Ex MPSR 3305

OBM Mathematically Cleaned Up

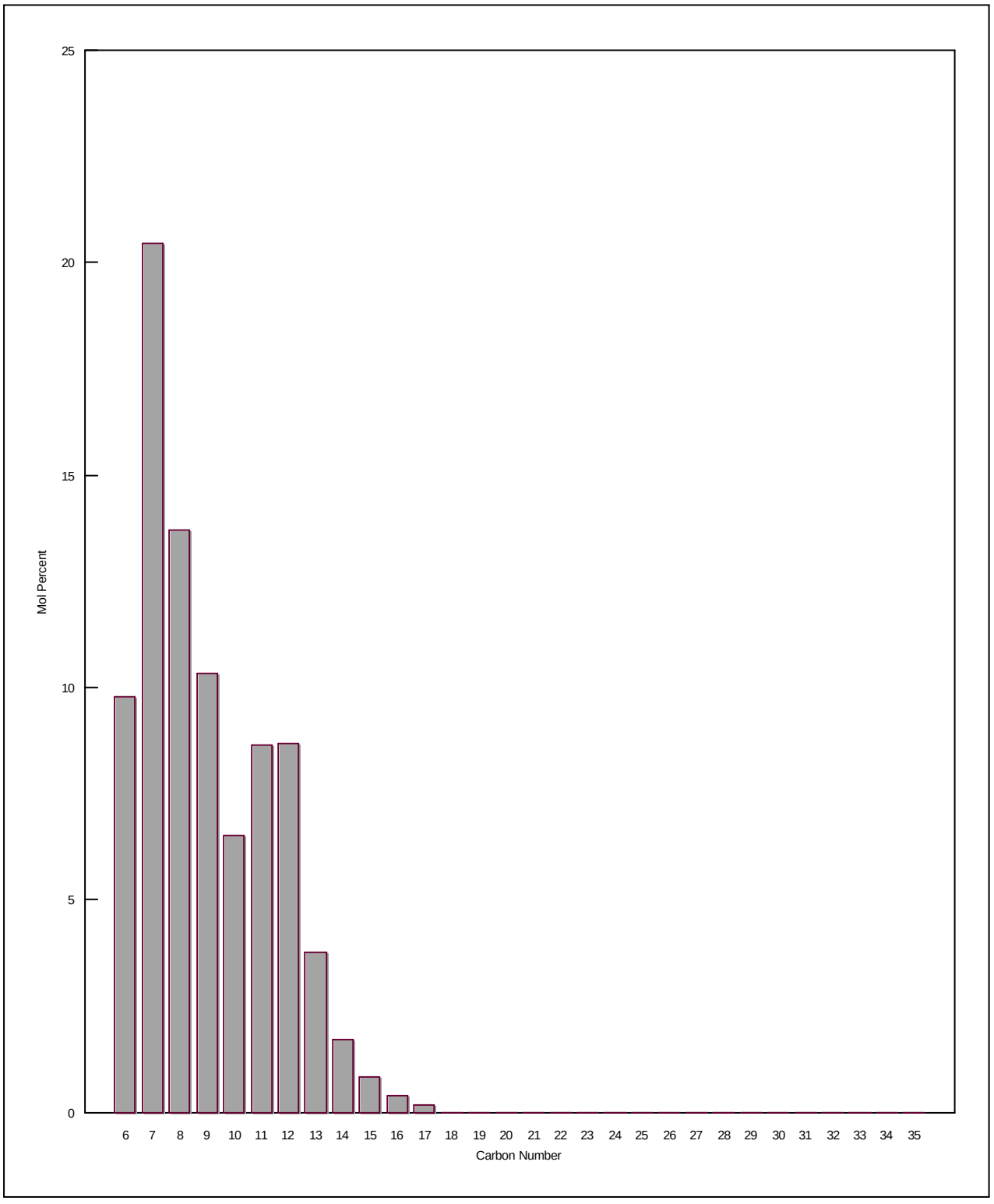
Component		Mol %
Hexanes minus	C6-	14.99
Hexanes	C6	9.77
Heptanes	C7	20.43
Octanes	C8	13.69
Nonanes	C9	10.33
Decanes	C10	6.52
Undecanes	C11	8.65
Dodecanes	C12	8.69
Tridecanes	C13	3.77
Tetradecanes	C14	1.72
Pentadecanes	C15	0.84
Hexadecanes	C16	0.40
Heptadecanes	C17	0.19
Octadecanes	C18	0.01
Nonadecanes	C19	0.00
Eicosanes	C20	0.00
Heneicosanes	C21	0.00
Docosanes	C22	0.00
Tricosanes	C23	0.00
Tetracosanes	C24	0.00
Pentacosanes	C25	0.00
Hexacosanes	C26	0.00
Heptacosanes	C27	0.00
Octacosanes	C28	0.00
Nonacosanes	C29	0.00
Triacontanes	C30	0.00
Hentriacontanes	C31	0.00
Dotriacontanes	C32	0.00
Tritriacontanes	C33	0.00
Tetratriacontanes	C34	0.00
Pentatriacontanes Plus	C35+	0.00
TOTAL		100.00

Molecular Weight Calculated *	:	112.9
Density @ 60 °F Calculated *	:	0.7410
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.7410

*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 # 812660 Ex MPSR 3305
OBM Mathematically Cleaned Up



COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

2764.5 mMD depth - OBM Mathematically Cleaned Up

Sample 3, Cylinder # 812660 Ex MPSR 3305

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.17	11.55	11.48
Nitrogen	N2	0.00	0.10	0.10
Methane	C1	0.41	71.60	71.15
Ethane	C2	0.24	7.08	7.04
Propane	C3	0.42	3.50	3.48
Iso-Butane	iC4	0.34	1.13	1.13
N-Butane	nC4	1.20	2.79	2.78
Iso-Pentane	iC5	0.81	0.72	0.72
N-Pentane	nC5	1.27	0.88	0.88
Hexanes	C6	10.93	0.29	0.36
Heptanes	C7	22.87	0.23	0.37
Octanes	C8	15.32	0.08	0.18
Nonanes	C9	11.56	0.03	0.10
Decanes	C10	7.30	0.02	0.07
Undecanes	C11	9.68	0.00	0.06
Dodecanes Plus	C12+	17.48	0.00	0.10
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.0063	0.9937	1.0000
Mass Ratio	:	0.0299	0.9701	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	-- @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	134322 SCF	--
Stream Properties				
Molecular Weight	:	118.5	24.32	24.9
Density obs. (gm/cc)	:	0.7556 @ 60 °F	--	-- @ PT*
Gravity (AIR = 1.000)	:	55.6 °API @ 60 °F	0.843	--
GHV (BTU/scf)	:	--	1170	--
Hexanes Plus Properties				
Mol %	:	95.14	0.65	1.24
Molecular Weight	:	121.6	94.3	107.4
Density (gm/cc @ 60 °F)	:	0.7611	0.6814	0.7225
Gravity (°API @ 60 °F)	:	54.2	76.0	64.2
Heptanes Plus Properties				
Mol %	:	84.21	0.36	0.88
Molecular Weight	:	126.5	102.6	116.9
Density (gm/cc @ 60 °F)	:	0.7685	0.6925	0.7397
Gravity (°API @ 60 °F)	:	52.5	72.6	59.6
Decanes Plus Properties				
Mol %	:	34.46	0.02	0.23
Molecular Weight	:	157.2	133.9	155.2
Density (gm/cc @ 60 °F)	:	0.7981	0.7277	0.7925
Gravity (°API @ 60 °F)	:	45.6	62.8	46.9
Undecanes Plus Properties				
Mol %	:	27.16	0.00	0.16
Molecular Weight	:	163.4	--	163.4
Density (gm/cc @ 60 °F)	:	0.8027	--	0.8027
Gravity (°API @ 60 °F)	:	44.6	--	44.6
Dodecanes Plus Properties				
Mol %	:	17.48	0.00	0.10
Molecular Weight	:	172.5	--	172.5
Density (gm/cc @ 60 °F)	:	0.8093	--	0.8093
Gravity (°API @ 60 °F)	:	43.2	--	43.2

* (P)ressure : 3769 psig * (T)emperature : 253 °F

CONSTANT MASS STUDY
@ 253 °F
On Bottom Hole Sample from Cylinder # 812664

Pressure (psig)		Relative Volume (V/Vsat) (1)	Formation Volume Factor (Bg) (2)	Gas Expansion Factor (E) (3)	Deviation Factor (Z)	Specific Volume (CFT/LB)	Gas Viscosity (Centipoise) (4)
7000		0.9345	0.00315	317.62	1.096	0.03957	0.0609
6900		0.9402	0.00317	315.69	1.087	0.03981	0.0601
6800		0.9461	0.00319	313.72	1.078	0.04006	0.0594
6700		0.9522	0.00321	311.72	1.069	0.04032	0.0586
6600		0.9584	0.00323	309.68	1.060	0.04058	0.0578
6500		0.9649	0.00325	307.61	1.051	0.04085	0.0571
6400		0.9715	0.00327	305.51	1.042	0.04114	0.0563
6300		0.9794	0.00330	303.07	1.034	0.04147	0.0554
6200		0.9874	0.00333	300.60	1.026	0.04181	0.0546
6050	*	1.0000	0.00337	296.81	1.014	0.04234	0.0532

* Dew Point Pressure

(1) Cubic feet of gas at indicated pressure and temperature per cubic foot at reservoir pressure
(2) Cubic feet of gas at indicated pressure and temperature per cubic foot at 14.696 psia and 60 °F
(3) Cubic feet of gas at 14.696 psia and 60 °F per cubic foot at indicated pressure and temperature
(4) Calculated from correlation of Lee, Gonzales and Eakin

CONSTANT MASS STUDY
@ 253 °F
On Bottom Hole Sample from Cylinder # 812664

Pressure (psig)		Relative Volume (V/Vsat) (1)	Retrograde Liquid Deposit (Bbl/MMSCF) (2)	(Volume%) (3)
6050	*	1.0000	0.00	0.00
5800		1.0214	5.52	0.92
5400		1.0681	40.62	6.77
5000		1.1223	82.93	13.82
4400		1.2315	108.07	18.01
3769	* *	1.3974	115.93	19.32
3100		1.6572	116.59	19.43
2500		2.0312	114.19	19.03
1900		2.6677	110.05	18.34
1300		3.9124	104.83	17.47
700		7.3225	98.35	16.39

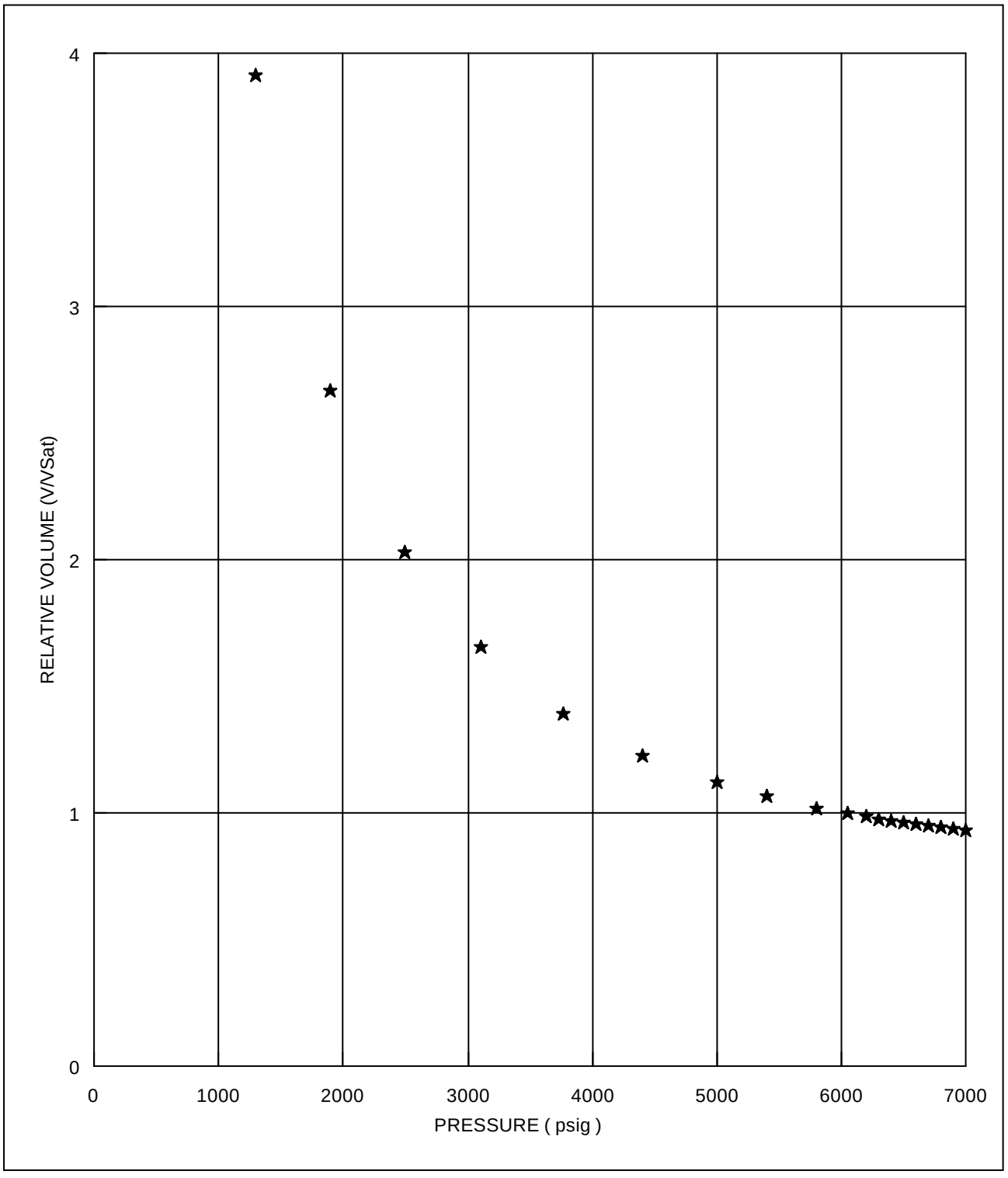
* Dew Point Pressure
* * Reservoir Pressure

(1) Cubic feet of gas at indicated pressure and temperature per cubic foot at saturation pressure
(2) Barrels of liquid at indicated pressure and temperature per MMSCF of original reservoir fluid
(3) Percent of reservoir hydrocarbon pore space at dew point

RELATIVE VOLUME

Equation of best fit

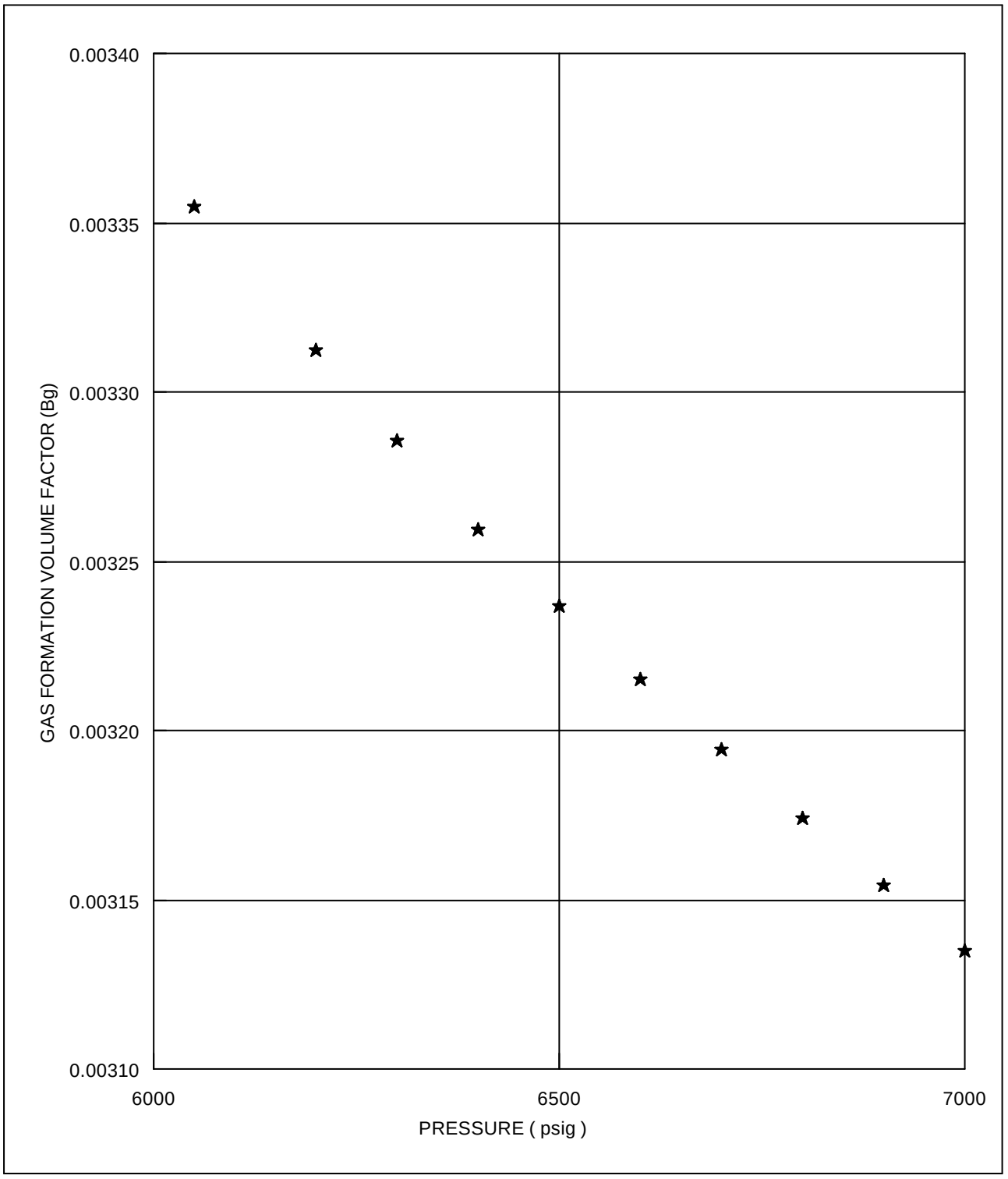
V/VSat = +1.30E+01 -1.04E-02 * P +3.46E-06 * P^2 -5.05E-10 * P^3 +2.68E-14 * P^4



GAS FORMATION VOLUME FACTOR

Equation of best fit

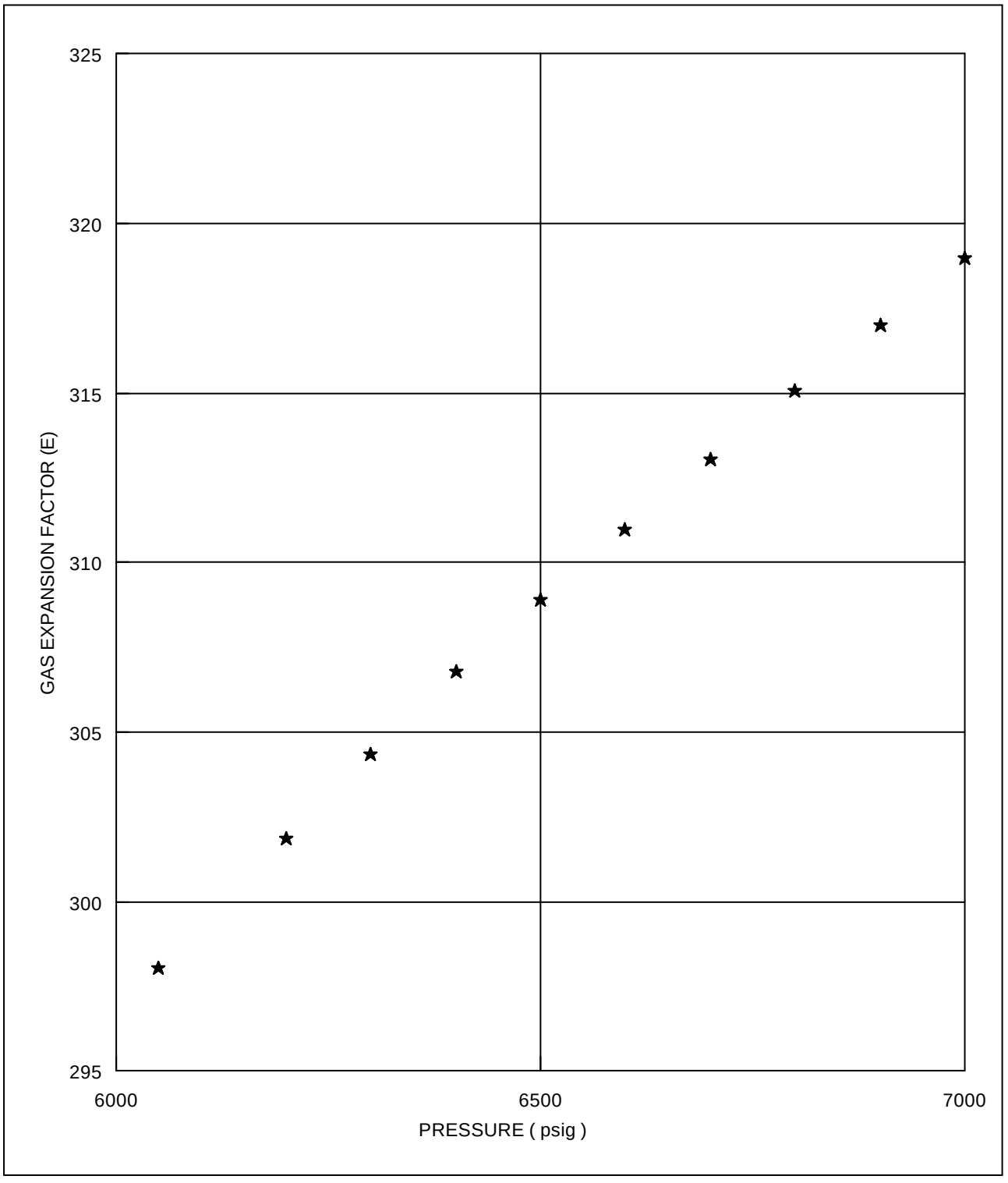
Bg = +1.77E-02 -5.80E-06 * P +7.95E-10 * P^2 -3.75E-14 * P^3 +0.00E+00 * P^4



GAS EXPANSION FACTOR

Equation of best fit

E = -8.17E+02 +4.48E-01 * P -6.13E-05 * P^2 +2.92E-09 * P^3 +0.00E+00 * P^4

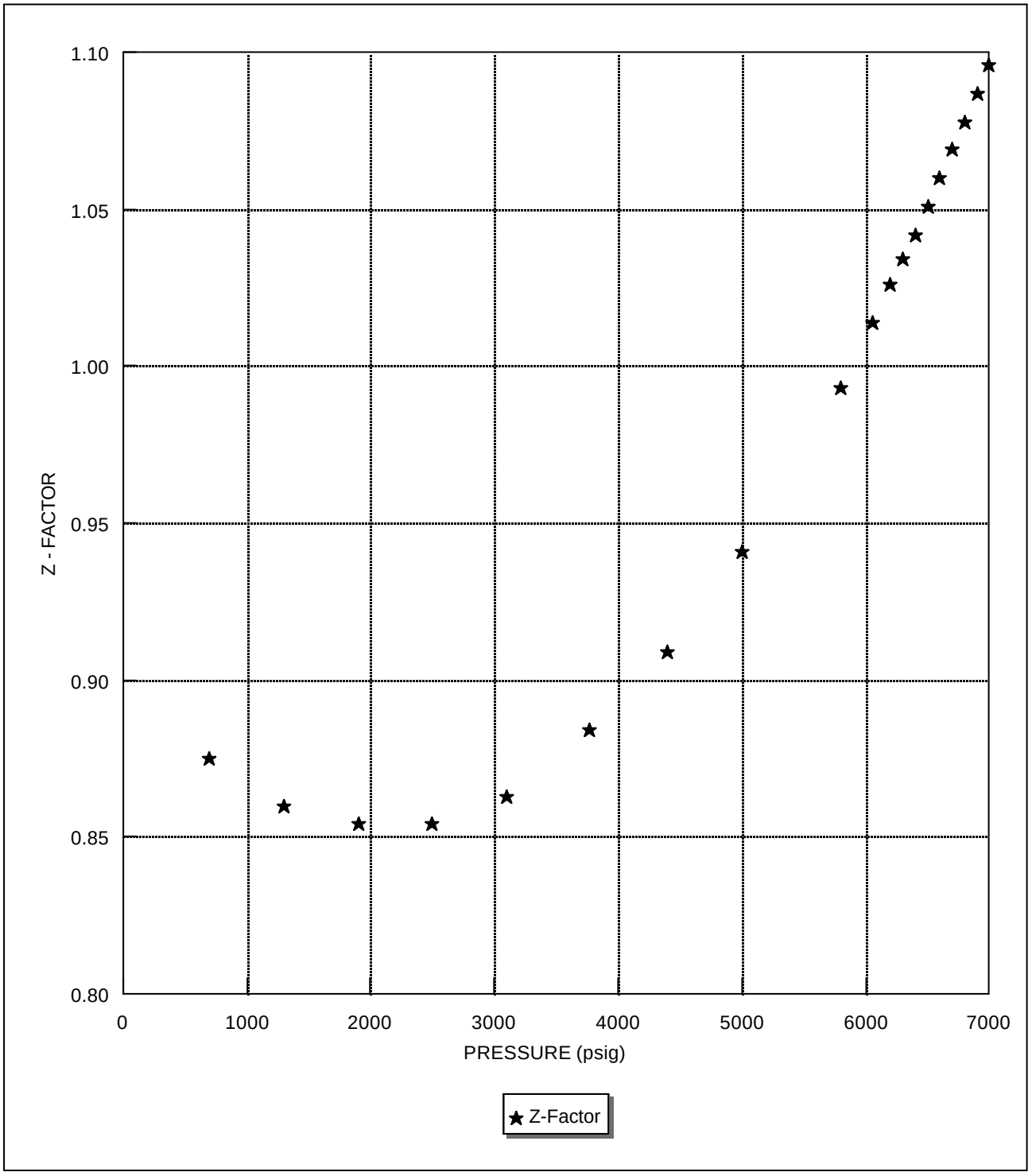


GAS DEVIATION FACTOR

Equation of best fit

Z

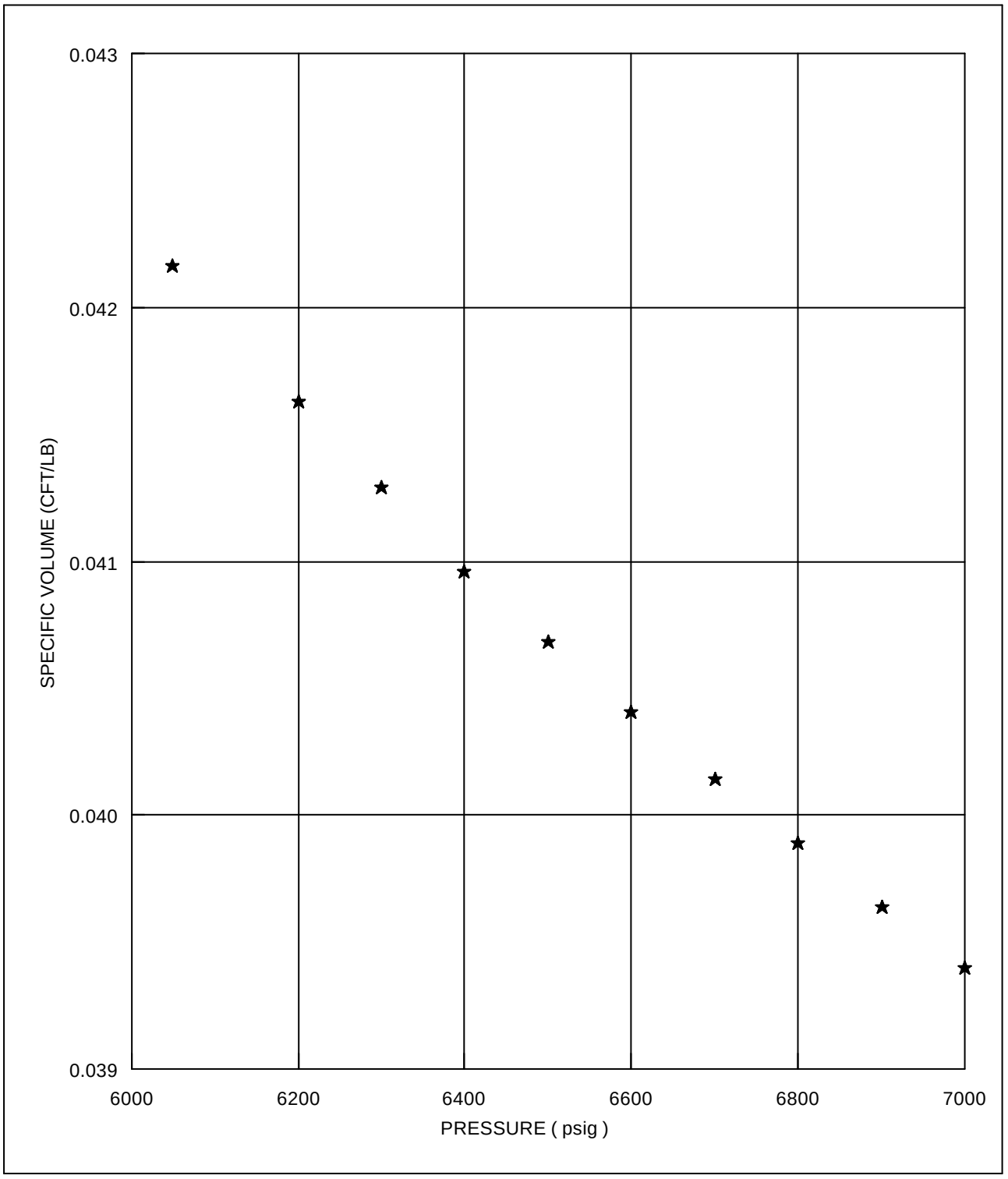
Z = -2.20E-10 +8.95E-04 * P -2.95E-07 * P^2 +4.05E-11 * P^3 +-1.92E-15 * P^4



RESERVOIR FLUID SPECIFIC VOLUME

Equation of best fit

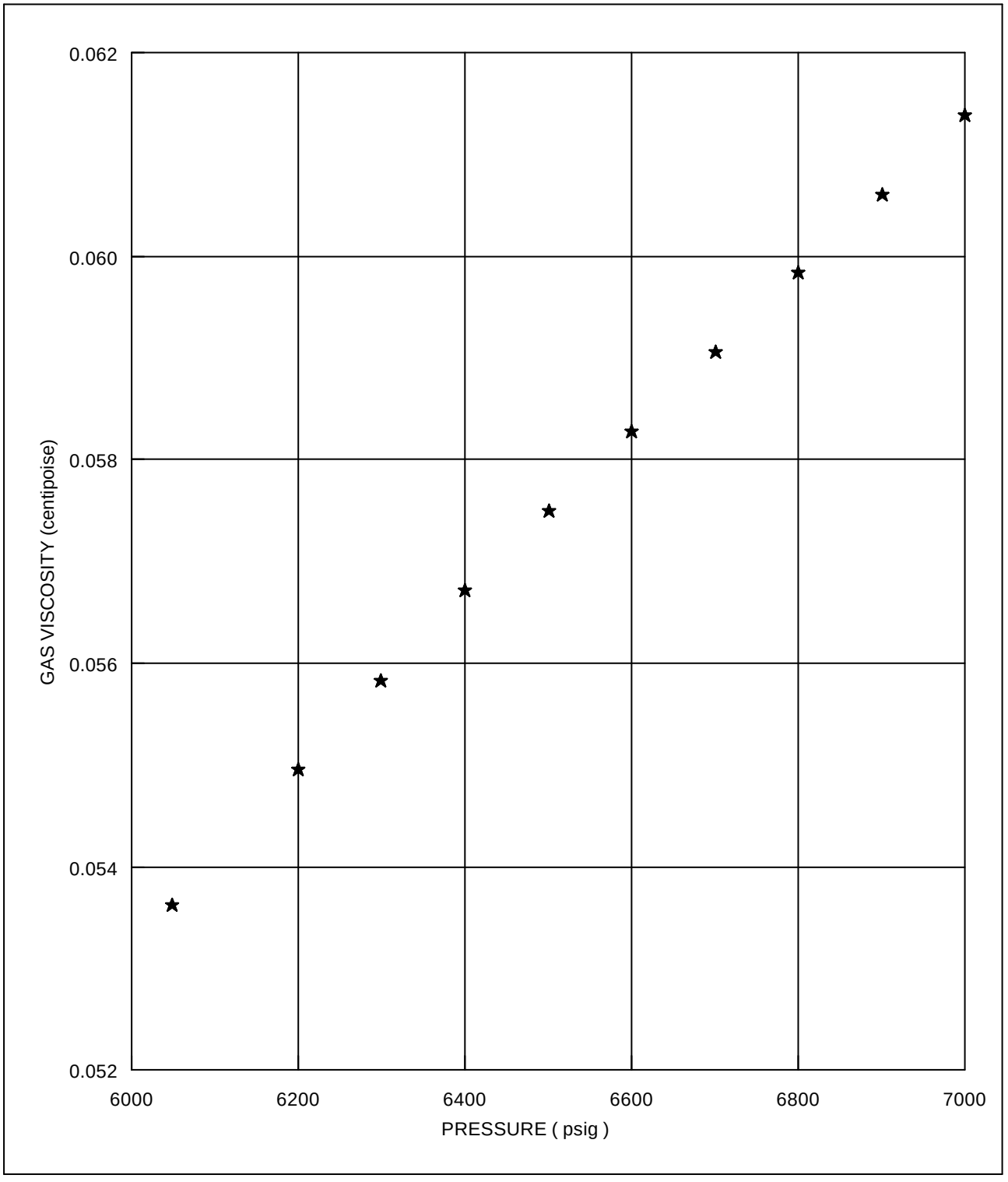
SV = +2.22E-01 -7.29E-05 * P +9.99E-09 * P^2 -4.72E-13 * P^3 +0.00E+00 * P^4



VISCOSITY OF RESERVOIR FLUID

Equation of best fit

$\mu = -2.79E\text{-}01 + 1.33E\text{-}04 * P - 1.83E\text{-}08 * P^2 + 8.90E\text{-}13 * P^3 + 0.00E+00 * P^4$

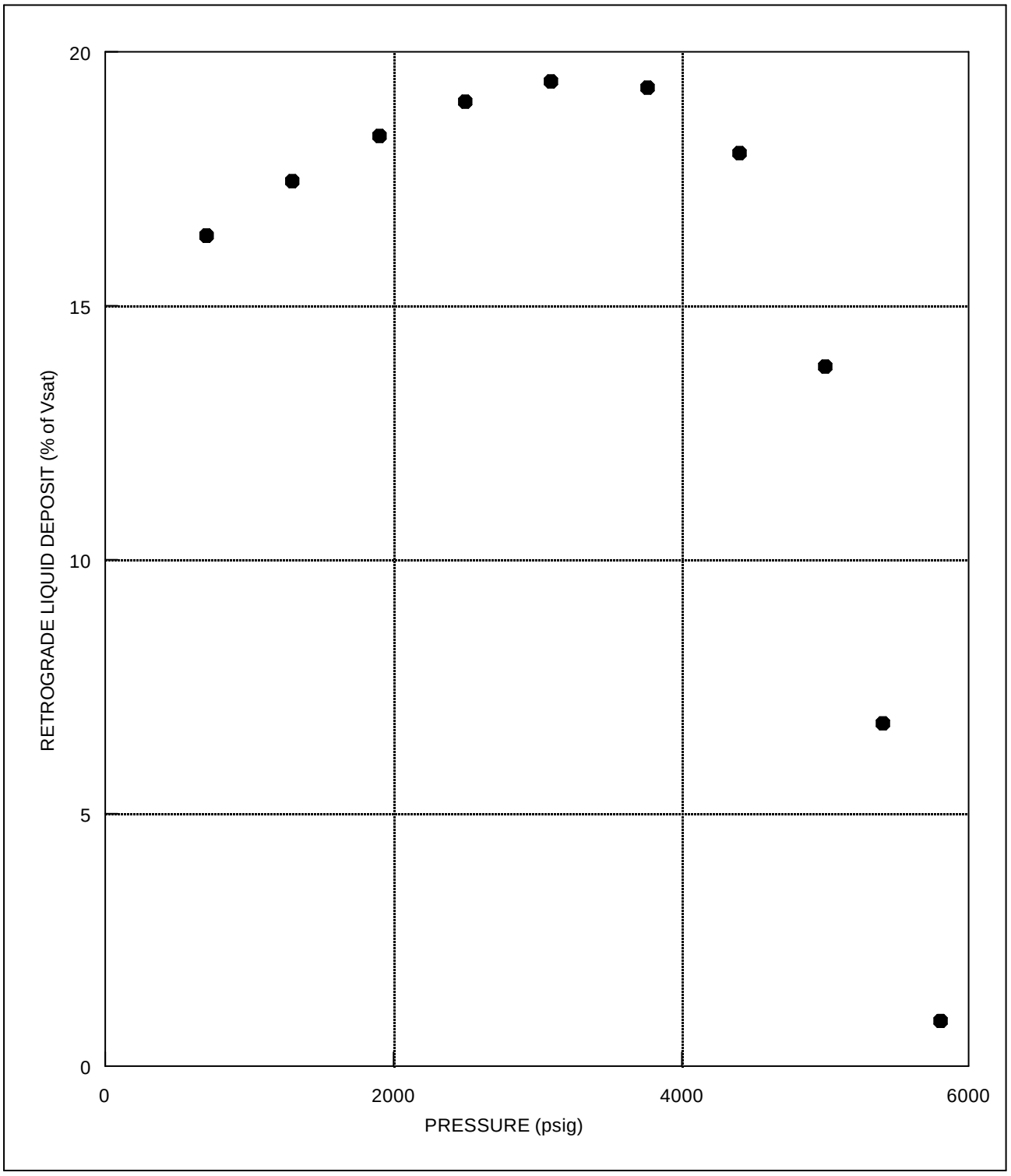


RETROGRADE CONDENSATION

Equation of best fit

Constant Mass

RLD = +1.84E+01 -4.92E-03 * P +3.87E-06 * P^2 -7.65E-10 * P^3 +2.80E-14 * P^4



FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812672 Ex MPSR 3348

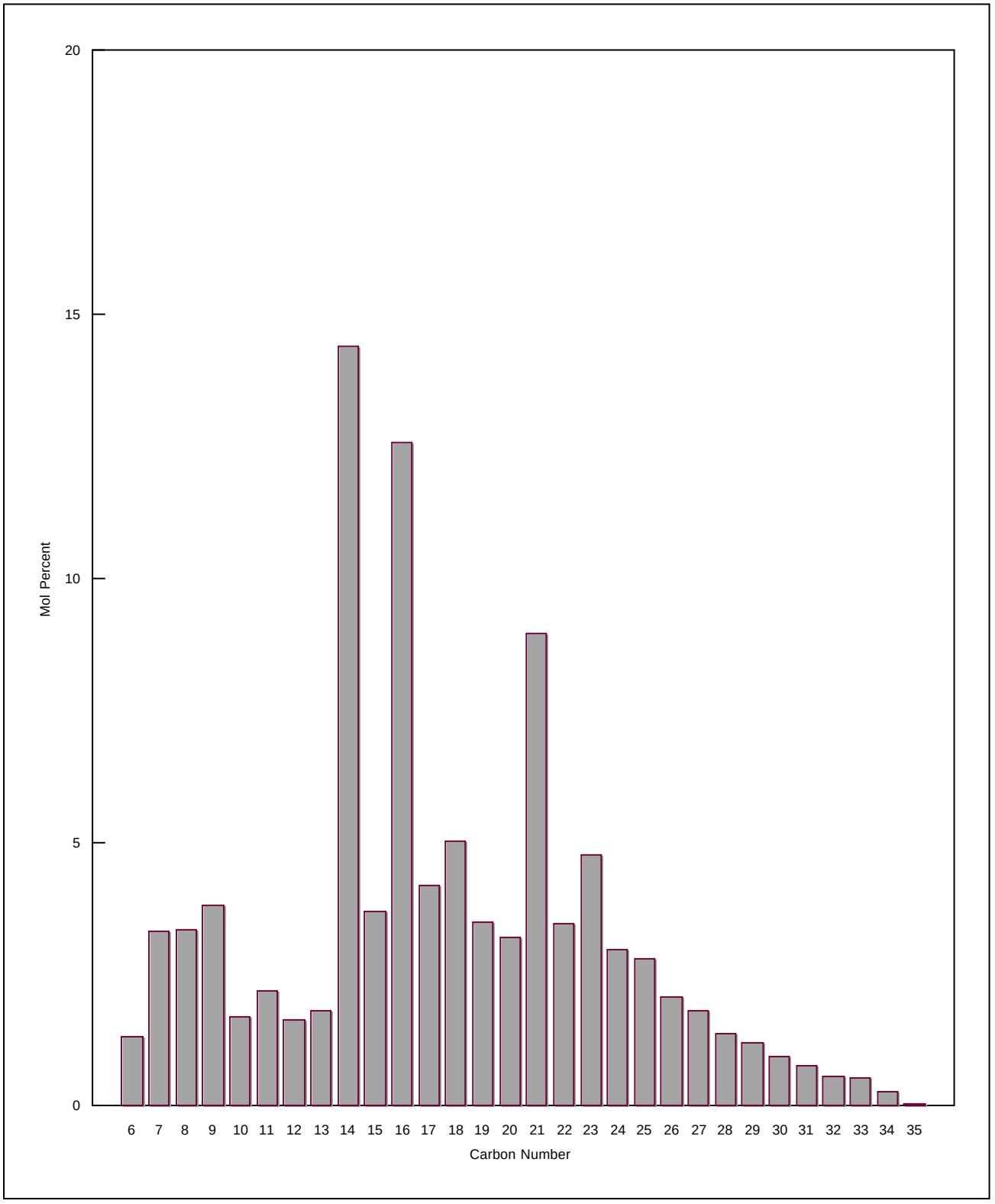
Component		Mol %
Hexanes minus	C6-	1.88
Hexanes	C6	1.31
Heptanes	C7	3.30
Octanes	C8	3.34
Nonanes	C9	3.80
Decanes	C10	1.70
Undecanes	C11	2.17
Dodecanes	C12	1.63
Tridecanes	C13	1.82
Tetradecanes	C14	14.39
Pentadecanes	C15	3.68
Hexadecanes	C16	12.58
Heptadecanes	C17	4.17
Octadecanes	C18	5.03
Nonadecanes	C19	3.50
Eicosanes	C20	3.20
Heneicosanes	C21	8.96
Docosanes	C22	3.45
Tricosanes	C23	4.75
Tetracosanes	C24	2.96
Pentacosanes	C25	2.80
Hexacosanes	C26	2.08
Heptacosanes	C27	1.82
Octacosanes	C28	1.38
Nonacosanes	C29	1.19
Triacontanes	C30	0.94
Hentriacontanes	C31	0.76
Dotriacontanes	C32	0.57
Tritriacontanes	C33	0.53
Tetratriacontanes	C34	0.26
Pentatriacontanes Plus	C35+	0.05
TOTAL		100.00

Molecular Weight Calculated *	:	237.6
Density @ 60 °F Calculated *	:	0.8484
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.8421

*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 # 812672 Ex MPSR 3348



PETROLAB

COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

2890.2 mMD depth

Sample 4, Cylinder # 812672 Ex MPSR 3348

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.26	17.90	10.11
Nitrogen	N2	0.00	0.05	0.03
Methane	C1	0.39	66.54	37.33
Ethane	C2	0.29	8.60	4.93
Propane	C3	0.45	3.71	2.27
Iso-Butane	iC4	0.17	0.56	0.39
N-Butane	nC4	0.47	1.08	0.81
Iso-Pentane	iC5	0.39	0.34	0.36
N-Pentane	nC5	0.47	0.32	0.39
Hexanes	C6	1.30	0.26	0.72
Heptanes	C7	3.27	0.27	1.59
Octanes	C8	3.31	0.16	1.55
Nonanes	C9	3.76	0.12	1.73
Decanes	C10	1.68	0.04	0.77
Undecanes	C11	2.15	0.03	0.96
Dodecanes Plus	C12+	81.66	0.02	36.06
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.4415	0.5585	1.0000
Mass Ratio	:	0.8809	0.1191	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	1.3883 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	606 SCF	--
Stream Properties				
Molecular Weight	:	235.3	25.14	117.9
Density obs. (gm/cc)	:	0.8477 @ 60 °F	--	0.6935 @ PT*
Gravity (AIR = 1.000)	:	35.3 °API @ 60 °F	0.871	72.3
GHV (BTU/scf)	:	--	1055	--
Hexanes Plus Properties				
Mol %	:	97.12	0.90	43.38
Molecular Weight	:	240.8	102.9	239.2
Density (gm/cc @ 60 °F)	:	0.8505	0.6928	0.8495
Gravity (°API @ 60 °F)	:	34.7	72.5	34.9
Heptanes Plus Properties				
Mol %	:	95.82	0.64	42.66
Molecular Weight	:	242.9	110.5	241.8
Density (gm/cc @ 60 °F)	:	0.8514	0.7023	0.8508
Gravity (°API @ 60 °F)	:	34.5	69.8	34.7
Decanes Plus Properties				
Mol %	:	85.49	0.09	37.79
Molecular Weight	:	259.1	146.3	259.0
Density (gm/cc @ 60 °F)	:	0.8576	0.7394	0.8575
Gravity (°API @ 60 °F)	:	33.3	59.7	33.4
Undecanes Plus Properties				
Mol %	:	83.81	0.05	37.02
Molecular Weight	:	261.7	156.2	261.6
Density (gm/cc @ 60 °F)	:	0.8585	0.7480	0.8584
Gravity (°API @ 60 °F)	:	33.2	57.5	33.2
Dodecanes Plus Properties				
Mol %	:	81.66	0.02	36.06
Molecular Weight	:	264.7	169.9	264.6
Density (gm/cc @ 60 °F)	:	0.8596	0.7592	0.8596
Gravity (°API @ 60 °F)	:	33.0	54.7	33.0

* (P)ressure : 4002 psig * (T)emperature : 264 °F

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812672 Ex MPSR 3348

OBM Mathematically Cleaned Up

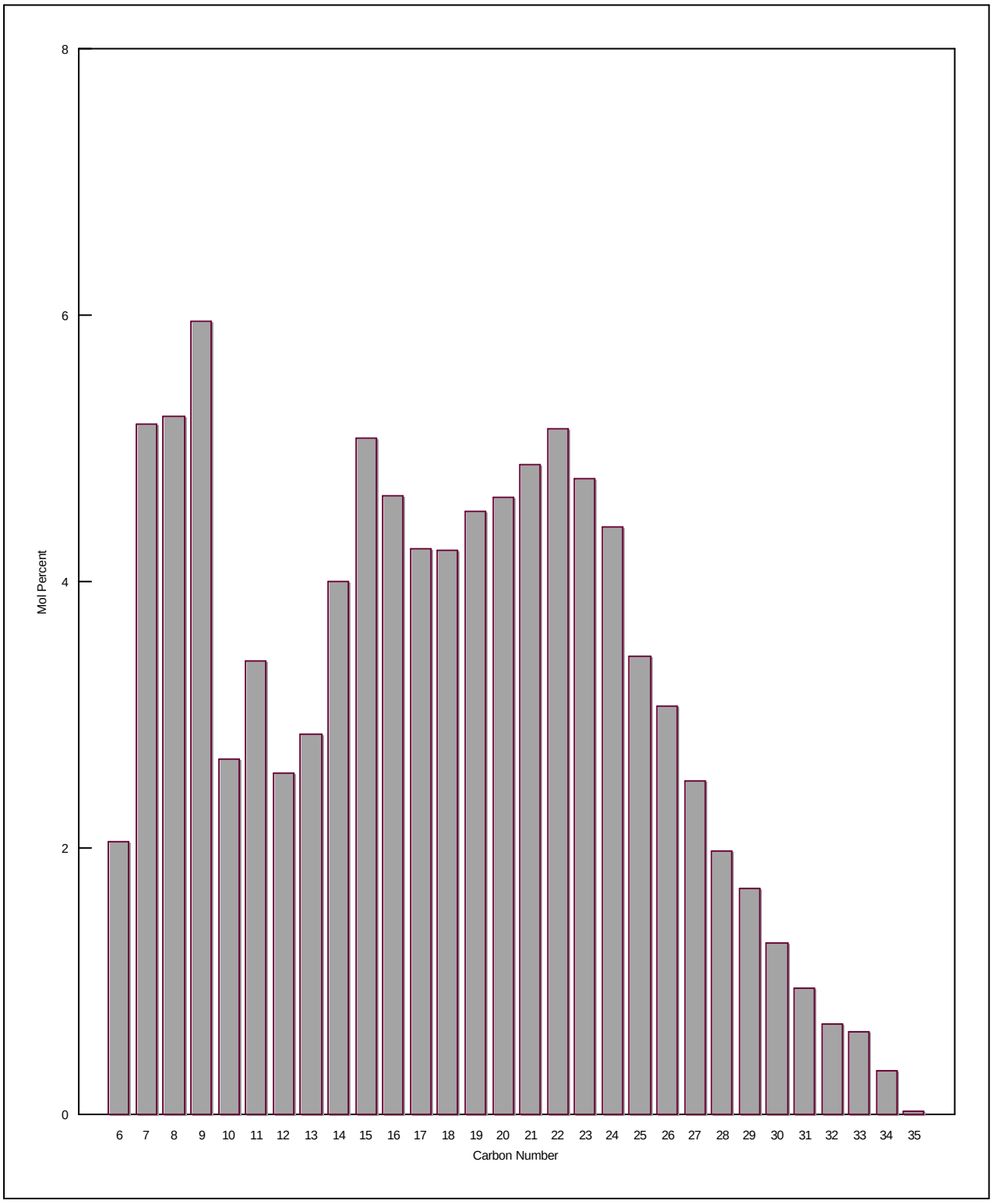
Component		Mol %
Hexanes minus	C6-	2.97
Hexanes	C6	2.05
Heptanes	C7	5.18
Octanes	C8	5.24
Nonanes	C9	5.96
Decanes	C10	2.67
Undecanes	C11	3.40
Dodecanes	C12	2.56
Tridecanes	C13	2.85
Tetradecanes	C14	4.00
Pentadecanes	C15	5.08
Hexadecanes	C16	4.64
Heptadecanes	C17	4.25
Octadecanes	C18	4.23
Nonadecanes	C19	4.53
Eicosanes	C20	4.63
Heneicosanes	C21	4.88
Docosanes	C22	5.15
Tricosanes	C23	4.77
Tetracosanes	C24	4.41
Pentacosanes	C25	3.44
Hexacosanes	C26	3.07
Heptacosanes	C27	2.50
Octacosanes	C28	1.98
Nonacosanes	C29	1.69
Triacontanes	C30	1.29
Hentriacontanes	C31	0.95
Dotriacontanes	C32	0.67
Tritriacontanes	C33	0.62
Tetratriacontanes	C34	0.32
Pentatriacontanes Plus	C35+	0.02
TOTAL		100.00

Molecular Weight Calculated *	:	236.2
Density @ 60 °F Calculated *	:	0.8483
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.8421

*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 # 812672 Ex MPSR 3348
OBM Mathematically Cleaned Up



PETROLAB

COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

2890.2 mMD depth - OBM Mathematically Cleaned Up

Sample 4, Cylinder # 812672 Ex MPSR 3348

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.26	17.90	12.06
Nitrogen	N2	0.00	0.05	0.03
Methane	C1	0.39	66.54	44.64
Ethane	C2	0.29	8.60	5.85
Propane	C3	0.45	3.71	2.63
Iso-Butane	iC4	0.17	0.56	0.43
N-Butane	nC4	0.47	1.08	0.88
Iso-Pentane	iC5	0.39	0.34	0.36
N-Pentane	nC5	0.47	0.32	0.37
Hexanes	C6	2.05	0.26	0.85
Heptanes	C7	5.18	0.27	1.90
Octanes	C8	5.24	0.16	1.84
Nonanes	C9	5.97	0.12	2.05
Decanes	C10	2.67	0.04	0.91
Undecanes	C11	3.40	0.03	1.15
Dodecanes Plus	C12+	72.60	0.02	24.05
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.3310	0.6690	1.0000
Mass Ratio	:	0.8227	0.1773	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	1.5864 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	967 SCF	--
Stream Properties				
Molecular Weight	:	235.8	25.14	94.9
Density obs. (gm/cc)	:	0.8488 @ 60 °F	--	0.6508 @ PT*
Gravity (AIR = 1.000)	:	35.1 °API @ 60 °F	0.871	85.7
GHV (BTU/scf)	:	--	1055	--
Hexanes Plus Properties				
Mol %	:	97.12	0.90	32.75
Molecular Weight	:	241.4	102.9	238.8
Density (gm/cc @ 60 °F)	:	0.8515	0.6928	0.8500
Gravity (°API @ 60 °F)	:	34.5	72.5	34.8
Heptanes Plus Properties				
Mol %	:	95.07	0.64	31.90
Molecular Weight	:	244.7	110.5	242.9
Density (gm/cc @ 60 °F)	:	0.8531	0.7023	0.8520
Gravity (°API @ 60 °F)	:	34.2	69.8	34.4
Decanes Plus Properties				
Mol %	:	78.68	0.09	26.11
Molecular Weight	:	273.1	146.3	272.8
Density (gm/cc @ 60 °F)	:	0.8634	0.7394	0.8632
Gravity (°API @ 60 °F)	:	32.2	59.7	32.3
Undecanes Plus Properties				
Mol %	:	76.00	0.05	25.20
Molecular Weight	:	278.0	156.2	277.8
Density (gm/cc @ 60 °F)	:	0.8650	0.7480	0.8649
Gravity (°API @ 60 °F)	:	31.9	57.5	32.0
Dodecanes Plus Properties				
Mol %	:	72.60	0.02	24.05
Molecular Weight	:	284.1	169.9	284.1
Density (gm/cc @ 60 °F)	:	0.8670	0.7592	0.8670
Gravity (°API @ 60 °F)	:	31.5	54.7	31.6

* (P)ressure : 4002 psig * (T)emperature : 264 °F

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812650 Ex MPSR 3349

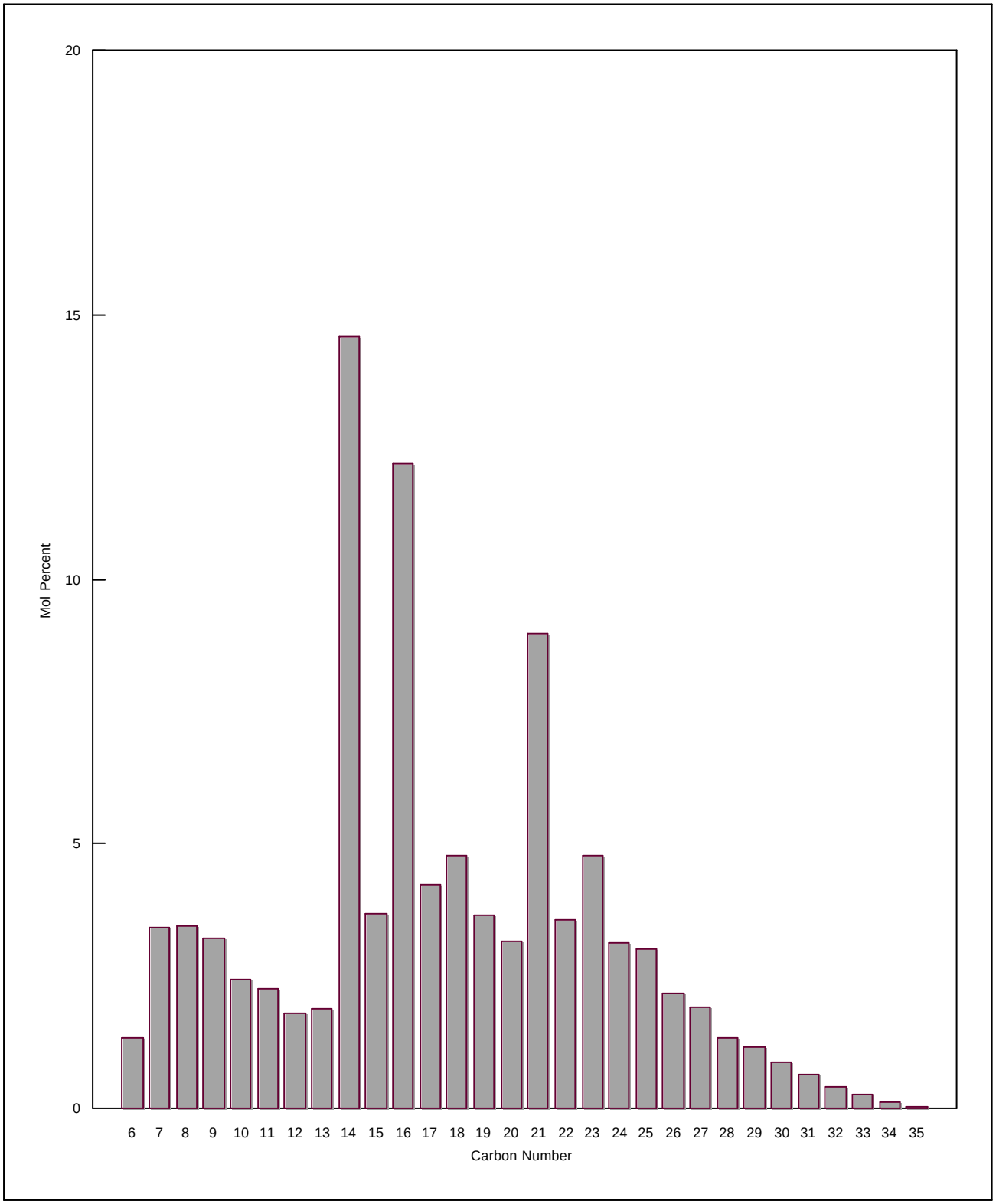
Component		Mol %
Hexanes minus	C6-	1.90
Hexanes	C6	1.31
Heptanes	C7	3.40
Octanes	C8	3.43
Nonanes	C9	3.21
Decanes	C10	2.43
Undecanes	C11	2.24
Dodecanes	C12	1.79
Tridecanes	C13	1.88
Tetradecanes	C14	14.59
Pentadecanes	C15	3.68
Hexadecanes	C16	12.19
Heptadecanes	C17	4.22
Octadecanes	C18	4.76
Nonadecanes	C19	3.65
Eicosanes	C20	3.14
Heneicosanes	C21	8.97
Docosanes	C22	3.56
Tricosanes	C23	4.78
Tetracosanes	C24	3.12
Pentacosanes	C25	2.99
Hexacosanes	C26	2.16
Heptacosanes	C27	1.89
Octacosanes	C28	1.33
Nonacosanes	C29	1.14
Triacontanes	C30	0.85
Hentriacontanes	C31	0.62
Dotriacontanes	C32	0.39
Tritriacontanes	C33	0.25
Tetratriacontanes	C34	0.10
Pentatriacontanes Plus	C35+	0.03
TOTAL		100.00

Molecular Weight Calculated *	:	235.6
Density @ 60 °F Calculated *	:	0.8474
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.8424

*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 # 812650 Ex MPSR 3349



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Company : Esso Australia Pty. Ltd.	Page : 50 of 136
Well : Snapper A21-A	File : E - 28005

COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

2890.2 mMD depth

Sample 5, Cylinder # 812650 Ex MPSR 3349

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.25	17.72	10.02
Nitrogen	N2	0.00	0.05	0.03
Methane	C1	0.38	66.71	37.47
Ethane	C2	0.28	8.48	4.86
Propane	C3	0.44	3.72	2.27
Iso-Butane	iC4	0.17	0.57	0.39
N-Butane	nC4	0.46	1.09	0.81
Iso-Pentane	iC5	0.39	0.36	0.38
N-Pentane	nC5	0.49	0.35	0.41
Hexanes	C6	1.30	0.30	0.74
Heptanes	C7	3.37	0.30	1.65
Octanes	C8	3.40	0.17	1.59
Nonanes	C9	3.18	0.11	1.46
Decanes	C10	2.41	0.03	1.08
Undecanes	C11	2.22	0.02	0.99
Dodecanes Plus	C12+	81.28	0.02	35.85
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.4409	0.5591	1.0000
Mass Ratio	:	0.8798	0.1202	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	1.4052 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	612 SCF	--
Stream Properties				
Molecular Weight	:	233.4	25.14	117.0
Density obs. (gm/cc)	:	0.8467 @ 60 °F	--	0.6852 @ PT*
Gravity (AIR = 1.000)	:	35.5 °API @ 60 °F	0.871	74.8
GHV (BTU/scf)	:	--	1055	--
Hexanes Plus Properties				
Mol %	:	97.14	0.95	43.36
Molecular Weight	:	238.8	100.9	237.1
Density (gm/cc @ 60 °F)	:	0.8495	0.6903	0.8485
Gravity (°API @ 60 °F)	:	34.9	73.3	35.1
Heptanes Plus Properties				
Mol %	:	95.85	0.65	42.62
Molecular Weight	:	240.9	108.7	239.8
Density (gm/cc @ 60 °F)	:	0.8504	0.7001	0.8497
Gravity (°API @ 60 °F)	:	34.7	70.4	34.9
Decanes Plus Properties				
Mol %	:	85.90	0.07	37.92
Molecular Weight	:	256.3	148.0	256.2
Density (gm/cc @ 60 °F)	:	0.8564	0.7409	0.8563
Gravity (°API @ 60 °F)	:	33.6	59.3	33.6
Undecanes Plus Properties				
Mol %	:	83.50	0.04	36.84
Molecular Weight	:	259.8	158.5	259.8
Density (gm/cc @ 60 °F)	:	0.8577	0.7500	0.8576
Gravity (°API @ 60 °F)	:	33.3	57.0	33.3
Dodecanes Plus Properties				
Mol %	:	81.28	0.02	35.85
Molecular Weight	:	262.9	169.9	262.9
Density (gm/cc @ 60 °F)	:	0.8588	0.7592	0.8588
Gravity (°API @ 60 °F)	:	33.1	54.7	33.1

* (P)ressure : 2800 psig * (T)emperature : 264 °F

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812650 Ex MPSR 3349

OBM Mathematically Cleaned Up

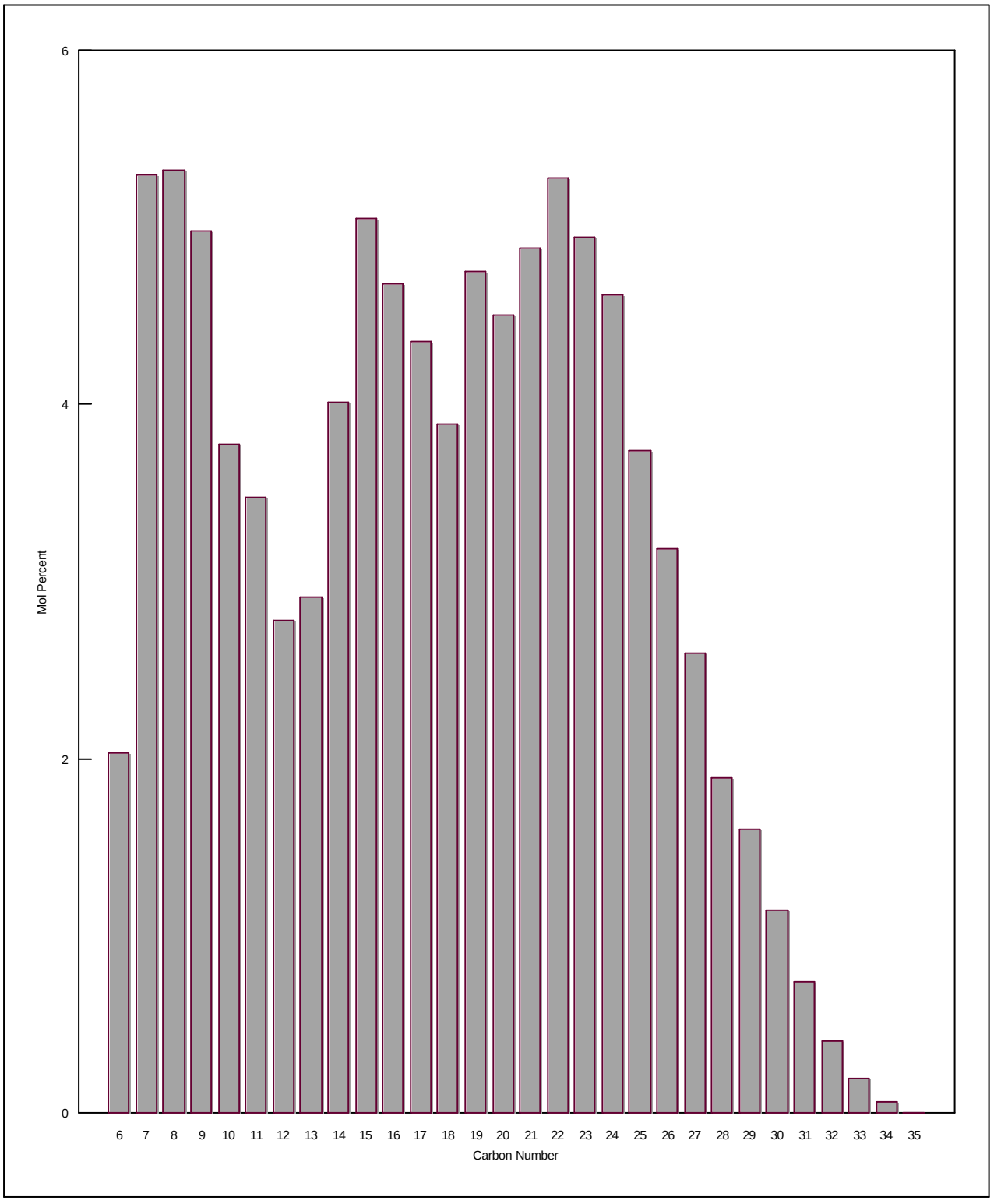
Component		Mol %
Hexanes minus	C6-	2.97
Hexanes	C6	2.03
Heptanes	C7	5.29
Octanes	C8	5.32
Nonanes	C9	4.98
Decanes	C10	3.77
Undecanes	C11	3.47
Dodecanes	C12	2.78
Tridecanes	C13	2.91
Tetradecanes	C14	4.01
Pentadecanes	C15	5.05
Hexadecanes	C16	4.68
Heptadecanes	C17	4.35
Octadecanes	C18	3.89
Nonadecanes	C19	4.75
Eicosanes	C20	4.50
Heneicosanes	C21	4.88
Docosanes	C22	5.28
Tricosanes	C23	4.94
Tetracosanes	C24	4.62
Pentacosanes	C25	3.74
Hexacosanes	C26	3.18
Heptacosanes	C27	2.59
Octacosanes	C28	1.89
Nonacosanes	C29	1.60
Triacontanes	C30	1.14
Hentriacontanes	C31	0.74
Dotriacontanes	C32	0.40
Tritriacontanes	C33	0.19
Tetratriacontanes	C34	0.06
Pentatriacontanes Plus	C35+	0.00
TOTAL		100.00

Molecular Weight Calculated *	:	233.6
Density @ 60 °F Calculated *	:	0.8469
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.8424

*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 # 812650 Ex MPSR 3349
OBM Mathematically Cleaned Up



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COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

2890.2 mMD depth - OBM Mathematically Cleaned Up

Sample 5, Cylinder # 812650 Ex MPSR 3349

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.25	17.72	12.01
Nitrogen	N2	0.00	0.05	0.03
Methane	C1	0.38	66.71	45.03
Ethane	C2	0.28	8.48	5.80
Propane	C3	0.44	3.72	2.65
Iso-Butane	iC4	0.17	0.57	0.44
N-Butane	nC4	0.46	1.09	0.88
Iso-Pentane	iC5	0.39	0.36	0.37
N-Pentane	nC5	0.49	0.35	0.40
Hexanes	C6	2.03	0.30	0.87
Heptanes	C7	5.30	0.30	1.93
Octanes	C8	5.33	0.17	1.86
Nonanes	C9	4.99	0.11	1.70
Decanes	C10	3.77	0.03	1.25
Undecanes	C11	3.47	0.02	1.15
Dodecanes Plus	C12+	72.25	0.02	23.63
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.3268	0.6732	1.0000
Mass Ratio	:	0.8183	0.1817	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	1.6031 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	995 SCF	--
Stream Properties				
Molecular Weight	:	233.2	25.14	93.1
Density obs. (gm/cc)	:	0.8474 @ 60 °F	--	0.6465 @ PT*
Gravity (AIR = 1.000)	:	35.3 °API @ 60 °F	0.871	87.2
GHV (BTU/scf)	:	--	1055	--
Hexanes Plus Properties				
Mol %	:	97.14	0.95	32.39
Molecular Weight	:	238.6	100.9	235.9
Density (gm/cc @ 60 °F)	:	0.8502	0.6903	0.8485
Gravity (°API @ 60 °F)	:	34.8	73.3	35.1
Heptanes Plus Properties				
Mol %	:	95.11	0.65	31.52
Molecular Weight	:	241.9	108.7	240.0
Density (gm/cc @ 60 °F)	:	0.8517	0.7001	0.8505
Gravity (°API @ 60 °F)	:	34.5	70.4	34.7
Decanes Plus Properties				
Mol %	:	79.50	0.07	26.03
Molecular Weight	:	268.2	148.0	268.0
Density (gm/cc @ 60 °F)	:	0.8615	0.7409	0.8613
Gravity (°API @ 60 °F)	:	32.6	59.3	32.6
Undecanes Plus Properties				
Mol %	:	75.72	0.04	24.78
Molecular Weight	:	274.9	158.5	274.8
Density (gm/cc @ 60 °F)	:	0.8637	0.7500	0.8637
Gravity (°API @ 60 °F)	:	32.2	57.0	32.2
Dodecanes Plus Properties				
Mol %	:	72.25	0.02	23.63
Molecular Weight	:	281.1	169.9	281.0
Density (gm/cc @ 60 °F)	:	0.8658	0.7592	0.8658
Gravity (°API @ 60 °F)	:	31.8	54.7	31.8

* (P)ressure : 4002 psig * (T)emperature : 264 °F

CONSTANT MASS STUDY
@ 264 °F
Using Bottom Hole Sample in Cylinder # 812650 Ex MPSR 3349

Pressure (psig)		Relative Volume (V/Vsat) (1)	Oil Compressibility (x10^-6)(psig^-1) (2)	Y Function (psig^-1) (3)	Thermal Expansion (x10^-4)(°F^-1) (4)
5000		0.9739	10.29		5.85
4500		0.9792	10.84		5.97
4002	**	0.9848	11.40		6.11
3750		0.9878	11.84		6.18
3500		0.9908	12.21		6.25
3250		0.9939	12.62		6.32
3000		0.9972	13.18		6.42
2800	*	1.0000	13.93		6.50
2600		1.0250		3.07	
2400		1.0546		3.05	
2200		1.0921		2.96	
2000		1.1398		2.86	
1800		1.2010		2.76	
1600		1.2799		2.68	
1400		1.3871		2.58	
1200		1.5355		2.49	
1000		1.7500		2.40	
800		2.0823		2.31	
600		2.6517		2.22	
400		3.8302		2.12	

* Saturation Pressure
** Reservoir Pressure

(1) Barrels at indicated pressure per barrel at saturation pressure
(2) Oil Compressibility = - (1/V) * (dV/dP)
(3) Y Function = (Psat - P) / (P)*(V/Vsat-1)
(4) Thermal Expansion = - (1/V) * (dV/dT)

DIFFERENTIAL VAPORIZATION
@ 264 °F
Using Bottom Hole Sample in Cylinder # 812650 Ex MPSR 3349

Pressure (psig)		Gas-Oil Ratio (SCF/Bbl) (1)	Formation Volume Factor (Bo) (2)	(Bt) (3)	Oil Density (gm/cc)	Oil Viscosity (Centipoise)
5000		542	1.3240	1.3240	0.7075	0.545
4500		542	1.3312	1.3312	0.7037	0.527
4002	* *	542	1.3388	1.3388	0.6997	0.510
3500		542	1.3469	1.3469	0.6955	0.492
3000		542	1.3557	1.3557	0.6910	0.474
2800	*	542	1.3594	1.3594	0.6891	0.467
2500		476	1.3306	1.4155	0.6960	0.491
2200		414	1.3046	1.4904	0.7022	0.518
1900		356	1.2812	1.5946	0.7075	0.544
1600		300	1.2590	1.7450	0.7125	0.574
1300		245	1.2366	1.9798	0.7180	0.608
1000		191	1.2131	2.3712	0.7241	0.644
700		137	1.1908	3.1261	0.7293	0.689
400		81	1.1667	5.0362	0.7351	0.756
0		0	1.0941		0.7654	0.967

* * Reservoir Pressure
* Saturation Pressure

(1) Cubic feet of gas at 14.696 psia and 60 °F per barrel of residual oil at 60 °F.
(2) Barrels of oil at indicated pressure and temperature per barrel of residual oil at 60 °F.
(3) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of residual oil at 60 °F.

Bo and Rs

Differential Data Corrected with Optimum Separator Test

OPTIMUM SEPARATOR TEST:	Pressure (psig) :		Temperature (°C) :	131
	(Bofb) :	1.3740	(Rsfb) :	597
DIFFERENTIAL :	(Bodb) :	1.3594	(Rsdb) :	542

(2) Bo=Bod*(Bofb/Bodb)
(4) Bt=Btd*(Bofb/Bodb)
(6) Rs=Rsfb-(Rsdb-Rsd)*(Bofb/Bodb)

Pressure (psig)		(Bod) (1)	(Bo) (2)	(Btd) (3)	(Bt) (4)	(Rsd) (SCF/BBL) (5)	(Rs) (SCF/BBL) (6)
4500		1.3312	1.3455	1.3312	1.3455	542	597
2800	*	1.3594	1.3740	1.3594	1.3740	542	597
2500		1.3306	1.3449	1.4155	1.4307	476	539
2200		1.3046	1.3186	1.4904	1.5064	414	484
1900		1.2812	1.2949	1.5946	1.6116	356	432
1600		1.2590	1.2725	1.7450	1.7637	300	383
1300		1.2366	1.2499	1.9798	2.0010	245	335
1000		1.2131	1.2261	2.3712	2.3966	191	287
700		1.1908	1.2036	3.1261	3.1596	137	239
400		1.1667	1.1792	5.0362	5.0901	81	190
0		1.0941	1.0941			0	0

* Saturation Pressure

(1) Barrels of oil at indicated pressure and temperature per barrel of residual oil at 60 °F
(2) Barrels of oil at indicated pressure and temperature per barrel of stock tank oil at 60 °F
(3) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of residual oil at 60 °F
(4) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of stock tank oil at 60 °F
(5) Cubic feet of gas at 14.696 psia and 60 °F per barrel of residual oil at 60 °F
(6) Cubic feet of gas at 14.696 psia and 60 °F per barrel of stock tank oil at 60 °F

DIFFERENTIAL VAPORIZATION
@ 264 °F
Using Bottom Hole Sample in Cylinder # 812650 Ex MPSR 3349

Pressure (psi)	Formation Volume Factor (Bg) (1)	Gas Expansion Factor (E) (2)	Deviation Factor (Z)	Gas Gravity (Air=1.00)	Gas Viscosity (Centipoise) (3)
2800 *					
2500	0.00728	137.318	0.895	0.738	0.0193
2200	0.00824	121.343	0.892	0.745	0.0184
1900	0.00953	104.906	0.892	0.754	0.0175
1600	0.01138	87.878	0.898	0.764	0.0167
1300	0.01419	70.452	0.912	0.776	0.0160
1000	0.01871	53.438	0.928	0.797	0.0152
700	0.02705	36.962	0.945	0.830	0.0145
400	0.04756	21.024	0.964	0.894	0.0138
0			1.000	1.070	0.0126

* Saturation Pressure

(1) Cubic feet of gas at indicated pressure and temperature per cubic foot at 14.696 psia and 60 °F
(2) Cubic feet of gas at 14.696 psia and 60 °F per cubic foot at indicated pressure and temperature
(3) Calculated from correlation of Lee, Gonzales and Eakin

COMPOSITIONAL ANALYSIS OF GASES
LIBERATED DURING DIFFERENTIAL VAPORIZATION

Pressure (psig):		2500	2200	1900
Component		Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	14.15	14.60	15.31
Nitrogen	N2	0.21	0.18	0.14
Methane	C1	78.33	77.61	76.46
Ethane	C2	4.92	5.07	5.38
Propane	C3	1.35	1.46	1.58
Iso-Butane	iC4	0.18	0.19	0.20
N-Butane	nC4	0.29	0.30	0.32
Iso-Pentane	iC5	0.07	0.08	0.09
N-Pentane	nC5	0.06	0.07	0.08
Hexanes	C6	0.09	0.09	0.10
Heptanes	C7	0.13	0.13	0.13
Octanes	C8	0.10	0.10	0.10
Nonanes	C9	0.08	0.08	0.08
Decanes	C10	0.03	0.03	0.02
Undecanes	C11	0.01	0.01	0.01
Dodecanes Plus	C12+	0.00	0.00	0.00
TOTAL		100.00	100.00	100.00

Stream Properties				
Molecular Weight	:	21.75	21.95	22.24
Gravity (AIR = 1.000)	:	0.753	0.760	0.770
Gross HV (BTU/SCF)	:	963	963	961
Nett HV (BTU/SCF)	:	870	870	869
Wobbe Index	:	1110	1105	1096
Critical Pressure (psia)	:	722.6	724.4	727.3
Critical Temperature (°R)	:	392.0	393.8	396.5

G P M Content				
Ethane Plus	:	2.085	2.168	2.300
Propane Plus	:	0.768	0.811	0.860
Butanes Plus	:	0.396	0.408	0.424
Pentanes Plus	:	0.245	0.251	0.258

Hexanes Plus Properties				
Mol %	:	0.44	0.44	0.44
Molecular Weight	:	104.3	104.3	103.2
Density (gm/cc @ 60 °F)	:	0.6947	0.6947	0.6933
Gravity (°API @ 60 °F)	:	72.0	72.0	72.4

Heptanes Plus Properties				
Mol %	:	0.35	0.35	0.34
Molecular Weight	:	109.6	109.6	108.9
Density (gm/cc @ 60 °F)	:	0.7012	0.7012	0.7003
Gravity (°API @ 60 °F)	:	70.1	70.1	70.4

Decanes Plus Properties				
Mol %	:	0.04	0.04	0.03
Molecular Weight	:	137.3	137.3	138.3
Density (gm/cc @ 60 °F)	:	0.7310	0.7310	0.7320
Gravity (°API @ 60 °F)	:	61.9	61.9	61.6

Undecanes Plus Properties				
Mol %	:	0.01	0.01	0.01
Molecular Weight	:	147.0	147.0	147.0
Density (gm/cc @ 60 °F)	:	0.7400	0.7400	0.7400
Gravity (°API @ 60 °F)	:	59.5	59.5	59.5

Dodecanes Plus Properties				
Mol %	:	0.00	0.00	0.00
Molecular Weight	:	--	--	--
Density (gm/cc @ 60 °F)	:	--	--	--
Gravity (°API @ 60 °F)	:	--	--	--

COMPOSITIONAL ANALYSIS OF GASES
LIBERATED DURING DIFFERENTIAL VAPORIZATION

Pressure (psig):		1600	1300	1000
Component		Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	15.85	16.71	17.90
Nitrogen	N2	0.12	0.10	0.06
Methane	C1	75.30	73.84	71.29
Ethane	C2	5.75	6.22	7.08
Propane	C3	1.77	1.84	2.16
Iso-Butane	iC4	0.21	0.23	0.28
N-Butane	nC4	0.34	0.36	0.46
Iso-Pentane	iC5	0.10	0.11	0.12
N-Pentane	nC5	0.09	0.10	0.11
Hexanes	C6	0.11	0.12	0.14
Heptanes	C7	0.14	0.15	0.17
Octanes	C8	0.11	0.11	0.12
Nonanes	C9	0.08	0.08	0.08
Decanes	C10	0.02	0.02	0.02
Undecanes	C11	0.01	0.01	0.01
Dodecanes Plus	C12+	0.00	0.00	0.00
TOTAL		100.00	100.00	100.00

Stream Properties				
Molecular Weight	:	22.54	22.91	23.56
Gravity (AIR = 1.000)	:	0.780	0.793	0.816
Gross HV (BTU/SCF)	:	964	963	969
Nett HV (BTU/SCF)	:	872	871	877
Wobbe Index	:	1092	1081	1073
Critical Pressure (psia)	:	729.4	733.0	737.7
Critical Temperature (°R)	:	399.4	402.8	409.1

GPM Content				
Ethane Plus	:	2.482	2.654	3.050
Propane Plus	:	0.943	0.989	1.155
Butanes Plus	:	0.455	0.482	0.559
Pentanes Plus	:	0.279	0.293	0.322

Hexanes Plus Properties				
Mol %	:	0.47	0.49	0.54
Molecular Weight	:	102.7	102.2	101.4
Density (gm/cc @ 60 °F)	:	0.6927	0.6920	0.6909
Gravity (°API @ 60 °F)	:	72.6	72.8	73.1

Heptanes Plus Properties				
Mol %	:	0.36	0.37	0.40
Molecular Weight	:	108.4	108.1	107.5
Density (gm/cc @ 60 °F)	:	0.6998	0.6994	0.6986
Gravity (°API @ 60 °F)	:	70.5	70.6	70.8

Decanes Plus Properties				
Mol %	:	0.03	0.03	0.03
Molecular Weight	:	138.3	138.3	138.3
Density (gm/cc @ 60 °F)	:	0.7320	0.7320	0.7320
Gravity (°API @ 60 °F)	:	61.6	61.6	61.6

Undecanes Plus Properties				
Mol %	:	0.01	0.01	0.01
Molecular Weight	:	147.0	147.0	147.0
Density (gm/cc @ 60 °F)	:	0.7400	0.7400	0.7400
Gravity (°API @ 60 °F)	:	59.5	59.5	59.5

Dodecanes Plus Properties				
Mol %	:	0.00	0.00	0.00
Molecular Weight	:	--	--	--
Density (gm/cc @ 60 °F)	:	--	--	--
Gravity (°API @ 60 °F)	:	--	--	--

COMPOSITIONAL ANALYSIS OF GASES
LIBERATED DURING DIFFERENTIAL VAPORIZATION

Pressure (psig):		700	400	0
Component		Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	19.48	21.81	24.23
Nitrogen	N2	0.04	0.02	0.02
Methane	C1	67.54	60.44	40.26
Ethane	C2	8.32	10.82	18.56
Propane	C3	2.74	4.03	10.69
Iso-Butane	iC4	0.35	0.54	1.57
N-Butane	nC4	0.58	0.94	2.65
Iso-Pentane	iC5	0.16	0.26	0.64
N-Pentane	nC5	0.15	0.25	0.54
Hexanes	C6	0.16	0.24	0.31
Heptanes	C7	0.22	0.32	0.30
Octanes	C8	0.15	0.20	0.15
Nonanes	C9	0.08	0.10	0.06
Decanes	C10	0.02	0.02	0.01
Undecanes	C11	0.01	0.01	0.01
Dodecanes Plus	C12+	0.00	0.00	0.00
TOTAL		100.00	100.00	100.00

Stream Properties				
Molecular Weight	:	24.54	26.44	31.54
Gravity (AIR = 1.000)	:	0.850	0.917	1.095
Gross HV (BTU/SCF)	:	982	1027	1244
Nett HV (BTU/SCF)	:	890	933	1136
Wobbe Index	:	1066	1073	1189
Critical Pressure (psia)	:	743.7	751.8	757.0
Critical Temperature (°R)	:	418.6	437.5	494.0

GPM Content				
Ethane Plus	:	3.674	5.053	10.050
Propane Plus	:	1.447	2.157	5.083
Butanes Plus	:	0.691	1.046	2.135
Pentanes Plus	:	0.393	0.572	0.785

Hexanes Plus Properties				
Mol %	:	0.64	0.89	0.84
Molecular Weight	:	100.69	99.47	96.38
Density (gm/cc @ 60 °F)	:	0.69	0.69	0.68
Gravity (°API @ 60 °F)	:	73.4	73.9	75.1

Heptanes Plus Properties				
Mol %	:	0.48	0.65	0.53
Molecular Weight	:	106.25	105.18	103.62
Density (gm/cc @ 60 °F)	:	0.70	0.70	0.69
Gravity (°API @ 60 °F)	:	71.3	71.7	72.3

Decanes Plus Properties				
Mol %	:	0.03	0.03	0.02
Molecular Weight	:	138.33	138.33	140.50
Density (gm/cc @ 60 °F)	:	0.73	0.73	0.73
Gravity (°API @ 60 °F)	:	61.6	61.6	61.1

Undecanes Plus Properties				
Mol %	:	0.01	0.01	0.01
Molecular Weight	:	147.00	147.00	147.00
Density (gm/cc @ 60 °F)	:	0.74	0.74	0.74
Gravity (°API @ 60 °F)	:	59.5	59.5	59.5

Dodecanes Plus Properties				
Mol %	:	0.00	0.00	0.00
Molecular Weight	:	--	--	--
Density (gm/cc @ 60 °F)	:	--	--	--
Gravity (°API @ 60 °F)	:	--	--	--

COMPOSITIONAL ANALYSIS OF
DIFFERENTIALLY DEPLETED LIQUIDS

Pressure (psig):		2500	2200	1900
Component		Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	9.72	9.37	8.94
Nitrogen	N2	0.05	0.04	0.03
Methane	C1	34.53	31.42	28.16
Ethane	C2	4.85	4.84	4.80
Propane	C3	2.34	2.40	2.46
Iso-Butane	iC4	0.40	0.42	0.44
N-Butane	nC4	0.85	0.89	0.93
Iso-Pentane	iC5	0.40	0.43	0.45
N-Pentane	nC5	0.43	0.46	0.49
Hexanes	C6	0.79	0.84	0.89
Heptanes	C7	1.76	1.88	2.00
Octanes	C8	1.70	1.81	1.94
Nonanes	C9	1.56	1.67	1.78
Decanes	C10	1.15	1.24	1.32
Undecanes	C11	1.06	1.14	1.22
Dodecanes Plus	C12+	38.41	41.18	44.16
TOTAL		100.00	100.00	100.00

Stream Properties

Molecular Weight	:	133.6	141.7	150.4
Density obs. (gm/cc)	:	0.6954	0.7027	0.7102
Gravity (°API @ 60 °F)	:	71.8	69.7	67.5

Hexanes Plus Properties

Mol %	:	46.42	49.74	53.31
Molecular Weight	:	237.2	237.3	237.4
Density (gm/cc @ 60 °F)	:	0.8485	0.8486	0.8486
Gravity (°API @ 60 °F)	:	35.1	35.1	35.1

Heptanes Plus Properties

Mol %	:	45.64	48.91	52.42
Molecular Weight	:	239.8	239.9	240.0
Density (gm/cc @ 60 °F)	:	0.8498	0.8498	0.8499
Gravity (°API @ 60 °F)	:	34.9	34.8	34.8

Decanes Plus Properties

Mol %	:	40.62	43.55	46.71
Molecular Weight	:	256.2	256.2	256.2
Density (gm/cc @ 60 °F)	:	0.8563	0.8563	0.8563
Gravity (°API @ 60 °F)	:	33.6	33.6	33.6

Undecanes Plus Properties

Mol %	:	39.47	42.32	45.38
Molecular Weight	:	259.8	259.8	259.8
Density (gm/cc @ 60 °F)	:	0.8576	0.8576	0.8576
Gravity (°API @ 60 °F)	:	33.3	33.3	33.3

Dodecanes Plus Properties

Mol %	:	38.41	41.18	44.16
Molecular Weight	:	262.9	262.9	262.9
Density (gm/cc @ 60 °F)	:	0.8588	0.8588	0.8588
Gravity (°API @ 60 °F)	:	33.1	33.1	33.1

COMPOSITIONAL ANALYSIS OF
DIFFERENTIALLY DEPLETED LIQUIDS

Pressure (psig):		1600	1300	1000
Component		Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	8.42	7.76	6.90
Nitrogen	N2	0.03	0.02	0.02
Methane	C1	24.61	20.68	16.39
Ethane	C2	4.73	4.61	4.40
Propane	C3	2.51	2.56	2.60
Iso-Butane	iC4	0.45	0.47	0.49
N-Butane	nC4	0.97	1.02	1.07
Iso-Pentane	iC5	0.48	0.51	0.54
N-Pentane	nC5	0.52	0.55	0.59
Hexanes	C6	0.95	1.01	1.09
Heptanes	C7	2.14	2.30	2.48
Octanes	C8	2.07	2.23	2.41
Nonanes	C9	1.91	2.05	2.22
Decanes	C10	1.42	1.53	1.66
Undecanes	C11	1.31	1.41	1.53
Dodecanes Plus	C12+	47.49	51.27	55.63
TOTAL		100.00	100.00	100.00

Stream Properties

Molecular Weight	:	160.0	170.9	183.4
Density obs. (gm/cc)	:	0.7182	0.7267	0.7360
Gravity (°API @ 60 °F)	:	65.3	63.0	60.6

Hexanes Plus Properties

Mol %	:	57.29	61.82	67.02
Molecular Weight	:	237.4	237.5	237.6
Density (gm/cc @ 60 °F)	:	0.8487	0.8487	0.8488
Gravity (°API @ 60 °F)	:	35.1	35.1	35.1

Heptanes Plus Properties

Mol %	:	56.34	60.80	65.93
Molecular Weight	:	240.0	240.1	240.2
Density (gm/cc @ 60 °F)	:	0.8499	0.8499	0.8500
Gravity (°API @ 60 °F)	:	34.8	34.8	34.8

Decanes Plus Properties

Mol %	:	50.22	54.22	58.82
Molecular Weight	:	256.2	256.2	256.2
Density (gm/cc @ 60 °F)	:	0.8563	0.8563	0.8563
Gravity (°API @ 60 °F)	:	33.6	33.6	33.6

Undecanes Plus Properties

Mol %	:	48.79	52.68	57.16
Molecular Weight	:	259.8	259.8	259.8
Density (gm/cc @ 60 °F)	:	0.8576	0.8576	0.8576
Gravity (°API @ 60 °F)	:	33.3	33.3	33.3

Dodecanes Plus Properties

Mol %	:	47.49	51.27	55.63
Molecular Weight	:	262.9	262.9	262.9
Density (gm/cc @ 60 °F)	:	0.8588	0.8588	0.8588
Gravity (°API @ 60 °F)	:	33.1	33.1	33.1

COMPOSITIONAL ANALYSIS OF
DIFFERENTIALLY DEPLETED LIQUIDS

Pressure (psig):		700	400	0
Component		Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	5.73	4.02	0.33
Nitrogen	N2	0.01	0.01	0.01
Methane	C1	11.64	6.44	0.28
Ethane	C2	4.03	3.31	0.53
Propane	C3	2.58	2.43	0.93
Iso-Butane	iC4	0.50	0.50	0.30
N-Butane	nC4	1.11	1.13	0.86
Iso-Pentane	iC5	0.57	0.61	0.60
N-Pentane	nC5	0.63	0.67	0.70
Hexanes	C6	1.18	1.27	1.45
Heptanes	C7	2.69	2.95	3.43
Octanes	C8	2.62	2.88	3.37
Nonanes	C9	2.42	2.67	3.14
Decanes	C10	1.82	2.01	2.37
Undecanes	C11	1.67	1.85	2.18
Dodecanes Plus	C12+	60.79	67.27	79.52
TOTAL		100.00	100.00	100.00

Stream Properties

Molecular Weight	:	198.2	216.4	250.1
Density obs. (gm/cc)	:	0.7463	0.7582	0.7781
Gravity (°API @ 60 °F)	:	57.9	54.9	50.2

Hexanes Plus Properties

Mol %	:	73.18	80.89	95.47
Molecular Weight	:	237.7	237.9	238.1
Density (gm/cc @ 60 °F)	:	0.8488	0.8489	0.8491
Gravity (°API @ 60 °F)	:	35.0	35.0	35.0

Heptanes Plus Properties

Mol %	:	72.01	79.61	94.01
Molecular Weight	:	240.2	240.4	240.5
Density (gm/cc @ 60 °F)	:	0.8500	0.8501	0.8502
Gravity (°API @ 60 °F)	:	34.8	34.8	34.8

Decanes Plus Properties

Mol %	:	64.28	71.12	84.07
Molecular Weight	:	256.2	256.2	256.2
Density (gm/cc @ 60 °F)	:	0.8563	0.8563	0.8563
Gravity (°API @ 60 °F)	:	33.6	33.6	33.6

Undecanes Plus Properties

Mol %	:	62.46	69.12	81.70
Molecular Weight	:	259.8	259.8	259.8
Density (gm/cc @ 60 °F)	:	0.8576	0.8576	0.8576
Gravity (°API @ 60 °F)	:	33.3	33.3	33.3

Dodecanes Plus Properties

Mol %	:	60.79	67.27	79.52
Molecular Weight	:	262.9	262.9	262.9
Density (gm/cc @ 60 °F)	:	0.8588	0.8588	0.8588
Gravity (°API @ 60 °F)	:	33.1	33.1	33.1

SEPARATOR TESTS

On Bottom Hole Reservoir Fluid in Cylinder # 812650

SEPARATOR Pressure (psig)	SEPARATOR Temperature (°F)	GAS/OIL Ratio (1)	DENSITY (@ 60 °F) °API	DENSITY (@ 60 °F) (gm/cc)	VOLUME Factor (2)	SHRINKAGE Factor (3)	GAS Gravity (Air = 1)
Test # 1							
1290	131	293				0.876	0.739
TO							
0	100	304	36.7	0.8403	1.374	0.983	0.940
	Total GOR	597					
Test # 2							
290	158	518				0.928	0.821
TO							
0	100	67	36.7	0.8407	1.373	0.983	1.042
	Total GOR	585					
Test # 3							
0	79	612	36.3	0.8424	1.399	0.992	0.871
	Total GOR	612					
Test # 1 CORRECTED FOR OBM CONTAMINATION							
1290	131	481				0.787	0.739
TO							
0	100	502	36.7	0.8403	1.477	0.983	0.940
	Total GOR	983					
Test # 2 CORRECTED FOR OBM CONTAMINATION							
290	158	827				0.908	0.821
TO							
0	100	110	36.7	0.8407	1.454	0.983	1.042
	Total GOR	937					
Test # 3 CORRECTED FOR OBM CONTAMINATION							
0	79	995	36.3	0.8424	1.595	0.992	0.871
	Total GOR	995					

(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 @ 2800 psig and 264°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

PETROLAB

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COMPOSITIONAL ANALYSIS OF LIBERATED GASES
FROM LABORATORY SEPARATOR TEST @ 1290 psig

Component		Separator Gas Mol %	Stock Tank Gas Mol %
Hydrogen Sulphide	H2S	0.00	0.00
Carbon Dioxide	CO2	13.57	19.99
Nitrogen	N2	0.15	0.02
Methane	C1	79.56	58.41
Ethane	C2	4.89	11.82
Propane	C3	1.14	5.66
Iso-Butane	iC4	0.10	0.82
N-Butane	nC4	0.15	1.49
Iso-Pentane	iC5	0.04	0.41
N-Pentane	nC5	0.04	0.36
Hexanes	C6	0.05	0.26
Heptanes	C7	0.12	0.49
Octanes	C8	0.07	0.15
Nonanes	C9	0.04	0.05
Decanes	C10	0.05	0.04
Undecanes	C11	0.02	0.02
Dodecanes Plus	C12+	0.01	0.01
TOTAL		100.00	100.00
Stream Properties			
Molecular Weight	:	21.35	27.13
Gravity (AIR = 1.000)	:	0.739	0.941
Gross HV (BTU/SCF)	:	957	1111
Nett HV (BTU/SCF)	:	864	1010
Wobbe Index	:	1113	1145
Critical Pressure (psia)	:	720.9	742.2
Critical Temperature (°R)	:	388.5	446.6
GPM Content			
Ethane Plus	:	1.900	6.183
Propane Plus	:	0.591	3.020
Butanes Plus	:	0.277	1.459
Pentanes Plus	:	0.197	0.721
Hexanes Plus Properties			
Mol %	:	0.36	1.02
Molecular Weight	:	109.6	99.0
Density (gm/cc @ 60 °F)	:	0.7012	0.6878
Gravity (°API @ 60 °F)	:	70.1	74.0
Heptanes Plus Properties			
Mol %	:	0.31	0.76
Molecular Weight	:	113.7	104.2
Density (gm/cc @ 60 °F)	:	0.7061	0.6945
Gravity (°API @ 60 °F)	:	68.7	72.0
Decanes Plus Properties			
Mol %	:	0.08	0.07
Molecular Weight	:	142.4	143.6
Density (gm/cc @ 60 °F)	:	0.7358	0.7369
Gravity (°API @ 60 °F)	:	60.6	60.3
Undecanes Plus Properties			
Mol %	:	0.03	0.03
Molecular Weight	:	156.3	156.3
Density (gm/cc @ 60 °F)	:	0.7482	0.7482
Gravity (°API @ 60 °F)	:	57.4	57.4
Dodecanes Plus Properties			
Mol %	:	0.01	0.01
Molecular Weight	:	175.0	175.0
Density (gm/cc @ 60 °F)	:	0.7631	0.7631
Gravity (°API @ 60 °F)	:	53.8	53.8

COMPOSITIONAL ANALYSIS OF LIBERATED GASES
FROM LABORATORY SEPARATOR TEST @ 290 psig

Component		Separator Gas Mol %	Stock Tank Gas Mol %
Hydrogen Sulphide	H2S	0.00	0.00
Carbon Dioxide	CO2	18.98	25.19
Nitrogen	N2	0.10	0.26
Methane	C1	71.07	47.33
Ethane	C2	6.69	14.99
Propane	C3	1.60	6.51
Iso-Butane	iC4	0.22	1.02
N-Butane	nC4	0.50	2.48
Iso-Pentane	iC5	0.14	0.60
N-Pentane	nC5	0.13	0.53
Hexanes	C6	0.12	0.33
Heptanes	C7	0.25	0.55
Octanes	C8	0.09	0.14
Nonanes	C9	0.04	0.04
Decanes	C10	0.03	0.03
Undecanes	C11	0.03	0.00
Dodecanes Plus	C12+	0.01	0.00
TOTAL		100.00	100.00

Stream Properties			
Molecular Weight	:	23.70	30.02
Gravity (AIR = 1.000)	:	0.821	1.042
Gross HV (BTU/SCF)	:	949	1133
Nett HV (BTU/SCF)	:	858	1032
Wobbe Index	:	1047	1110
Critical Pressure (psia)	:	742.0	761.5
Critical Temperature (°R)	:	409.0	473.3

GPM Content			
Ethane Plus	:	2.813	7.796
Propane Plus	:	1.023	3.784
Butanes Plus	:	0.582	1.989
Pentanes Plus	:	0.352	0.872

Hexanes Plus Properties			
Mol %	:	0.57	1.09
Molecular Weight	:	103.0	95.7
Density (gm/cc @ 60 °F)	:	0.6931	0.6834
Gravity (°API @ 60 °F)	:	72.5	75.4

Heptanes Plus Properties			
Mol %	:	0.45	0.76
Molecular Weight	:	108.1	100.8
Density (gm/cc @ 60 °F)	:	0.6994	0.6902
Gravity (°API @ 60 °F)	:	70.6	73.3

Decanes Plus Properties			
Mol %	:	0.07	0.03
Molecular Weight	:	145.4	134.0
Density (gm/cc @ 60 °F)	:	0.7386	0.7278
Gravity (°API @ 60 °F)	:	59.9	62.7

Undecanes Plus Properties			
Mol %	:	0.04	0.00
Molecular Weight	:	154.0	--
Density (gm/cc @ 60 °F)	:	0.7462	--
Gravity (°API @ 60 °F)	:	57.9	--

Dodecanes Plus Properties			
Mol %	:	0.01	0.00
Molecular Weight	:	175.0	--
Density (gm/cc @ 60 °F)	:	0.7631	--
Gravity (°API @ 60 °F)	:	53.8	--

RELATIVE VOLUME

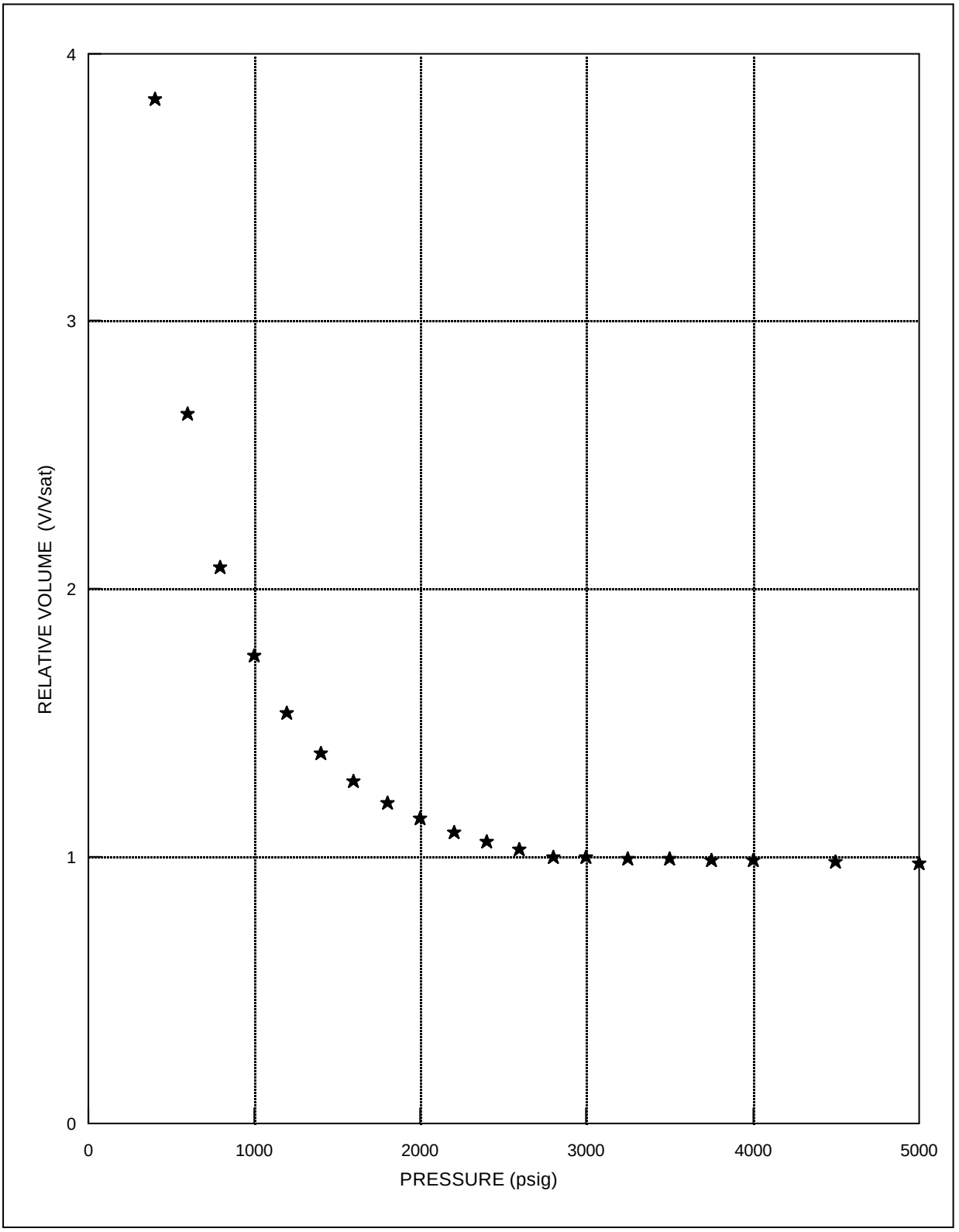
Equation of best fit

ABOVE Psat

RV = +1.05E+00 -2.54E-05 * P +2.72E-09 * P^2 -1.65E-13 * P^3 +0.00E+00 * P^4

BELOW Psat

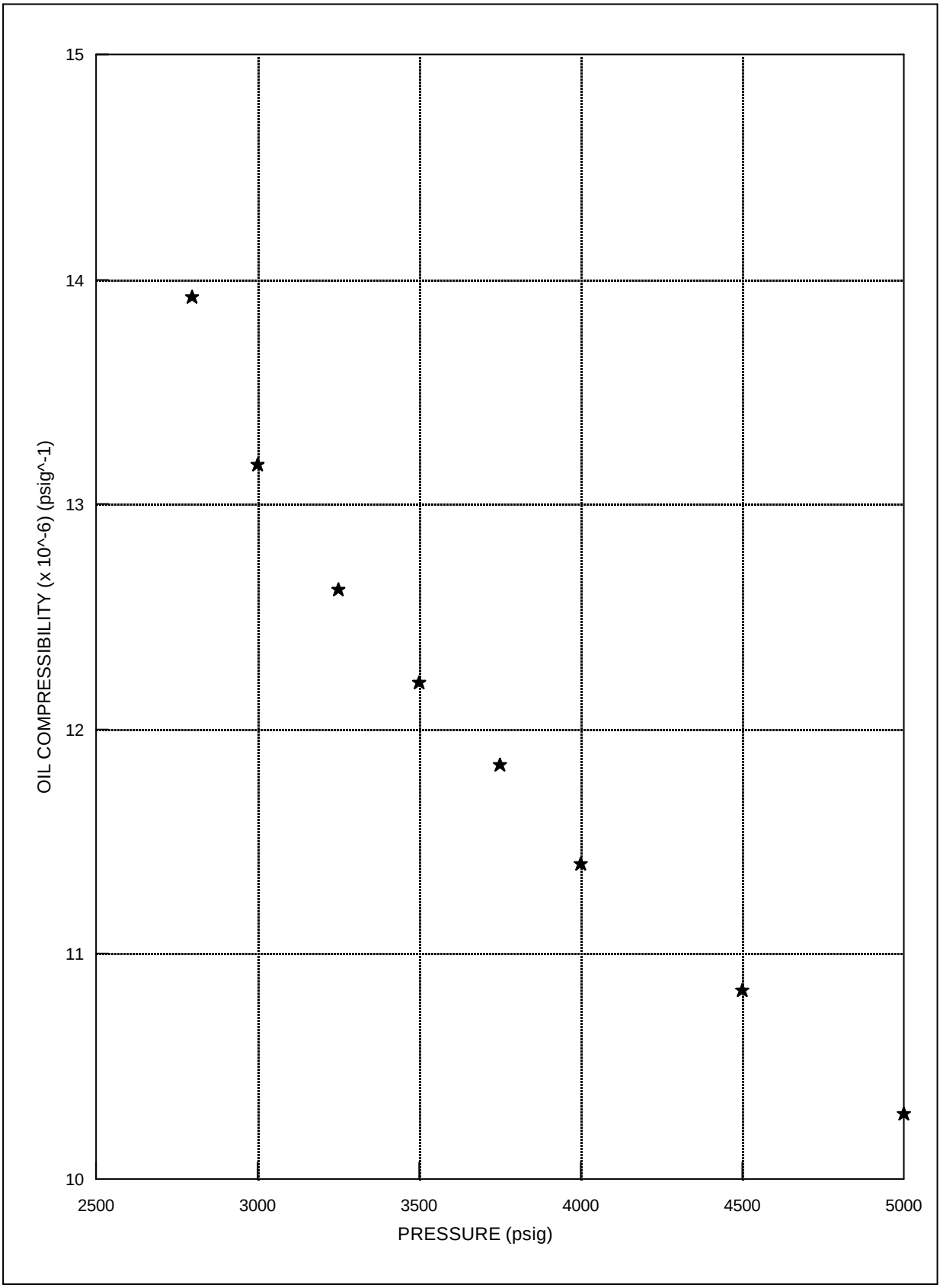
RV = +7.69E+00 -1.36E-02 * P +1.12E-05 * P^2 -4.18E-09 * P^3 +5.77E-13 * P^4



OIL COMPRESSIBILITY

Equation of best fit

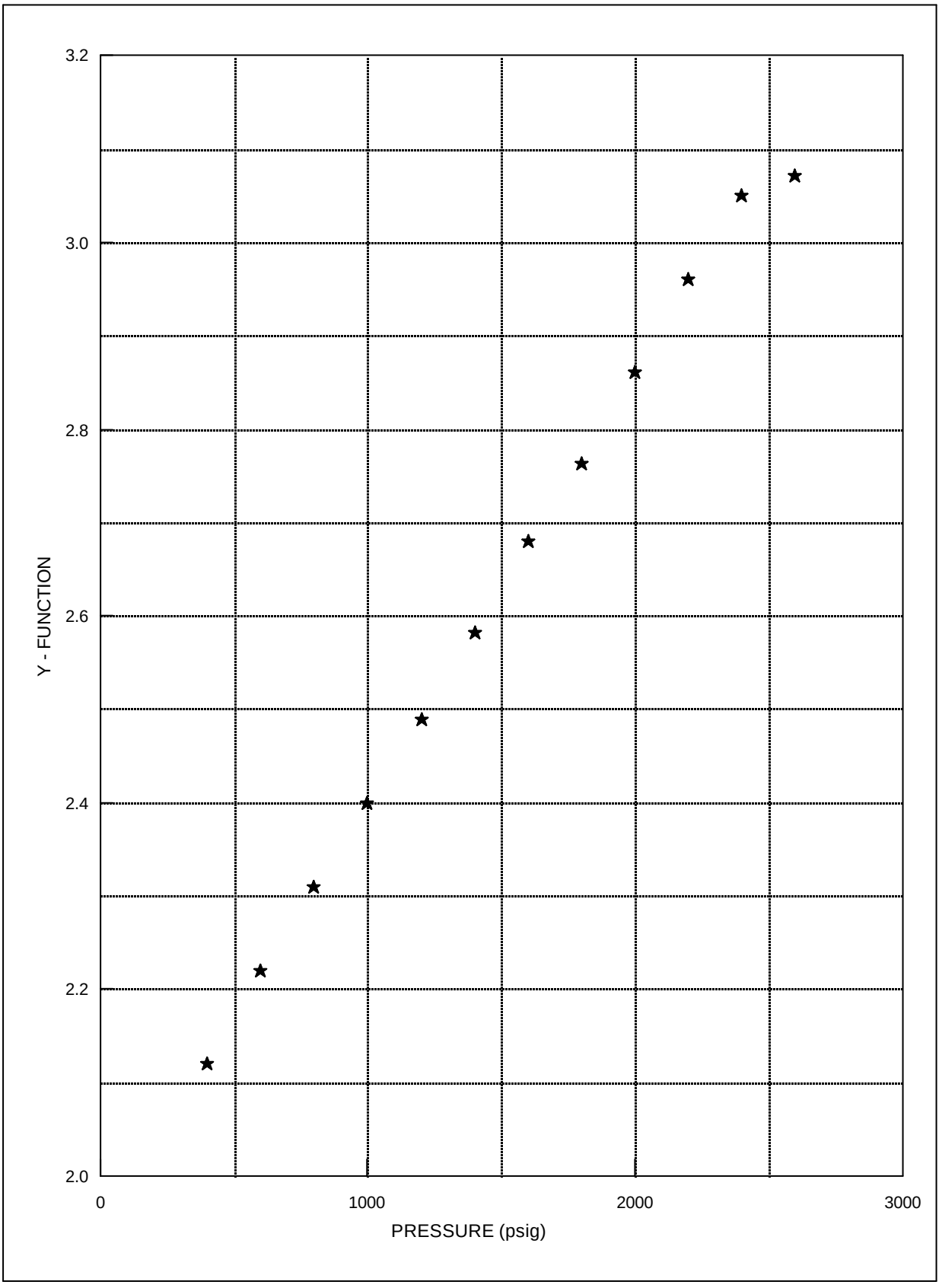
Co = +3.92E+01 -1.70E-02 * P +3.61E-06 * P^2 -2.72E-10 * P^3 +0.00E+00 * P^4



Y - FUNCTION

Equation of best fit

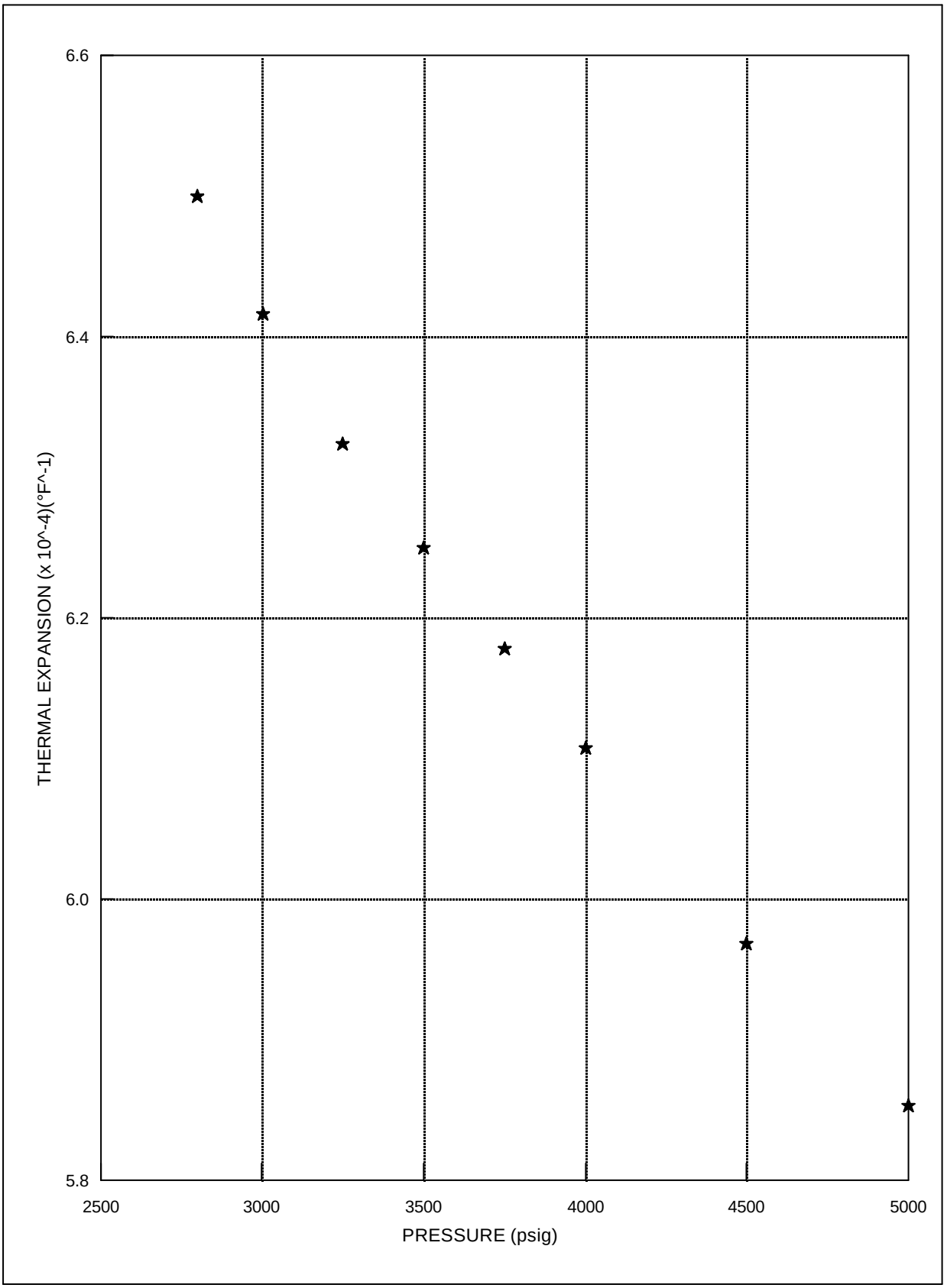
Y = +1.94E+00 +4.64E-04 * P



OIL THERMAL EXPANSION

Equation of best fit

TE = +8.51E+00 -1.14E-03 * P +1.84E-07 * P^2 -1.27E-11 * P^3 +0.00E+00 * P^4

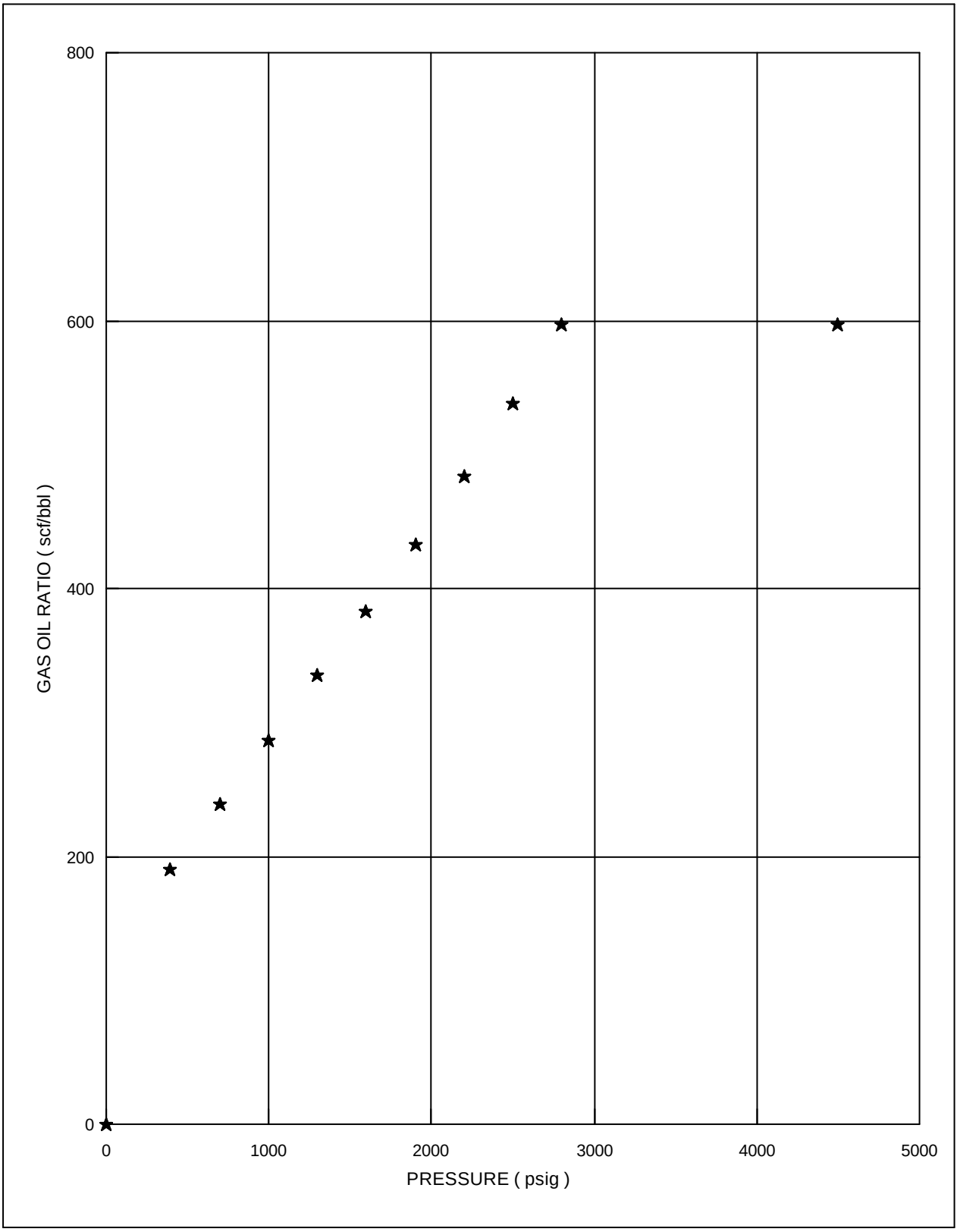


GAS - OIL RATIO

DIFFERENTIAL DATA CORRECTED WITH SEPARATOR TEST

Equation of best fit

GOR = +3.76E+00 +5.87E-01 * P -4.68E-04 * P^2 +2.01E-07 * P^3 -2.92E-11 * P^4

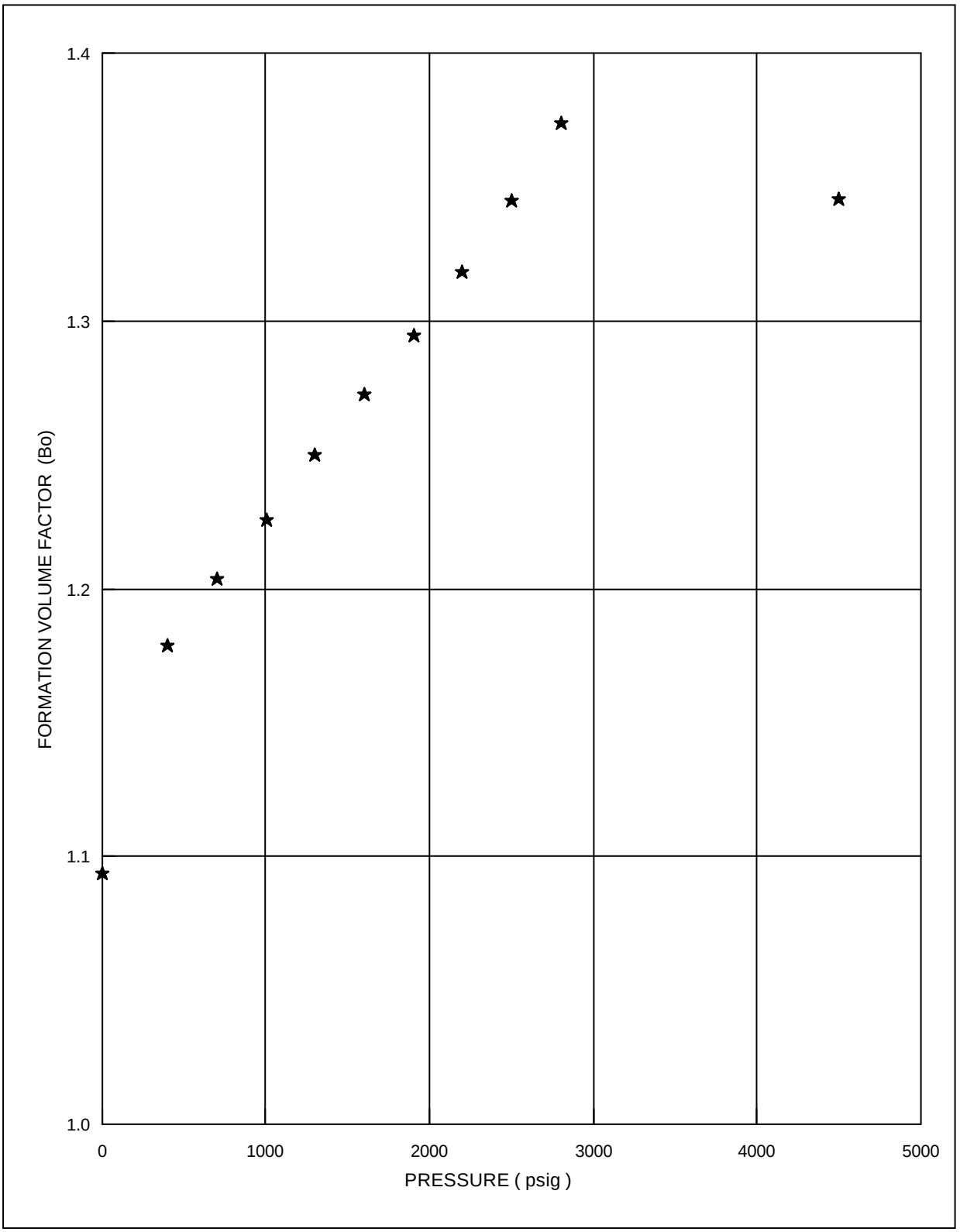


OIL FORMATION VOLUME FACTOR

DIFFERENTIAL DATA CORRECTED WITH SEPARATOR TEST

Equation of best fit

Bo = +1.10E+00 +2.59E-04 * P -1.94E-07 * P^2 +8.06E-11 * P^3 -1.14E-14 * P^4

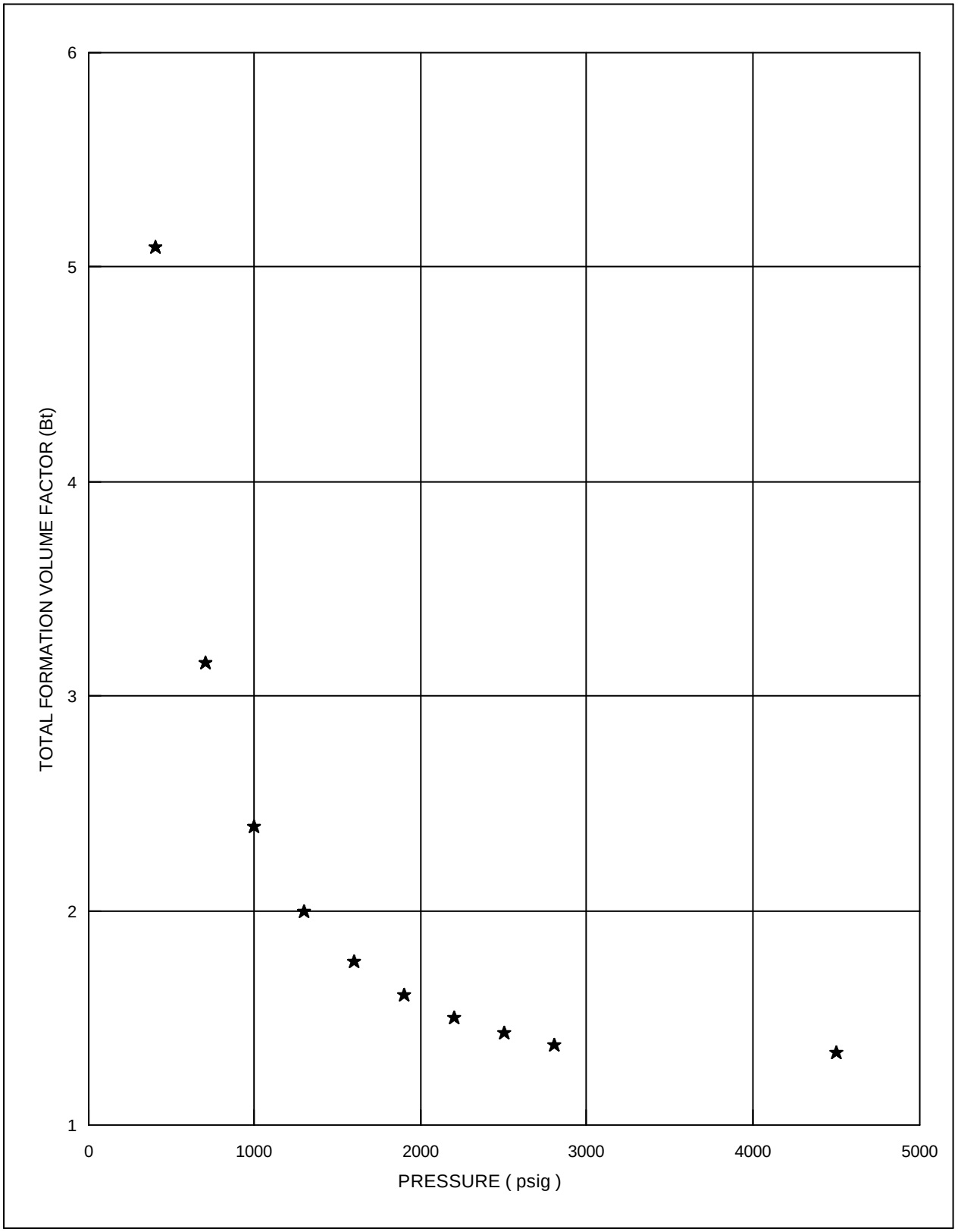


TOTAL FORMATION VOLUME FACTOR

DIFFERENTIAL DATA CORRECTED WITH SEPARATOR TEST

Equation of best fit

Bt = +9.77E+00 -1.61E-02 * P +1.24E-05 * P^2 -4.33E-09 * P^3 +5.55E-13 * P^4



OIL DENSITY

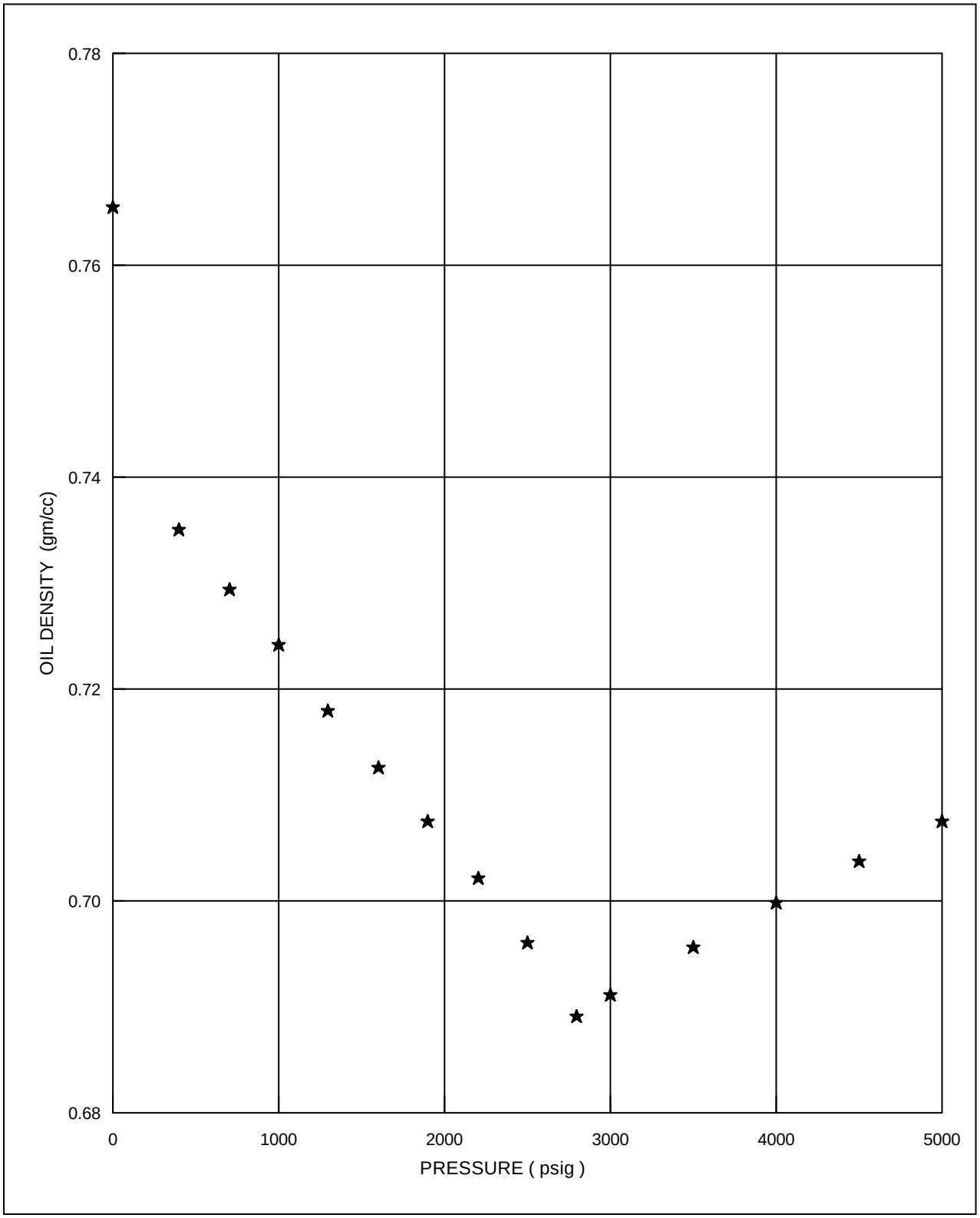
Equation of best fit

ABOVE Psat

Þ = +6.54E-01 +1.64E-05 * P -1.63E-09 * P^2 +9.98E-14 * P^3 +0.00E+00 * P^4

BELOW Psat

Þ = +7.65E-01 -9.43E-05 * P +8.10E-08 * P^2 -3.40E-11 * P^3 +4.90E-15 * P^4



OIL VISCOSITY

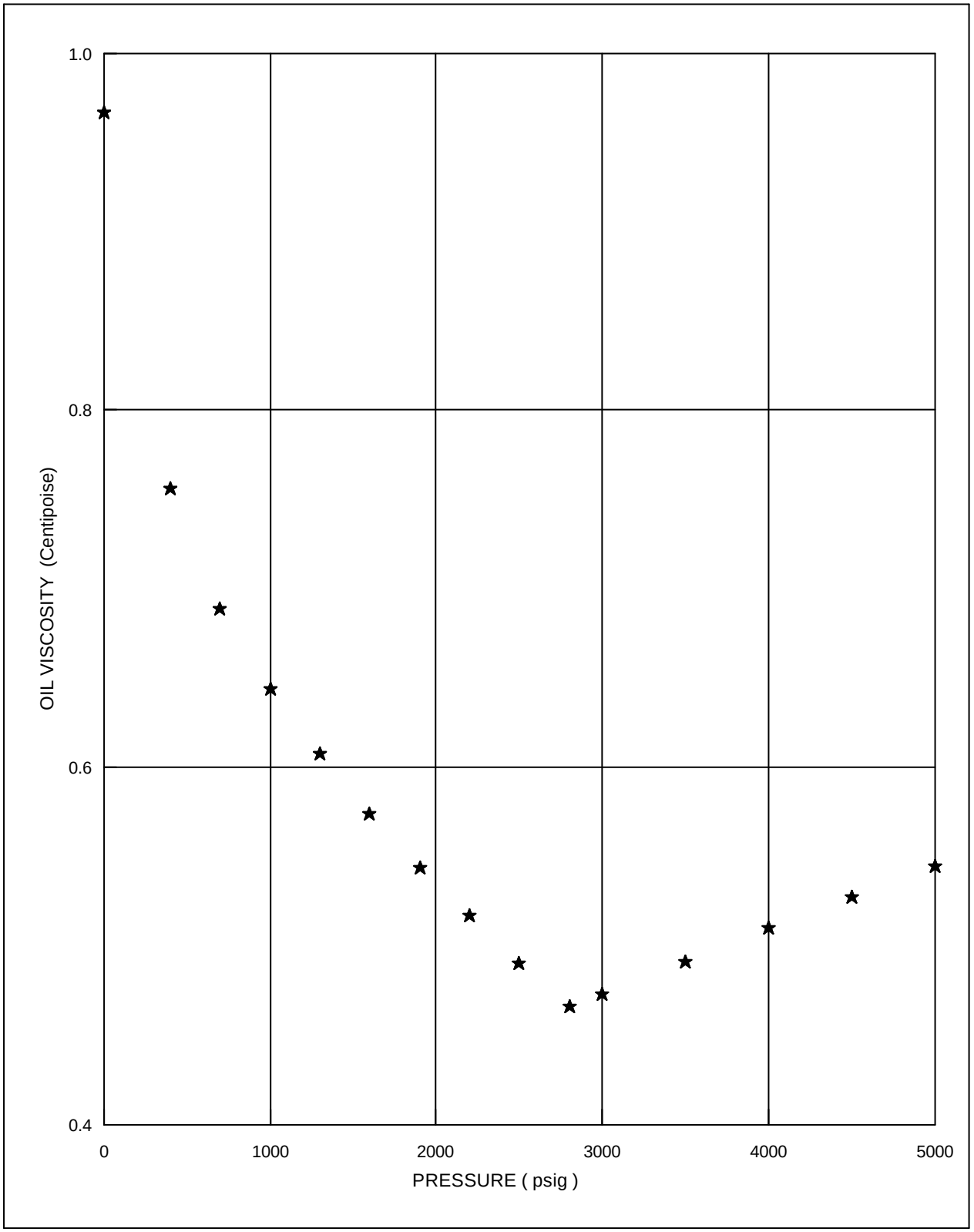
Equation of best fit

ABOVE Psat

μo = +3.72E-01 +3.02E-05 * P +1.87E-09 * P^2 -1.90E-13 * P^3 +0.00E+00 * P^4

BELOW Psat

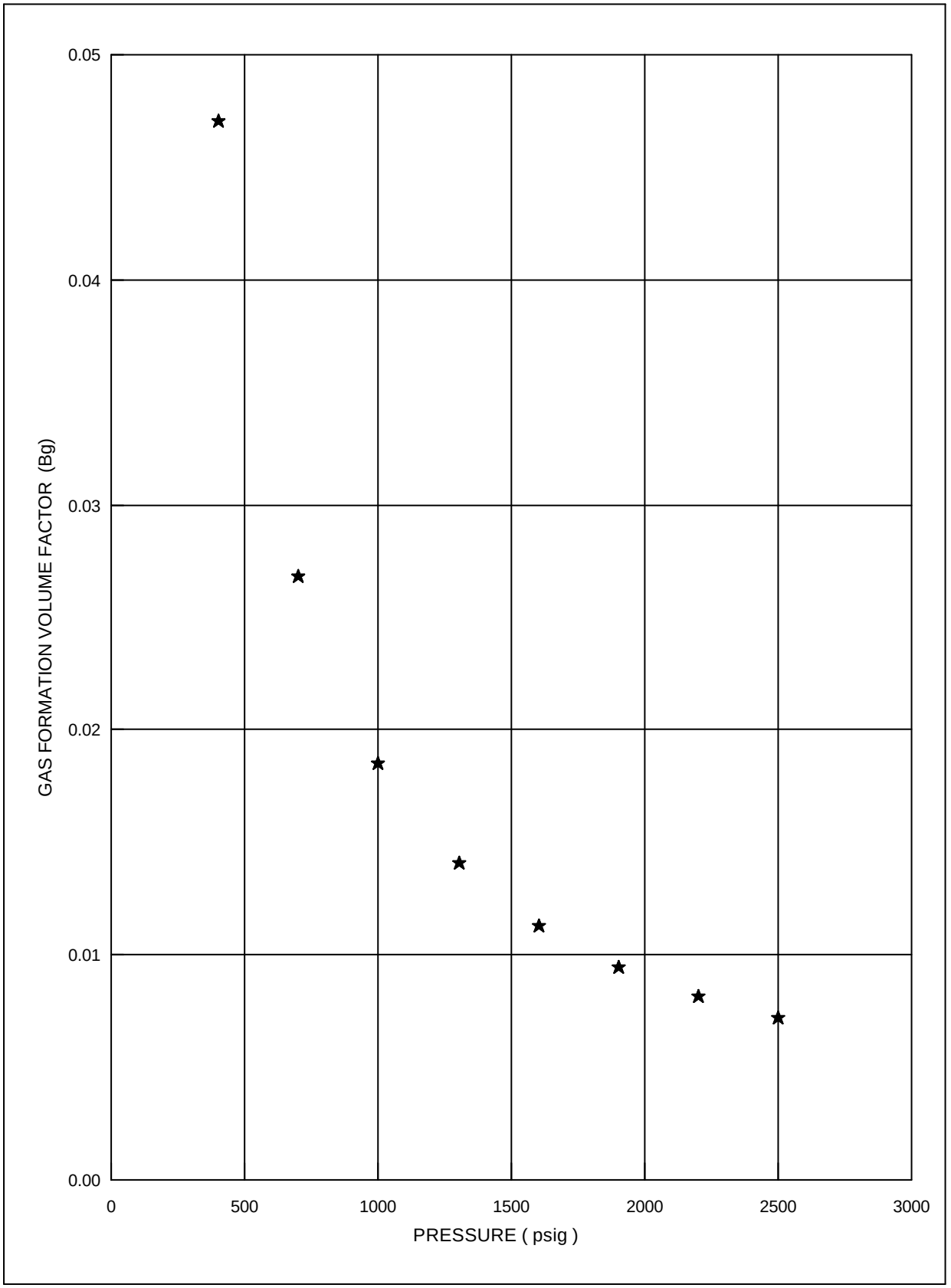
μo = +9.65E-01 -7.11E-04 * P +6.06E-07 * P^2 -2.60E-10 * P^3 +4.06E-14 * P^4



GAS FORMATION VOLUME FACTOR

Equation of best fit

Bg = +1.00E-01 -1.86E-04 * P +1.54E-07 * P^2 -5.80E-11 * P^3 +8.16E-15 * P^4



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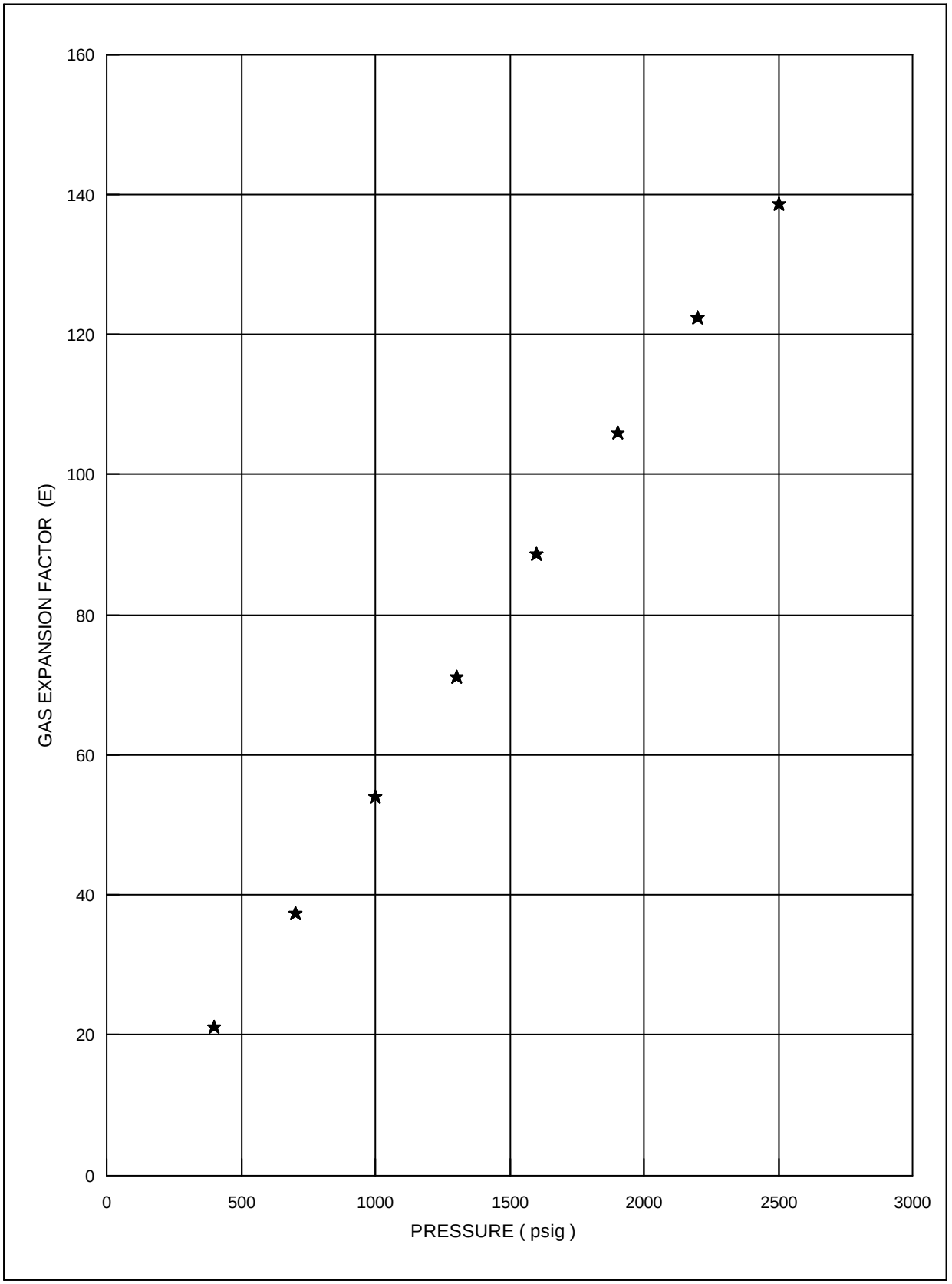
Well : Snapper A21-A | File : E - 28005

GAS EXPANSION FACTOR

Equation of best fit

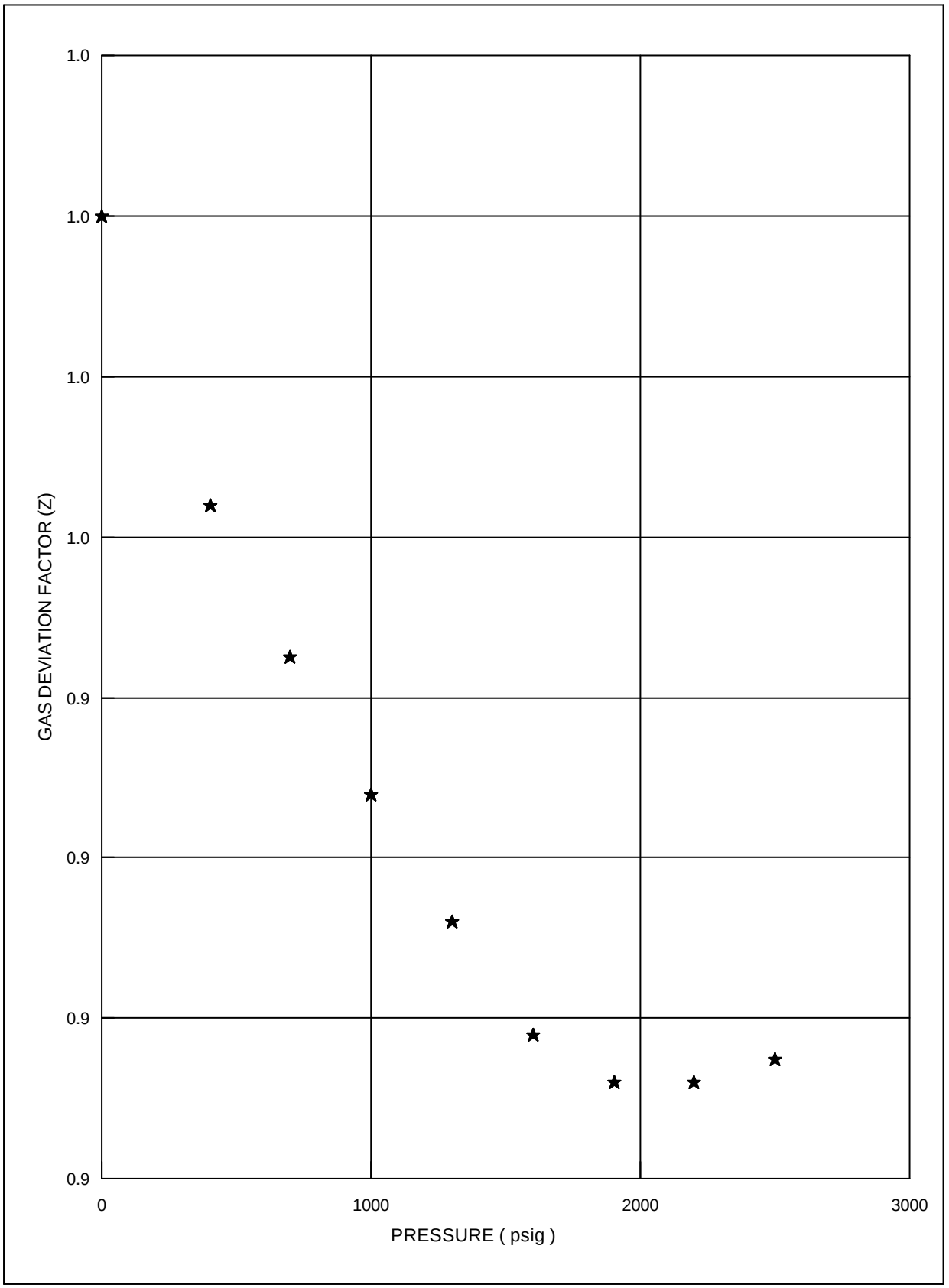
E = +1.79E+00 +4.55E-02 * P +8.88E-06 * P^2 -2.18E-09 * P^3 +4.39E-14 * P^4



GAS DEVIATION FACTOR

Equation of best fit

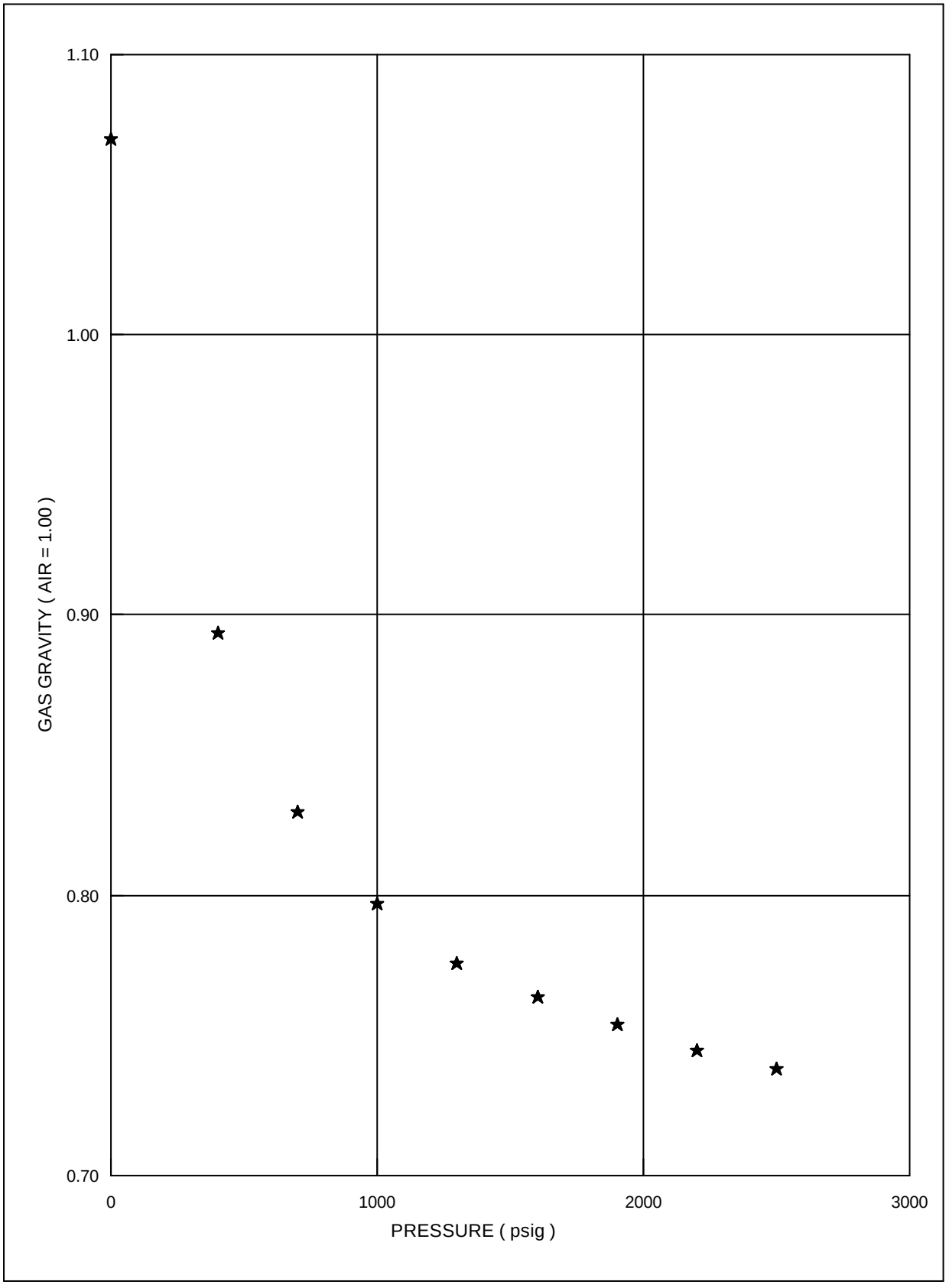
Z = +1.00E+00 -9.65E-05 * P +3.16E-08 * P^2 -1.09E-11 * P^3 +2.81E-15 * P^4



GAS GRAVITY

Equation of best fit

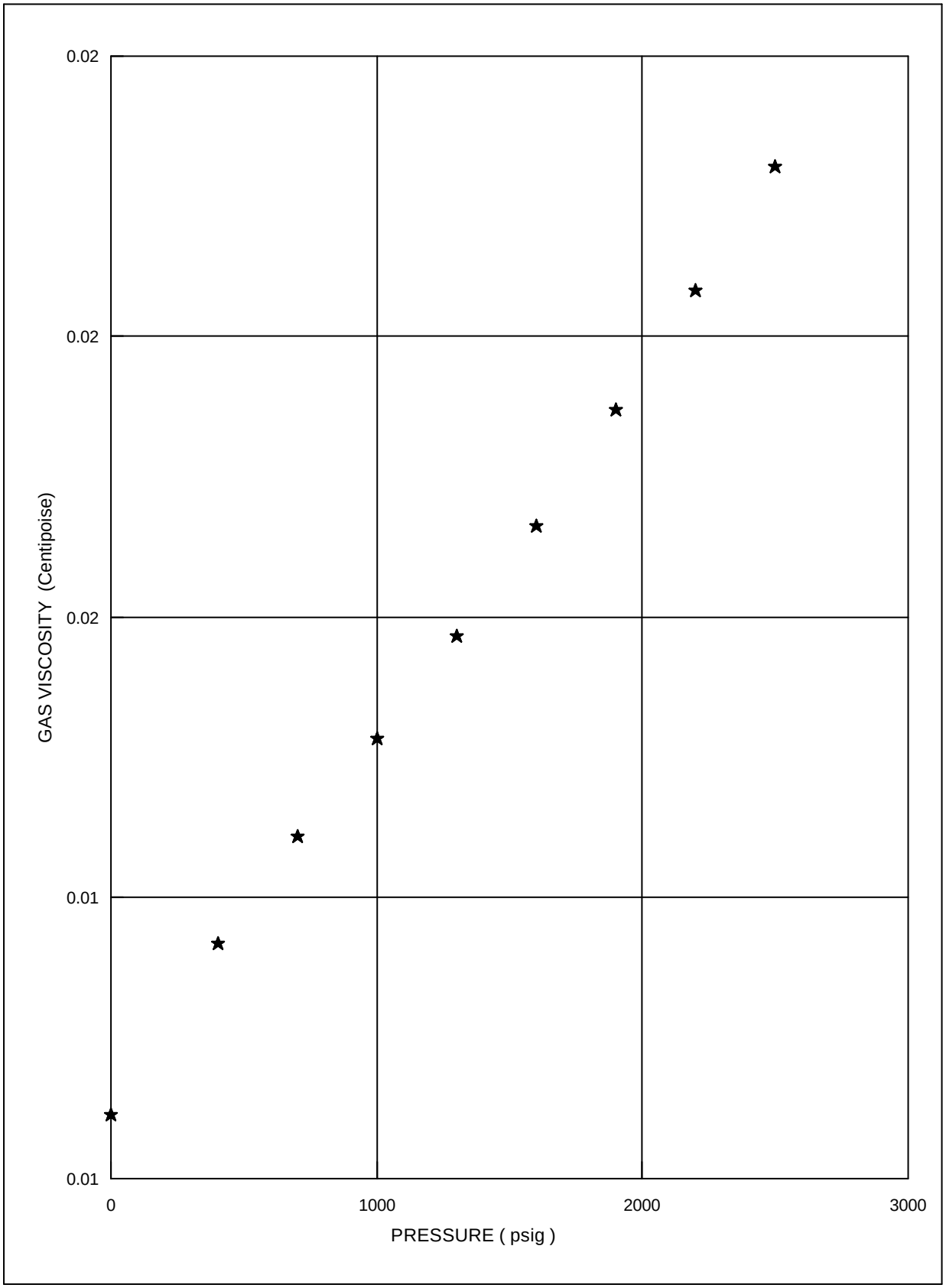
GG = +1.05E+00 -5.23E-04 * P +3.91E-07 * P^2 -1.40E-10 * P^3 +1.88E-14 * P^4



GAS VISCOSITY

Equation of best fit

μg = +1.25E-02 +3.24E-06 * P -1.14E-09 * P^2 +6.06E-13 * P^3 -9.60E-17 * P^4



FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812417 Ex MPSR 3350

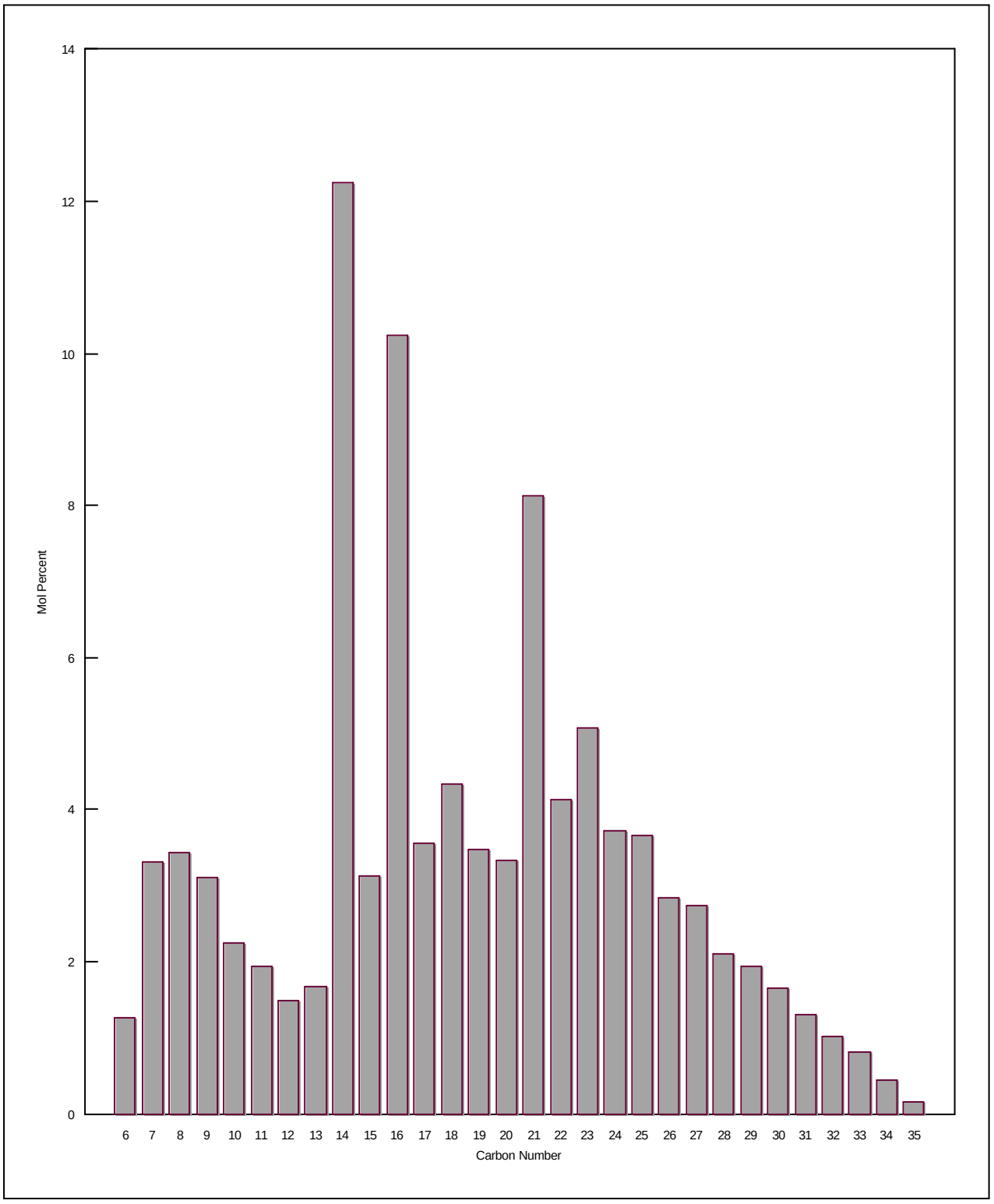
Component		Mol %
Hexanes minus	C6-	1.49
Hexanes	C6	1.27
Heptanes	C7	3.31
Octanes	C8	3.44
Nonanes	C9	3.10
Decanes	C10	2.25
Undecanes	C11	1.94
Dodecanes	C12	1.49
Tridecanes	C13	1.68
Tetradecanes	C14	12.24
Pentadecanes	C15	3.12
Hexadecanes	C16	10.24
Heptadecanes	C17	3.55
Octadecanes	C18	4.34
Nonadecanes	C19	3.47
Eicosanes	C20	3.33
Heneicosanes	C21	8.12
Docosanes	C22	4.14
Tricosanes	C23	5.07
Tetracosanes	C24	3.72
Pentacosanes	C25	3.66
Hexacosanes	C26	2.85
Heptacosanes	C27	2.74
Octacosanes	C28	2.10
Nonacosanes	C29	1.94
Triacontanes	C30	1.66
Hentriacontanes	C31	1.30
Dotriacontanes	C32	1.02
Tritriacontanes	C33	0.82
Tetratriacontanes	C34	0.45
Pentatriacontanes Plus	C35+	0.15
TOTAL		100.00

Molecular Weight Calculated *	:	251.4
Density @ 60 °F Calculated *	:	0.8549
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.8557

*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 # 812417 Ex MPSR 3350



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Company : Esso Australia Pty. Ltd.	Page : 83 of 136
Well : Snapper A21-A	File : E - 28005

COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

3014.2 mMD depth

Sample 7, Cylinder # 812417 Ex MPSR 3350

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.31	21.13	12.78
Nitrogen	N2	0.00	0.05	0.03
Methane	C1	0.38	65.44	39.34
Ethane	C2	0.26	7.50	4.59
Propane	C3	0.38	3.09	2.00
Iso-Butane	iC4	0.15	0.49	0.35
N-Butane	nC4	0.39	0.88	0.68
Iso-Pentane	iC5	0.35	0.30	0.32
N-Pentane	nC5	0.40	0.27	0.32
Hexanes	C6	1.26	0.25	0.65
Heptanes	C7	3.27	0.25	1.46
Octanes	C8	3.40	0.16	1.46
Nonanes	C9	3.06	0.10	1.29
Decanes	C10	2.22	0.03	0.91
Undecanes	C11	1.92	0.03	0.79
Dodecanes Plus	C12+	82.25	0.03	33.03
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.4012	0.5988	1.0000
Mass Ratio	:	0.8672	0.1328	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	1.4359 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	682 SCF	--
Stream Properties				
Molecular Weight	:	248.7	25.51	115.1
Density obs. (gm/cc)	:	0.8542 @ 60 °F	--	0.6864 @ PT*
Gravity (AIR = 1.000)	:	34.0 °API @ 60 °F	0.884	74.5
GHV (BTU/scf)	:	--	993	--
Hexanes Plus Properties				
Mol %	:	97.39	0.85	39.59
Molecular Weight	:	254.1	103.2	252.1
Density (gm/cc @ 60 °F)	:	0.8565	0.6933	0.8555
Gravity (°API @ 60 °F)	:	33.5	72.4	33.7
Heptanes Plus Properties				
Mol %	:	96.13	0.60	38.94
Molecular Weight	:	256.3	111.2	255.0
Density (gm/cc @ 60 °F)	:	0.8574	0.7032	0.8567
Gravity (°API @ 60 °F)	:	33.4	69.5	33.5
Decanes Plus Properties				
Mol %	:	86.39	0.09	34.73
Molecular Weight	:	273.0	150.3	272.8
Density (gm/cc @ 60 °F)	:	0.8633	0.7430	0.8632
Gravity (°API @ 60 °F)	:	32.3	58.8	32.3
Undecanes Plus Properties				
Mol %	:	84.17	0.06	33.82
Molecular Weight	:	276.7	158.5	276.6
Density (gm/cc @ 60 °F)	:	0.8645	0.7500	0.8644
Gravity (°API @ 60 °F)	:	32.0	57.0	32.0
Dodecanes Plus Properties				
Mol %	:	82.25	0.03	33.03
Molecular Weight	:	279.7	169.9	279.7
Density (gm/cc @ 60 °F)	:	0.8655	0.7592	0.8655
Gravity (°API @ 60 °F)	:	31.8	54.7	31.8

* (P)ressure : 3205 psig * (T)emperature : 271 °F

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812417 Ex MPSR 3350

OBM Mathematically Cleaned Up

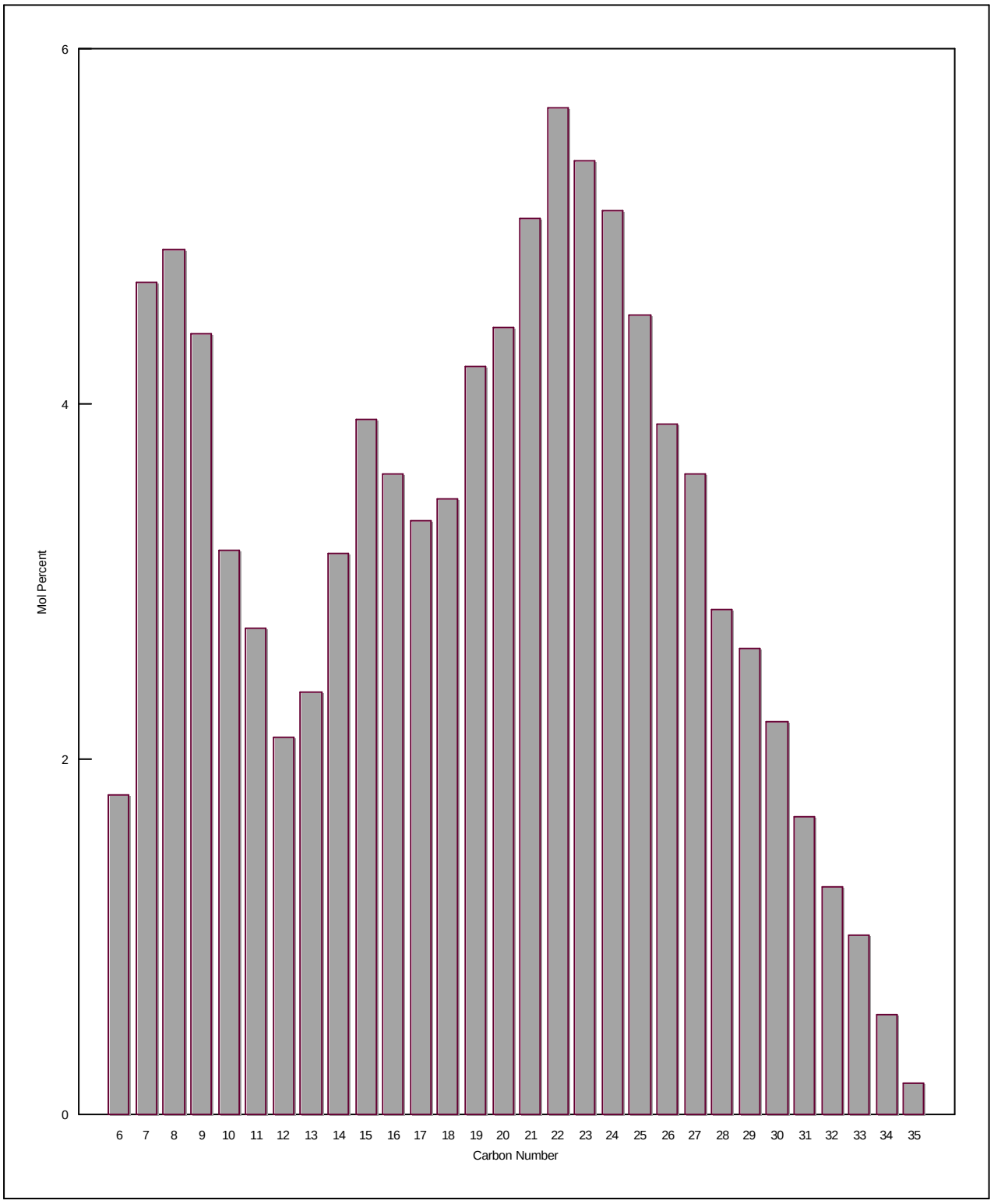
Component		Mol %
Hexanes minus	C6-	2.15
Hexanes	C6	1.80
Heptanes	C7	4.69
Octanes	C8	4.87
Nonanes	C9	4.40
Decanes	C10	3.18
Undecanes	C11	2.74
Dodecanes	C12	2.12
Tridecanes	C13	2.38
Tetradecanes	C14	3.16
Pentadecanes	C15	3.91
Hexadecanes	C16	3.61
Heptadecanes	C17	3.34
Octadecanes	C18	3.47
Nonadecanes	C19	4.21
Eicosanes	C20	4.43
Heneicosanes	C21	5.05
Docosanes	C22	5.67
Tricosanes	C23	5.37
Tetracosanes	C24	5.09
Pentacosanes	C25	4.50
Hexacosanes	C26	3.89
Heptacosanes	C27	3.61
Octacosanes	C28	2.84
Nonacosanes	C29	2.62
Triacontanes	C30	2.21
Hentriacontanes	C31	1.67
Dotriacontanes	C32	1.28
Tritriacontanes	C33	1.01
Tetratriacontanes	C34	0.56
Pentatriacontanes Plus	C35+	0.17
TOTAL		100.00

Molecular Weight Calculated *	:	256.6
Density @ 60 °F Calculated *	:	0.8576
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.8557

*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 # 812417 Ex MPSR 3350
OBM Mathematically Cleaned Up



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COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

3014.2 mMD depth - OBM Mathematically Cleaned Up

Sample 7, Cylinder # 812417 Ex MPSR 3350

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.31	21.13	14.51
Nitrogen	N2	0.00	0.05	0.03
Methane	C1	0.38	65.44	44.76
Ethane	C2	0.26	7.50	5.20
Propane	C3	0.38	3.09	2.23
Iso-Butane	iC4	0.15	0.49	0.38
N-Butane	nC4	0.39	0.88	0.72
Iso-Pentane	iC5	0.35	0.30	0.32
N-Pentane	nC5	0.40	0.27	0.31
Hexanes	C6	1.79	0.25	0.74
Heptanes	C7	4.67	0.25	1.65
Octanes	C8	4.85	0.16	1.65
Nonanes	C9	4.38	0.10	1.46
Decanes	C10	3.16	0.03	1.03
Undecanes	C11	2.73	0.03	0.89
Dodecanes Plus	C12+	75.81	0.03	24.12
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.3179	0.6821	1.0000
Mass Ratio	:	0.8234	0.1766	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	1.5731 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	959 SCF	--
Stream Properties				
Molecular Weight	:	255.1	25.51	98.5
Density obs. (gm/cc)	:	0.8575 @ 60 °F	--	0.6626 @ PT*
Gravity (AIR = 1.000)	:	33.4 °API @ 60 °F	0.884	81.9
GHV (BTU/scf)	:	--	993	--
Hexanes Plus Properties				
Mol %	:	97.39	0.85	31.54
Molecular Weight	:	260.6	103.2	257.7
Density (gm/cc @ 60 °F)	:	0.8598	0.6933	0.8583
Gravity (°API @ 60 °F)	:	32.9	72.4	33.2
Heptanes Plus Properties				
Mol %	:	95.60	0.60	30.80
Molecular Weight	:	263.9	111.2	261.9
Density (gm/cc @ 60 °F)	:	0.8611	0.7032	0.8600
Gravity (°API @ 60 °F)	:	32.7	69.5	32.9
Decanes Plus Properties				
Mol %	:	81.70	0.09	26.04
Molecular Weight	:	290.5	150.3	290.1
Density (gm/cc @ 60 °F)	:	0.8697	0.7430	0.8695
Gravity (°API @ 60 °F)	:	31.0	58.8	31.1
Undecanes Plus Properties				
Mol %	:	78.54	0.06	25.01
Molecular Weight	:	296.8	158.5	296.5
Density (gm/cc @ 60 °F)	:	0.8716	0.7500	0.8715
Gravity (°API @ 60 °F)	:	30.7	57.0	30.7
Dodecanes Plus Properties				
Mol %	:	75.81	0.03	24.12
Molecular Weight	:	302.2	169.9	302.1
Density (gm/cc @ 60 °F)	:	0.8732	0.7592	0.8731
Gravity (°API @ 60 °F)	:	30.4	54.7	30.4

* (P)ressure : 4231 psig * (T)emperature : 271 °F

DISTILLATION OF STOCK TANK LIQUID SAMPLE
Flashed from Sample in Cylinder # 812417 Ex MPSR 3350
(Hexanes to Eicosanes Plus)

C6 PLUS PROPERTIES OF STOCK TANK LIQUID

		Cut (°C)	Mol %	Molecular Weight	Weight %	Volume %	Density (gm/cc)	API Gravity
Hexanes	C6	59 - 84	1.69	90	0.55	0.63	0.7416	59.1
Heptanes	C7	85 - 112	3.08	101	1.12	1.23	0.7763	50.6
Octanes	C8	113 - 138	4.24	108	1.65	1.73	0.8094	43.2
Nonanes	C9	139 - 162	3.03	122	1.34	1.40	0.8106	42.9
Decanes	C10	163 - 185	1.19	135	0.58	0.60	0.8128	42.4
Undecanes	C11	186 - 206	1.60	149	0.86	0.89	0.8156	41.8
Dodecanes	C12	207 - 227	1.28	164	0.76	0.78	0.8188	41.1
Tridecanes	C13	228 - 246	6.70	179	4.32	4.45	0.8232	40.2
Tetradecanes	C14	247 - 263	8.88	192	6.17	6.30	0.8286	39.1
Pentadecanes	C15	264 - 280	7.71	208	5.80	5.89	0.8345	37.9
Hexadecanes	C16	281 - 296	5.80	224	4.69	4.72	0.8415	36.5
Heptadecanes	C17	297 - 312	3.69	232	3.10	3.08	0.8522	34.4
Octadecanes	C18	313 - 322	3.88	246	3.45	3.41	0.8557	33.7
Nonadecanes	C19	323 - 335	6.44	266	6.19	6.12	0.8564	33.6
Eicosanes Plus	C20+	> 336	40.79	403	59.42	58.77	0.8555	33.7
	TOTAL		100.00		100.00	100.00		

C6 PLUS PROPERTIES OF BOTTOM HOLE RESERVOIR FLUID

		Cut (°C)	Mol %	Molecular Weight	Weight %	Volume %	Density (gm/cc)	API Gravity
Hexanes	C6	59 - 84	2.09	89	0.67	0.78	0.7302	62.1
Heptanes	C7	85 - 112	3.45	100	1.26	1.39	0.7696	52.2
Octanes	C8	113 - 138	4.44	108	1.75	1.84	0.8053	44.0
Nonanes	C9	139 - 162	3.16	122	1.41	1.47	0.8080	43.5
Decanes	C10	163 - 185	1.23	134	0.60	0.63	0.8113	42.7
Undecanes	C11	186 - 206	1.63	149	0.88	0.92	0.8148	42.0
Dodecanes	C12	207 - 227	1.31	163	0.78	0.81	0.8181	41.3
Tridecanes	C13	228 - 246	6.61	179	4.30	4.42	0.8232	40.2
Tetradecanes	C14	247 - 263	8.75	192	6.14	6.27	0.8286	39.1
Pentadecanes	C15	264 - 280	7.60	208	5.77	5.85	0.8345	37.9
Hexadecanes	C16	281 - 296	5.73	223	4.67	4.69	0.8415	36.5
Heptadecanes	C17	297 - 312	3.64	232	3.08	3.06	0.8522	34.4
Octadecanes	C18	313 - 322	3.83	246	3.43	3.39	0.8557	33.7
Nonadecanes	C19	323 - 335	6.35	266	6.16	6.08	0.8564	33.6
Eicosanes Plus	C20+	> 336	40.18	403	59.10	58.40	0.8555	33.7
	TOTAL		100.00		100.00	100.00		

PETROLAB

COMPOSITIONAL ANALYSIS OF MDT BOTTOM HOLE RESERVOIR FLUID

Sample in Cylinder # 812417 Ex MPSR 3350

Extended with High Temperature Vacuum Distillation

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.31	21.13	13.26
Nitrogen	N2	0.00	0.05	0.03
Methane	C1	0.38	65.44	40.84
Ethane	C2	0.26	7.50	4.76
Propane	C3	0.38	3.09	2.06
Iso-Butane	iC4	0.15	0.49	0.36
N-Butane	nC4	0.39	0.88	0.69
Iso-Pentane	iC5	0.35	0.30	0.32
N-Pentane	nC5	0.40	0.27	0.32
Hexanes	C6	1.65	0.25	0.78
Heptanes	C7	3.00	0.25	1.29
Octanes	C8	4.13	0.16	1.66
Nonanes	C9	2.96	0.10	1.18
Decanes	C10	1.15	0.03	0.46
Undecanes	C11	1.56	0.03	0.61
Dodecanes	C12	1.24	0.03	0.49
Tridecanes	C13	6.53	0.00	2.47
Tetradecanes	C14	8.65	0.00	3.27
Pentadecanes	C15	7.50	0.00	2.84
Hexadecanes	C16	5.65	0.00	2.14
Heptadecanes	C17	3.59	0.00	1.36
Octadecanes	C18	3.78	0.00	1.43
Nonadecanes	C19	6.27	0.00	2.37
Eicosanes Plus	C20+	39.71	0.00	15.01
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.3781	0.6219	1.0000
Mass Ratio	:	0.8659	0.1341	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	1.4396 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	682 SCF	--

Stream Properties				
Molecular Weight	:	270.9	25.51	118.27
Density obs. (gm/cc)	:	0.8443 @ 60 °F	--	0.6778 @ PT*
Gravity (AIR = 1.000)	:	35.9 °API @ 60 °F	0.884	77.1 °API
GHV (BTU/scf)	:	--	993	--

Hexanes Plus Properties				
Mol %	:	97.39	0.85	37.36
Molecular Weight	:	276.81	102.92	274.35
Density (gm/cc @ 60 °F)	:	0.8464	0.6929	0.8454
Gravity (°API @ 60 °F)	:	35.51	72.52	35.71

Heptanes Plus Properties				
Mol %	:	95.73	0.60	36.58
Molecular Weight	:	280.04	110.80	278.32
Density (gm/cc @ 60 °F)	:	0.8471	0.7027	0.8464
Gravity (°API @ 60 °F)	:	35.38	69.68	35.52

Dodecanes Plus Properties				
Mol %	:	82.94	0.03	31.38
Molecular Weight	:	305.20	161.00	305.11
Density (gm/cc @ 60 °F)	:	0.8498	0.7521	0.8497
Gravity (°API @ 60 °F)	:	34.86	56.47	34.86

Eicosanes Plus Properties				
Mol %	:	39.71	0.00	15.01
Molecular Weight	:	403.30	--	403.30
Density (gm/cc @ 60 °F)	:	0.8555	--	0.8555
Gravity (°API @ 60 °F)	:	33.74	--	33.74

* (P)ressure : 3205 psig * (T)emperature : 271 °F

CONSTANT MASS STUDY
@ 271 °F
Using Bottom Hole Sample in Cylinder # 812417 Ex MPSR 3350

Pressure (psig)		Relative Volume (V/Vsat) (1)	Oil Compressibility (x10^-6)(psig^-1) (2)	Y Function (psig^-1) (3)	Thermal Expansion (x10^-4)(°F^-1) (4)
5000		0.9748	9.91		5.52
4750		0.9774	10.84		5.58
4500		0.9803	11.82		5.67
4231	* *	0.9837	12.87		5.78
4000		0.9869	13.98		5.90
3750		0.9907	15.14		6.01
3500		0.9947	16.37		6.08
3205	*	1.0000	17.89		6.18
3100		1.0105		3.24	
3000		1.0213		3.21	
2750		1.0529		3.13	
2500		1.0928		3.04	
2250		1.1441		2.95	
2000		1.2110		2.86	
1750		1.2999		2.77	
1500		1.4215		2.70	
1250		1.5949		2.63	
1000		1.8600		2.56	
750		2.3104		2.50	
500		3.2337		2.42	

* Saturation Pressure
* * Reservoir Pressure

(1) Barrels at indicated pressure per barrel at saturation pressure
(2) Oil Compressibility = - (1/V) * (dV/dP)
(3) Y Function = (Psat - P) / (P)*(V/Vsat-1)
(4) Thermal Expansion = - (1/V) * (dV/dT)

DIFFERENTIAL VAPORIZATION
@ 271 °F
Using Bottom Hole Sample in Cylinder # 812417 Ex MPSR 3350

Pressure (psig)		Gas-Oil Ratio (SCF/Bbl) (1)	Formation Volume Factor (Bo) (2)	(Bt) (3)	Oil Density (gm/cc)	Oil Viscosity (Centipoise)
5000		608	1.3628	1.3628	0.7080	0.494
4500		608	1.3705	1.3705	0.7040	0.463
4231	* *	608	1.3753	1.3753	0.7015	0.447
4000		608	1.3797	1.3797	0.6993	0.433
3500		608	1.3907	1.3907	0.6938	0.403
3205	*	608	1.3980	1.3980	0.6901	0.383
2850		527	1.3638	1.4576	0.6974	0.426
2500		456	1.3346	1.5338	0.7033	0.480
2150		387	1.3057	1.6405	0.7099	0.545
1800		320	1.2771	1.8003	0.7166	0.621
1450		256	1.2494	2.0518	0.7234	0.709
1100		196	1.2248	2.4781	0.7290	0.810
750		134	1.1994	3.3400	0.7346	0.929
400		67	1.1710	5.7750	0.7407	1.109
0		0	1.0933		0.7773	1.420

* Saturation Pressure
* * Reservoir Pressure

(1) Cubic feet of gas at 14.696 psia and 60 °F per barrel of residual oil at 60 °F.
(2) Barrels of oil at indicated pressure and temperature per barrel of residual oil at 60 °F.
(3) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of residual oil at 60 °F.

Bo and Rs

Differential Data Corrected with Optimum Separator Test

OPTIMUM SEPARATOR TEST:	Pressure (psig) :		Temperature (°C) :	131
	(Bofb) :	1.3960	(Rsfb) :	660
DIFFERENTIAL :	(Bodb) :	1.3980	(Rsdb) :	608

(2) Bo=Bod*(Bofb/Bodb)
(4) Bt=Btd*(Bofb/Bodb)
(6) Rs=Rsfb-(Rsdb-Rsd)*(Bofb/Bodb)

Pressure (psig)		(Bod) (1)	(Bo) (2)	(Btd) (3)	(Bt) (4)	(Rsd) (SCF/BBL) (5)	(Rs) (SCF/BBL) (6)
4500		1.3705	1.3685	1.3705	1.3685	608	660
3205	*	1.3980	1.3960	1.3980	1.3960	608	660
2850		1.3638	1.3618	1.4576	1.4555	527	579
2500		1.3346	1.3327	1.5338	1.5316	456	509
2150		1.3057	1.3038	1.6405	1.6381	387	440
1800		1.2771	1.2752	1.8003	1.7977	320	373
1450		1.2494	1.2476	2.0518	2.0488	256	309
1100		1.2248	1.2231	2.4781	2.4745	196	249
750		1.1994	1.1977	3.3400	3.3351	134	187
400		1.1710	1.1693	5.7750	5.7666	67	120
0		1.0933	1.0933			0	0

* Saturation Pressure

(1) Barrels of oil at indicated pressure and temperature per barrel of residual oil at 60 °F
(2) Barrels of oil at indicated pressure and temperature per barrel of stock tank oil at 60 °F
(3) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of residual oil at 60 °F
(4) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of stock tank oil at 60 °F
(5) Cubic feet of gas at 14.696 psia and 60 °F per barrel of residual oil at 60 °F
(6) Cubic feet of gas at 14.696 psia and 60 °F per barrel of stock tank oil at 60 °F

DIFFERENTIAL VAPORIZATION
@ 271 °F
Using Bottom Hole Sample in Cylinder # 812417 Ex MPSR 3350

Pressure (psi)	Formation Volume Factor (Bg) (1)	Gas Expansion Factor (E) (2)	Deviation Factor (Z)	Gas Gravity (Air=1.00)	Gas Viscosity (Centipoise) (3)
3205 *					
2850	0.00661	151.314	0.916	0.776	0.0205
2500	0.00746	134.027	0.908	0.780	0.0194
2150	0.00863	115.857	0.904	0.785	0.0183
1800	0.01034	96.708	0.908	0.794	0.0173
1450	0.01296	77.147	0.919	0.809	0.0163
1100	0.01729	57.831	0.933	0.831	0.0155
750	0.02567	38.963	0.950	0.864	0.0146
400	0.04840	20.660	0.972	0.941	0.0137
0			1.000	1.093	0.0126

* Saturation Pressure

(1) Cubic feet of gas at indicated pressure and temperature per cubic foot at 14.696 psia and 60 °F
(2) Cubic feet of gas at 14.696 psia and 60 °F per cubic foot at indicated pressure and temperature
(3) Calculated from correlation of Lee, Gonzales and Eakin

COMPOSITIONAL ANALYSIS OF GASES
LIBERATED DURING DIFFERENTIAL VAPORIZATION

Pressure (psig):		2850	2500	2150
Component		Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	18.10	18.45	18.98
Nitrogen	N2	0.22	0.19	0.15
Methane	C1	74.30	73.81	73.02
Ethane	C2	4.89	5.05	5.28
Propane	C3	1.45	1.45	1.51
Iso-Butane	iC4	0.14	0.15	0.17
N-Butane	nC4	0.24	0.25	0.27
Iso-Pentane	iC5	0.06	0.07	0.08
N-Pentane	nC5	0.05	0.06	0.07
Hexanes	C6	0.13	0.11	0.09
Heptanes	C7	0.18	0.17	0.15
Octanes	C8	0.12	0.12	0.12
Nonanes	C9	0.07	0.07	0.07
Decanes	C10	0.03	0.03	0.03
Undecanes	C11	0.02	0.02	0.01
Dodecanes Plus	C12+	0.00	0.00	0.00
TOTAL		100.00	100.00	100.00

Stream Properties				
Molecular Weight	:	22.92	23.04	23.21
Gravity (AIR = 1.000)	:	0.794	0.798	0.804
Gross HV (BTU/SCF)	:	926	924	921
Nett HV (BTU/SCF)	:	837	835	833
Wobbe Index	:	1040	1035	1028
Critical Pressure (psia)	:	738.3	739.9	742.2
Critical Temperature (°R)	:	400.5	401.6	403.3

G P M Content				
Ethane Plus	:	2.115	2.161	2.234
Propane Plus	:	0.806	0.809	0.821
Butanes Plus	:	0.406	0.409	0.405
Pentanes Plus	:	0.284	0.281	0.264

Hexanes Plus Properties				
Mol %	:	0.55	0.52	0.47
Molecular Weight	:	102.7	103.5	103.7
Density (gm/cc @ 60 °F)	:	0.6926	0.6937	0.6940
Gravity (°API @ 60 °F)	:	72.6	72.3	72.2

Heptanes Plus Properties				
Mol %	:	0.42	0.41	0.38
Molecular Weight	:	108.5	108.8	108.4
Density (gm/cc @ 60 °F)	:	0.6998	0.7002	0.6998
Gravity (°API @ 60 °F)	:	70.5	70.4	70.5

Decanes Plus Properties				
Mol %	:	0.05	0.05	0.04
Molecular Weight	:	139.2	139.2	137.3
Density (gm/cc @ 60 °F)	:	0.7328	0.7328	0.7310
Gravity (°API @ 60 °F)	:	61.4	61.4	61.9

Undecanes Plus Properties				
Mol %	:	0.02	0.02	0.01
Molecular Weight	:	147.0	147.0	147.0
Density (gm/cc @ 60 °F)	:	0.7400	0.7400	0.7400
Gravity (°API @ 60 °F)	:	59.5	59.5	59.5

Dodecanes Plus Properties				
Mol %	:	0.00	0.00	0.00
Molecular Weight	:	--	--	--
Density (gm/cc @ 60 °F)	:	--	--	--
Gravity (°API @ 60 °F)	:	--	--	--

COMPOSITIONAL ANALYSIS OF GASES
LIBERATED DURING DIFFERENTIAL VAPORIZATION

Pressure (psig):		1800	1450	1100
Component		Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	19.62	20.60	21.90
Nitrogen	N2	0.12	0.10	0.06
Methane	C1	72.00	70.24	67.86
Ethane	C2	5.54	5.99	6.64
Propane	C3	1.58	1.73	1.99
Iso-Butane	iC4	0.20	0.25	0.29
N-Butane	nC4	0.32	0.40	0.46
Iso-Pentane	iC5	0.09	0.11	0.13
N-Pentane	nC5	0.08	0.10	0.12
Hexanes	C6	0.08	0.09	0.11
Heptanes	C7	0.14	0.15	0.18
Octanes	C8	0.12	0.12	0.13
Nonanes	C9	0.07	0.08	0.09
Decanes	C10	0.03	0.03	0.03
Undecanes	C11	0.01	0.01	0.01
Dodecanes Plus	C12+	0.00	0.00	0.00
TOTAL		100.00	100.00	100.00

Stream Properties				
Molecular Weight	:	23.48	23.96	24.60
Gravity (AIR = 1.000)	:	0.813	0.830	0.852
Gross HV (BTU/SCF)	:	920	921	924
Nett HV (BTU/SCF)	:	831	833	836
Wobbe Index	:	1020	1012	1001
Critical Pressure (psia)	:	744.8	748.6	753.7
Critical Temperature (°R)	:	405.7	410.1	416.0

GPM Content				
Ethane Plus	:	2.349	2.579	2.902
Propane Plus	:	0.866	0.976	1.125
Butanes Plus	:	0.430	0.499	0.576
Pentanes Plus	:	0.264	0.291	0.336

Hexanes Plus Properties				
Mol %	:	0.45	0.48	0.55
Molecular Weight	:	104.4	104.1	103.3
Density (gm/cc @ 60 °F)	:	0.6947	0.6944	0.6934
Gravity (°API @ 60 °F)	:	72.0	72.1	72.4

Heptanes Plus Properties				
Mol %	:	0.37	0.39	0.44
Molecular Weight	:	108.8	108.7	108.1
Density (gm/cc @ 60 °F)	:	0.7002	0.7002	0.6994
Gravity (°API @ 60 °F)	:	70.4	70.4	70.6

Decanes Plus Properties				
Mol %	:	0.04	0.04	0.04
Molecular Weight	:	137.3	137.3	137.3
Density (gm/cc @ 60 °F)	:	0.7310	0.7310	0.7310
Gravity (°API @ 60 °F)	:	61.9	61.9	61.9

Undecanes Plus Properties				
Mol %	:	0.01	0.01	0.01
Molecular Weight	:	147.0	147.0	147.0
Density (gm/cc @ 60 °F)	:	0.7400	0.7400	0.7400
Gravity (°API @ 60 °F)	:	59.5	59.5	59.5

Dodecanes Plus Properties				
Mol %	:	0.00	0.00	0.00
Molecular Weight	:	--	--	--
Density (gm/cc @ 60 °F)	:	--	--	--
Gravity (°API @ 60 °F)	:	--	--	--

COMPOSITIONAL ANALYSIS OF GASES
LIBERATED DURING DIFFERENTIAL VAPORIZATION

Pressure (psig):		750	400	0
Component		Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	23.74	26.86	29.47
Nitrogen	N2	0.04	0.02	0.02
Methane	C1	64.04	55.74	37.71
Ethane	C2	7.85	10.46	17.59
Propane	C3	2.42	3.88	9.49
Iso-Butane	iC4	0.35	0.57	1.49
N-Butane	nC4	0.57	0.95	2.35
Iso-Pentane	iC5	0.16	0.27	0.59
N-Pentane	nC5	0.15	0.25	0.46
Hexanes	C6	0.14	0.23	0.28
Heptanes	C7	0.22	0.35	0.30
Octanes	C8	0.17	0.23	0.15
Nonanes	C9	0.11	0.13	0.07
Decanes	C10	0.03	0.04	0.02
Undecanes	C11	0.01	0.02	0.01
Dodecanes Plus	C12+	0.00	0.00	0.00
TOTAL		100.00	100.00	100.00
Stream Properties				
Molecular Weight	:	25.62	27.90	32.30
Gravity (AIR = 1.000)	:	0.887	0.967	1.122
Gross HV (BTU/SCF)	:	933	978	1153
Nett HV (BTU/SCF)	:	845	888	1052
Wobbe Index	:	991	995	1088
Critical Pressure (psia)	:	760.8	771.8	779.1
Critical Temperature (°R)	:	425.5	447.5	496.6
G P M Content				
Ethane Plus	:	3.477	4.986	9.293
Propane Plus	:	1.376	2.187	4.585
Butanes Plus	:	0.709	1.117	1.968
Pentanes Plus	:	0.414	0.630	0.738
Hexanes Plus Properties				
Mol %	:	0.68	1.00	0.83
Molecular Weight	:	102.75	101.56	97.58
Density (gm/cc @ 60 °F)	:	0.69	0.69	0.69
Gravity (°API @ 60 °F)	:	72.6	73.0	74.6
Heptanes Plus Properties				
Mol %	:	0.54	0.77	0.55
Molecular Weight	:	107.61	106.81	104.49
Density (gm/cc @ 60 °F)	:	0.70	0.70	0.69
Gravity (°API @ 60 °F)	:	70.8	71.1	71.9
Decanes Plus Properties				
Mol %	:	0.04	0.06	0.03
Molecular Weight	:	137.25	138.33	138.33
Density (gm/cc @ 60 °F)	:	0.73	0.73	0.73
Gravity (°API @ 60 °F)	:	61.9	61.6	61.6
Undecanes Plus Properties				
Mol %	:	0.01	0.02	0.01
Molecular Weight	:	147.00	147.00	147.00
Density (gm/cc @ 60 °F)	:	0.74	0.74	0.74
Gravity (°API @ 60 °F)	:	59.5	59.5	59.5
Dodecanes Plus Properties				
Mol %	:	0.00	0.00	0.00
Molecular Weight	:	--	--	--
Density (gm/cc @ 60 °F)	:	--	--	--
Gravity (°API @ 60 °F)	:	--	--	--

COMPOSITIONAL ANALYSIS OF
DIFFERENTIALLY DEPLETED LIQUIDS

Pressure (psig):		2850	2500	2150
Component		Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	12.84	12.37	11.79
Nitrogen	N2	0.06	0.05	0.04
Methane	C1	37.91	34.91	31.56
Ethane	C2	4.75	4.72	4.67
Propane	C3	2.11	2.17	2.23
Iso-Butane	iC4	0.38	0.40	0.42
N-Butane	nC4	0.73	0.77	0.81
Iso-Pentane	iC5	0.34	0.37	0.39
N-Pentane	nC5	0.34	0.37	0.39
Hexanes	C6	0.84	0.90	0.97
Heptanes	C7	1.39	1.49	1.61
Octanes	C8	1.79	1.93	2.09
Nonanes	C9	1.28	1.38	1.49
Decanes	C10	0.50	0.54	0.58
Undecanes	C11	0.66	0.72	0.78
Dodecanes Plus	C12+	34.08	36.93	40.18
TOTAL		100.00	100.00	100.00

Stream Properties

Molecular Weight	:	126.6	135.3	145.1
Density obs. (gm/cc)	:	0.6900	0.6982	0.7071
Gravity (°API @ 60 °F)	:	73.4	71.0	68.4

Hexanes Plus Properties

Mol %	:	40.54	43.88	47.70
Molecular Weight	:	252.3	252.5	252.6
Density (gm/cc @ 60 °F)	:	0.8556	0.8556	0.8557
Gravity (°API @ 60 °F)	:	33.7	33.7	33.7

Heptanes Plus Properties

Mol %	:	39.70	42.99	46.73
Molecular Weight	:	255.1	255.2	255.3
Density (gm/cc @ 60 °F)	:	0.8568	0.8568	0.8569
Gravity (°API @ 60 °F)	:	33.5	33.5	33.5

Decanes Plus Properties

Mol %	:	35.24	38.18	41.54
Molecular Weight	:	272.8	272.9	272.9
Density (gm/cc @ 60 °F)	:	0.8632	0.8632	0.8632
Gravity (°API @ 60 °F)	:	32.3	32.3	32.3

Undecanes Plus Properties

Mol %	:	34.74	37.65	40.96
Molecular Weight	:	276.6	276.6	276.6
Density (gm/cc @ 60 °F)	:	0.8644	0.8644	0.8644
Gravity (°API @ 60 °F)	:	32.0	32.0	32.0

Dodecanes Plus Properties

Mol %	:	34.08	36.93	40.18
Molecular Weight	:	279.7	279.7	279.7
Density (gm/cc @ 60 °F)	:	0.8655	0.8655	0.8655
Gravity (°API @ 60 °F)	:	31.8	31.8	31.8

COMPOSITIONAL ANALYSIS OF
DIFFERENTIALLY DEPLETED LIQUIDS

Pressure (psig):		1800	1450	1100
Component		Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	11.05	10.11	8.90
Nitrogen	N2	0.03	0.02	0.02
Methane	C1	27.76	23.56	19.05
Ethane	C2	4.59	4.46	4.23
Propane	C3	2.29	2.34	2.38
Iso-Butane	iC4	0.44	0.46	0.47
N-Butane	nC4	0.86	0.91	0.95
Iso-Pentane	iC5	0.42	0.45	0.48
N-Pentane	nC5	0.42	0.45	0.49
Hexanes	C6	1.05	1.15	1.25
Heptanes	C7	1.74	1.90	2.08
Octanes	C8	2.28	2.49	2.73
Nonanes	C9	1.63	1.78	1.95
Decanes	C10	0.63	0.69	0.76
Undecanes	C11	0.85	0.93	1.03
Dodecanes Plus	C12+	43.95	48.29	53.21
TOTAL		100.00	100.00	100.00

Stream Properties

Molecular Weight	:	156.6	169.7	184.4
Density obs. (gm/cc)	:	0.7168	0.7272	0.7382
Gravity (°API @ 60 °F)	:	65.7	62.9	60.0

Hexanes Plus Properties

Mol %	:	52.14	57.24	63.02
Molecular Weight	:	252.7	252.8	253.0
Density (gm/cc @ 60 °F)	:	0.8558	0.8559	0.8559
Gravity (°API @ 60 °F)	:	33.7	33.7	33.7

Heptanes Plus Properties

Mol %	:	51.09	56.09	61.76
Molecular Weight	:	255.4	255.5	255.6
Density (gm/cc @ 60 °F)	:	0.8569	0.8570	0.8571
Gravity (°API @ 60 °F)	:	33.5	33.5	33.4

Decanes Plus Properties

Mol %	:	45.44	49.92	55.00
Molecular Weight	:	272.9	272.9	272.9
Density (gm/cc @ 60 °F)	:	0.8632	0.8632	0.8632
Gravity (°API @ 60 °F)	:	32.3	32.3	32.3

Undecanes Plus Properties

Mol %	:	44.80	49.23	54.24
Molecular Weight	:	276.6	276.6	276.6
Density (gm/cc @ 60 °F)	:	0.8644	0.8644	0.8644
Gravity (°API @ 60 °F)	:	32.0	32.0	32.0

Dodecanes Plus Properties

Mol %	:	43.95	48.29	53.21
Molecular Weight	:	279.7	279.7	279.7
Density (gm/cc @ 60 °F)	:	0.8655	0.8655	0.8655
Gravity (°API @ 60 °F)	:	31.8	31.8	31.8

COMPOSITIONAL ANALYSIS OF
DIFFERENTIALLY DEPLETED LIQUIDS

Pressure (psig):		750	400	0
Component		Mol %	Mol %	Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	7.16	4.32	0.01
Nitrogen	N2	0.02	0.02	0.02
Methane	C1	13.76	7.70	2.56
Ethane	C2	3.81	2.85	0.32
Propane	C3	2.37	2.16	0.90
Iso-Butane	iC4	0.49	0.48	0.30
N-Butane	nC4	1.00	1.00	0.77
Iso-Pentane	iC5	0.52	0.56	0.55
N-Pentane	nC5	0.53	0.57	0.59
Hexanes	C6	1.38	1.55	1.77
Heptanes	C7	2.30	2.58	2.97
Octanes	C8	3.04	3.44	4.00
Nonanes	C9	2.17	2.46	2.87
Decanes	C10	0.85	0.96	1.12
Undecanes	C11	1.15	1.31	1.53
Dodecanes Plus	C12+	59.47	68.05	79.71
TOTAL		100.00	100.00	100.00

Stream Properties

Molecular Weight	:	203.1	228.4	262.0
Density obs. (gm/cc)	:	0.7511	0.7670	0.7862
Gravity (°API @ 60 °F)	:	56.7	52.8	48.3

Hexanes Plus Properties

Mol %	:	70.35	80.35	93.97
Molecular Weight	:	253.1	253.4	253.6
Density (gm/cc @ 60 °F)	:	0.8560	0.8562	0.8563
Gravity (°API @ 60 °F)	:	33.6	33.6	33.6

Heptanes Plus Properties

Mol %	:	68.96	78.80	92.21
Molecular Weight	:	255.8	256.0	256.1
Density (gm/cc @ 60 °F)	:	0.8571	0.8572	0.8573
Gravity (°API @ 60 °F)	:	33.4	33.4	33.4

Decanes Plus Properties

Mol %	:	61.46	70.32	82.36
Molecular Weight	:	272.9	272.9	272.9
Density (gm/cc @ 60 °F)	:	0.8632	0.8632	0.8632
Gravity (°API @ 60 °F)	:	32.3	32.3	32.3

Undecanes Plus Properties

Mol %	:	60.62	69.36	81.24
Molecular Weight	:	276.6	276.6	276.6
Density (gm/cc @ 60 °F)	:	0.8644	0.8644	0.8644
Gravity (°API @ 60 °F)	:	32.0	32.0	32.0

Dodecanes Plus Properties

Mol %	:	59.47	68.05	79.71
Molecular Weight	:	279.7	279.7	279.7
Density (gm/cc @ 60 °F)	:	0.8655	0.8655	0.8655
Gravity (°API @ 60 °F)	:	31.8	31.8	31.8

SEPARATOR TESTS

On Bottom Hole Reservoir Fluid in Cylinder # 812417

SEPARATOR Pressure (psig)	SEPARATOR Temperature (°F)	GAS/OIL Ratio (1)	DENSITY (@ 60 °F) °API	DENSITY (@ 60 °F) (gm/cc)	VOLUME Factor (2)	SHRINKAGE Factor (3)	GAS Gravity (Air = 1)
Test # 1							
1290	131	384				0.868	0.755
TO							
0	100	276	36.8	0.8401	1.396	0.983	0.949
	Total GOR	660					
Test # 2							
290	131	586				0.876	0.845
TO							
0	100	62	36.8	0.8401	1.354	0.983	1.060
	Total GOR	648					
Test # 3							
0	79	682	33.7	0.8557	1.428	0.992	0.884
	Total GOR	682					
Test # 1 CORRECTED FOR OBM CONTAMINATION							
1290	131	543				0.825	0.739
TO							
0	100	393	36.7	0.8403	1.469	0.983	0.940
	Total GOR	936					
Test # 2 CORRECTED FOR OBM CONTAMINATION							
290	158	828				0.930	0.821
TO							
0	100	90	36.7	0.8407	1.460	0.983	1.042
	Total GOR	918					
Test # 3 CORRECTED FOR OBM CONTAMINATION							
0	79	959	36.3	0.8424	1.564	0.992	0.871
	Total GOR	959					

(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 @ 3205 psig and 271°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

COMPOSITIONAL ANALYSIS OF LIBERATED GASES
FROM LABORATORY SEPARATOR TEST @ 1290 psig

Component		Separator Gas Mol %	Stock Tank Gas Mol %
Hydrogen Sulphide	H2S	0.00	0.00
Carbon Dioxide	CO2	16.53	23.96
Nitrogen	N2	0.07	0.02
Methane	C1	78.10	58.21
Ethane	C2	3.96	9.74
Propane	C3	0.79	4.20
Iso-Butane	iC4	0.08	0.74
N-Butane	nC4	0.13	1.44
Iso-Pentane	iC5	0.04	0.44
N-Pentane	nC5	0.03	0.39
Hexanes	C6	0.03	0.25
Heptanes	C7	0.10	0.43
Octanes	C8	0.07	0.11
Nonanes	C9	0.04	0.04
Decanes	C10	0.02	0.03
Undecanes	C11	0.01	0.00
Dodecanes Plus	C12+	0.00	0.00
TOTAL		100.00	100.00
Stream Properties			
Molecular Weight	:	21.82	27.36
Gravity (AIR = 1.000)	:	0.755	0.949
Gross HV (BTU/SCF)	:	909	1023
Nett HV (BTU/SCF)	:	820	929
Wobbe Index	:	1046	1050
Critical Pressure (psia)	:	733.2	758.7
Critical Temperature (°R)	:	390.8	444.4
GPM Content			
Ethane Plus	:	1.494	5.127
Propane Plus	:	0.434	2.520
Butanes Plus	:	0.216	1.362
Pentanes Plus	:	0.149	0.666
Hexanes Plus Properties			
Mol %	:	0.27	0.86
Molecular Weight	:	105.9	96.4
Density (gm/cc @ 60 °F)	:	0.6967	0.6843
Gravity (°API @ 60 °F)	:	71.4	75.1
Heptanes Plus Properties			
Mol %	:	0.24	0.61
Molecular Weight	:	108.7	101.5
Density (gm/cc @ 60 °F)	:	0.7001	0.6911
Gravity (°API @ 60 °F)	:	70.4	73.1
Decanes Plus Properties			
Mol %	:	0.03	0.03
Molecular Weight	:	138.3	134.0
Density (gm/cc @ 60 °F)	:	0.7320	0.7278
Gravity (°API @ 60 °F)	:	61.6	62.7
Undecanes Plus Properties			
Mol %	:	0.01	0.00
Molecular Weight	:	147.0	--
Density (gm/cc @ 60 °F)	:	0.7400	--
Gravity (°API @ 60 °F)	:	59.5	--
Dodecanes Plus Properties			
Mol %	:	0.00	0.00
Molecular Weight	:	--	--
Density (gm/cc @ 60 °F)	:	--	--
Gravity (°API @ 60 °F)	:	--	--

PETROLAB

COMPOSITIONAL ANALYSIS OF LIBERATED GASES
FROM LABORATORY SEPARATOR TEST @ 290 psig

Component		Separator Gas Mol %	Stock Tank Gas Mol %
Hydrogen Sulphide	H2S	0.00	0.00
Carbon Dioxide	CO2	22.48	29.97
Nitrogen	N2	0.08	0.13
Methane	C1	68.68	45.82
Ethane	C2	5.99	13.37
Propane	C3	1.39	5.63
Iso-Butane	iC4	0.20	0.93
N-Butane	nC4	0.43	2.14
Iso-Pentane	iC5	0.13	0.53
N-Pentane	nC5	0.11	0.44
Hexanes	C6	0.12	0.31
Heptanes	C7	0.23	0.53
Octanes	C8	0.09	0.14
Nonanes	C9	0.04	0.03
Decanes	C10	0.03	0.03
Undecanes	C11	0.00	0.00
Dodecanes Plus	C12+	0.00	0.00
TOTAL		100.00	100.00
Stream Properties			
Molecular Weight	:	24.39	30.56
Gravity (AIR = 1.000)	:	0.845	1.060
Gross HV (BTU/SCF)	:	898	1043
Nett HV (BTU/SCF)	:	812	950
Wobbe Index	:	977	1013
Critical Pressure (psia)	:	756.4	781.8
Critical Temperature (°R)	:	413.1	474.1
GPM Content			
Ethane Plus	:	2.496	6.902
Propane Plus	:	0.893	3.324
Butanes Plus	:	0.510	1.771
Pentanes Plus	:	0.309	0.791
Hexanes Plus Properties			
Mol %	:	0.51	1.04
Molecular Weight	:	99.3	95.7
Density (gm/cc @ 60 °F)	:	0.6882	0.6833
Gravity (°API @ 60 °F)	:	73.9	75.4
Heptanes Plus Properties			
Mol %	:	0.39	0.73
Molecular Weight	:	104.0	100.7
Density (gm/cc @ 60 °F)	:	0.6943	0.6900
Gravity (°API @ 60 °F)	:	72.1	73.4
Decanes Plus Properties			
Mol %	:	0.03	0.03
Molecular Weight	:	134.0	134.0
Density (gm/cc @ 60 °F)	:	0.7278	0.7278
Gravity (°API @ 60 °F)	:	62.7	62.7
Undecanes Plus Properties			
Mol %	:	0.00	0.00
Molecular Weight	:	--	--
Density (gm/cc @ 60 °F)	:	--	--
Gravity (°API @ 60 °F)	:	--	--
Dodecanes Plus Properties			
Mol %	:	0.00	0.00
Molecular Weight	:	--	--
Density (gm/cc @ 60 °F)	:	--	--
Gravity (°API @ 60 °F)	:	--	--

RELATIVE VOLUME

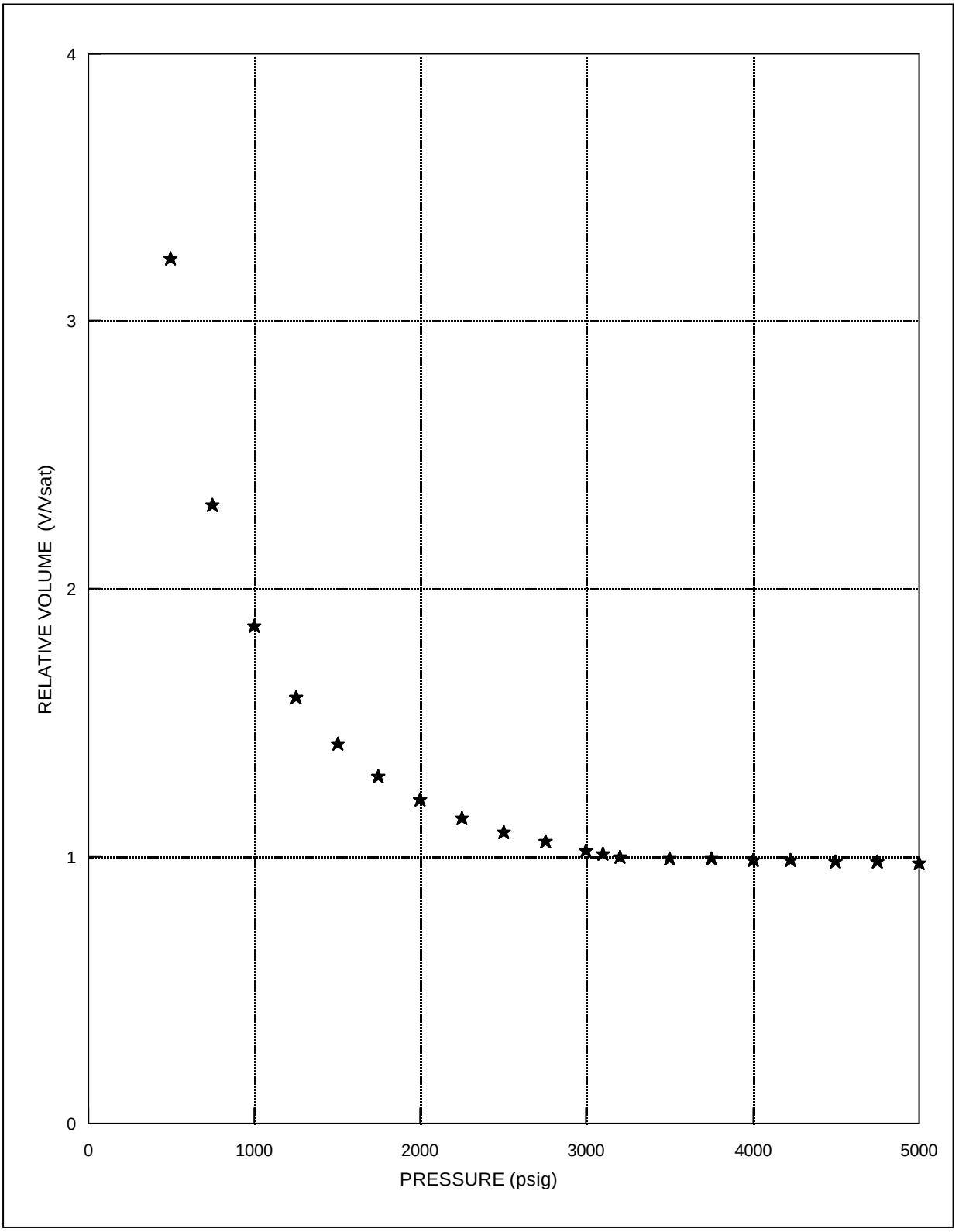
Equation of best fit

ABOVE Psat

RV = +1.10E+00 -4.60E-05 * P +5.44E-09 * P^2 -2.48E-13 * P^3 +0.00E+00 * P^4

BELOW Psat

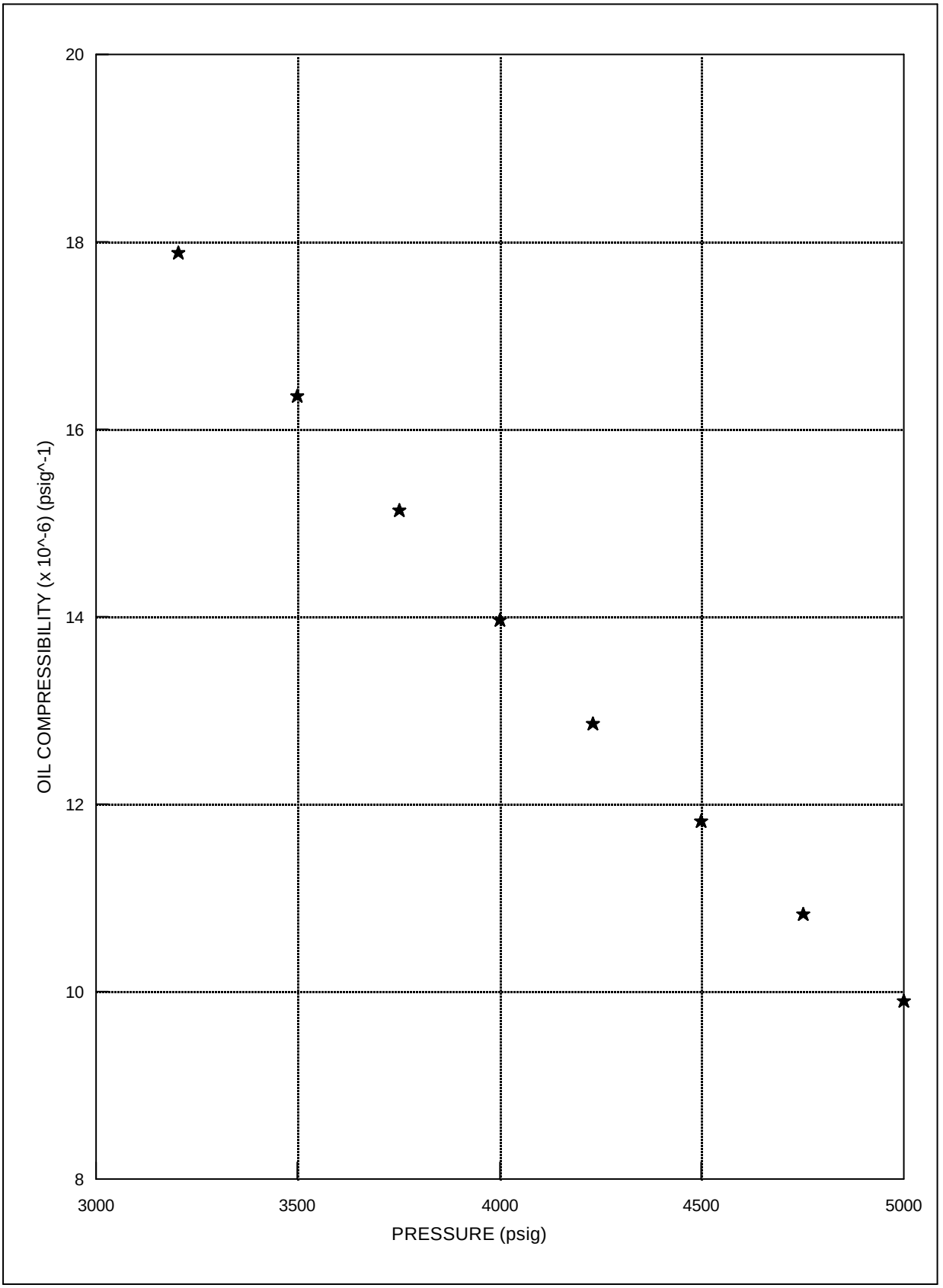
RV = +6.38E+00 -8.96E-03 * P +6.10E-06 * P^2 -1.89E-09 * P^3 +2.17E-13 * P^4



OIL COMPRESSIBILITY

Equation of best fit

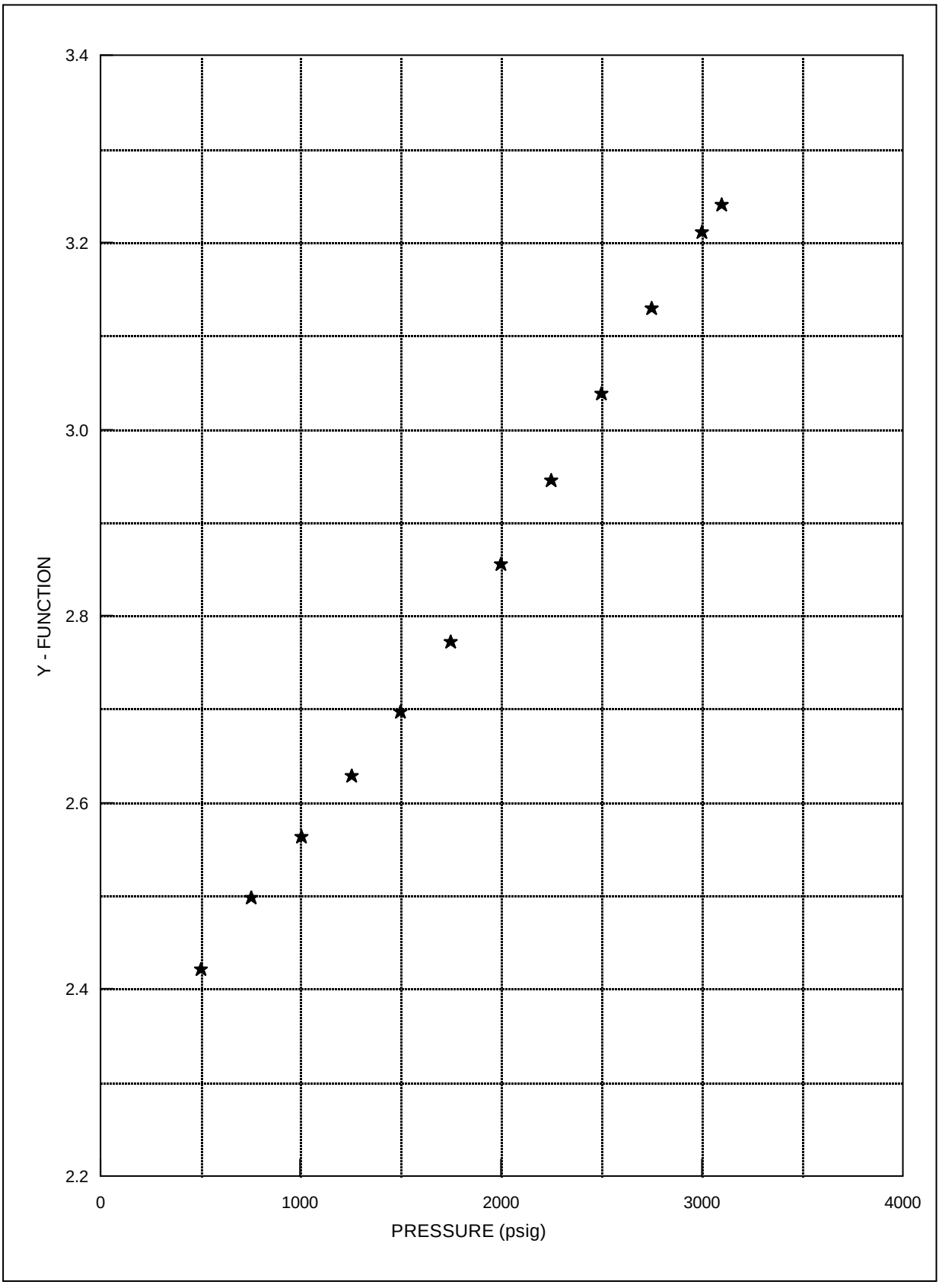
Co = +3.78E+01 -6.70E-03 * P +2.98E-08 * P^2 +3.92E-11 * P^3 +0.00E+00 * P^4



Y - FUNCTION

Equation of best fit

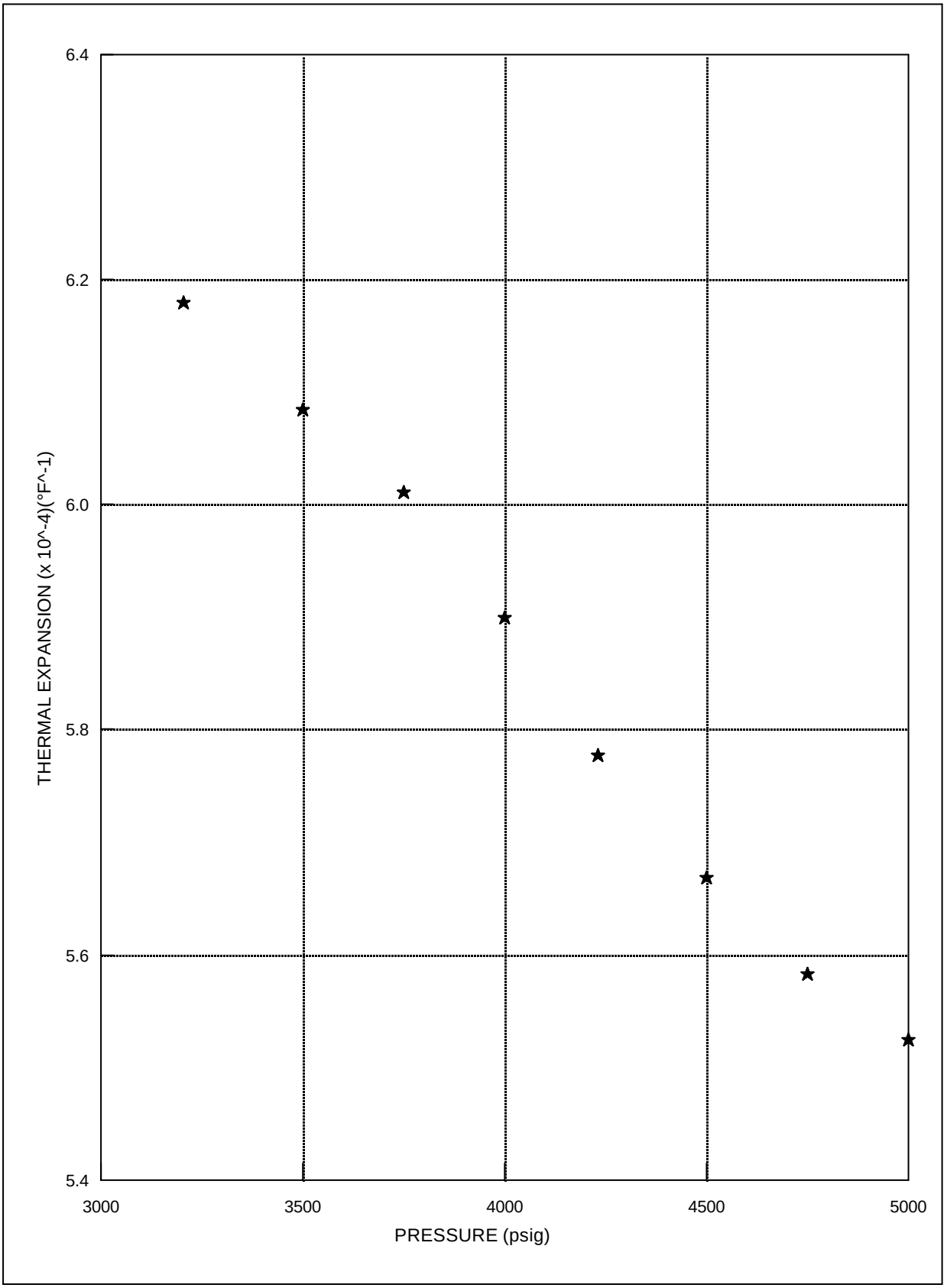
Y = +2.27E+00 +2.89E-04 * P



OIL THERMAL EXPANSION

Equation of best fit

TE = -6.35E-01 +5.69E-03 * P -1.51E-06 * P^2 +1.23E-10 * P^3 +0.00E+00 * P^4

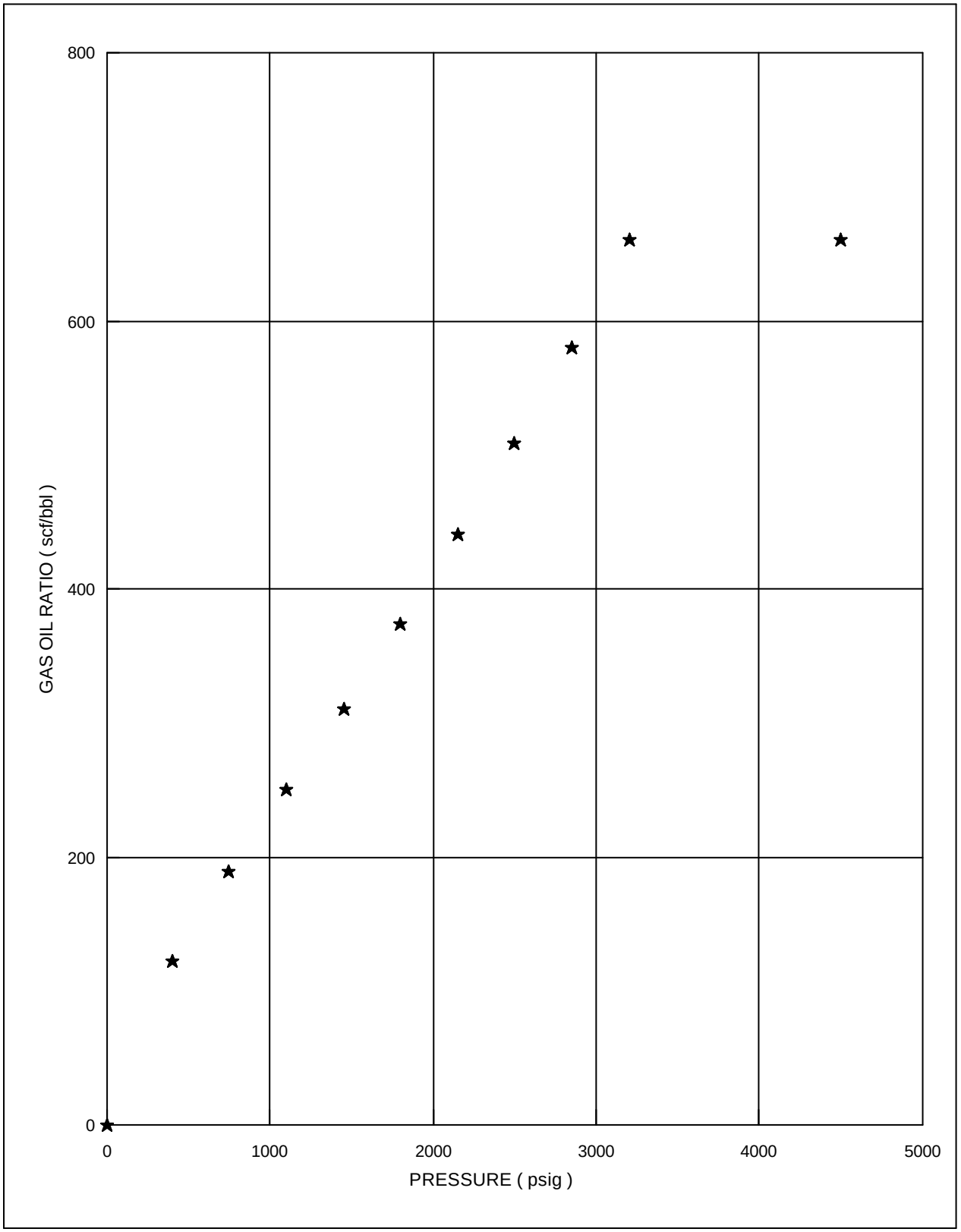


GAS - OIL RATIO

DIFFERENTIAL DATA CORRECTED WITH SEPARATOR TEST

Equation of best fit

GOR = +1.94E+00 +3.44E-01 * P -1.63E-04 * P^2 +6.18E-08 * P^3 -7.61E-12 * P^4

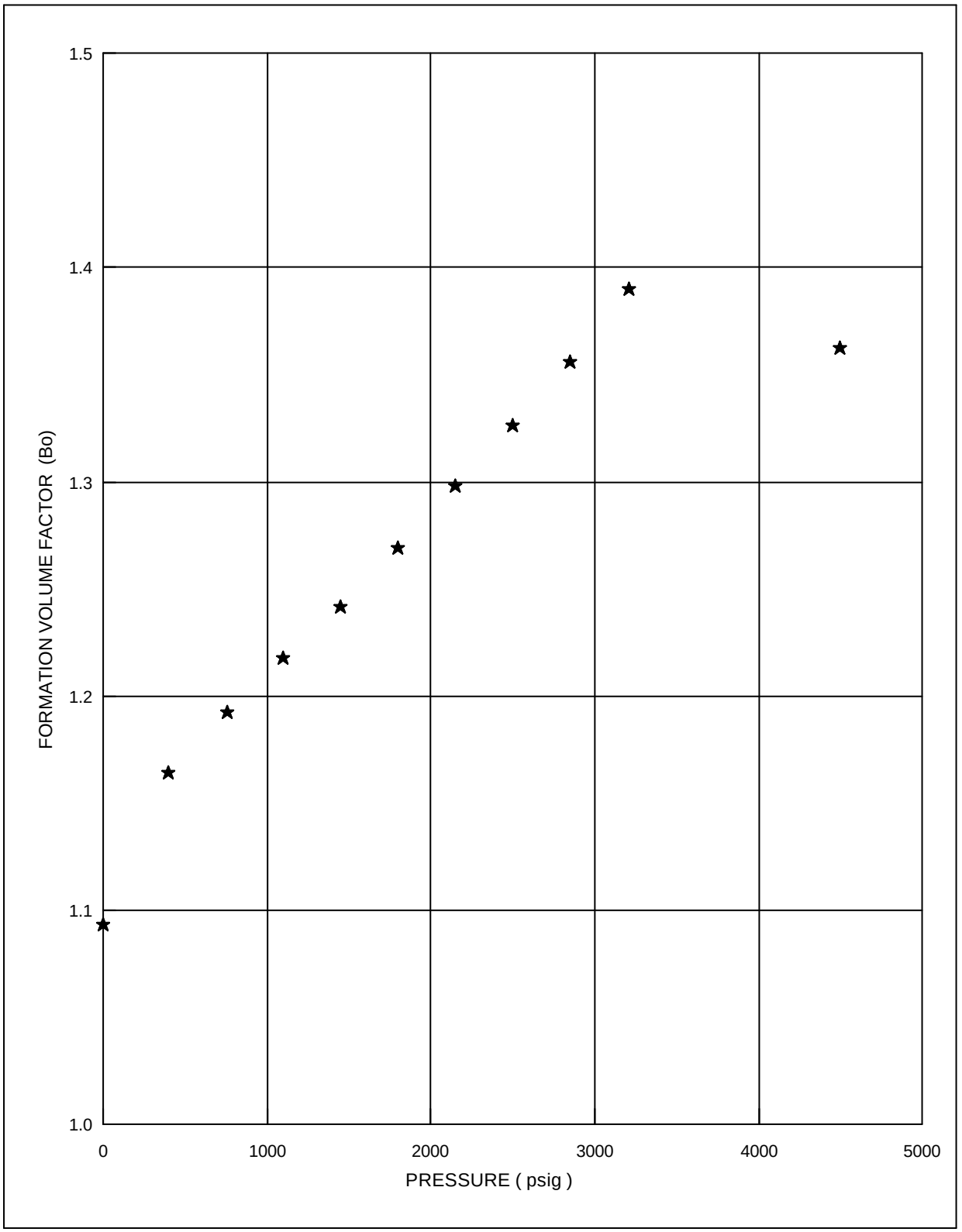


OIL FORMATION VOLUME FACTOR

DIFFERENTIAL DATA CORRECTED WITH SEPARATOR TEST

Equation of best fit

Bo = +1.10E+00 +2.04E-04 * P -1.29E-07 * P^2 +4.96E-11 * P^3 -6.36E-15 * P^4

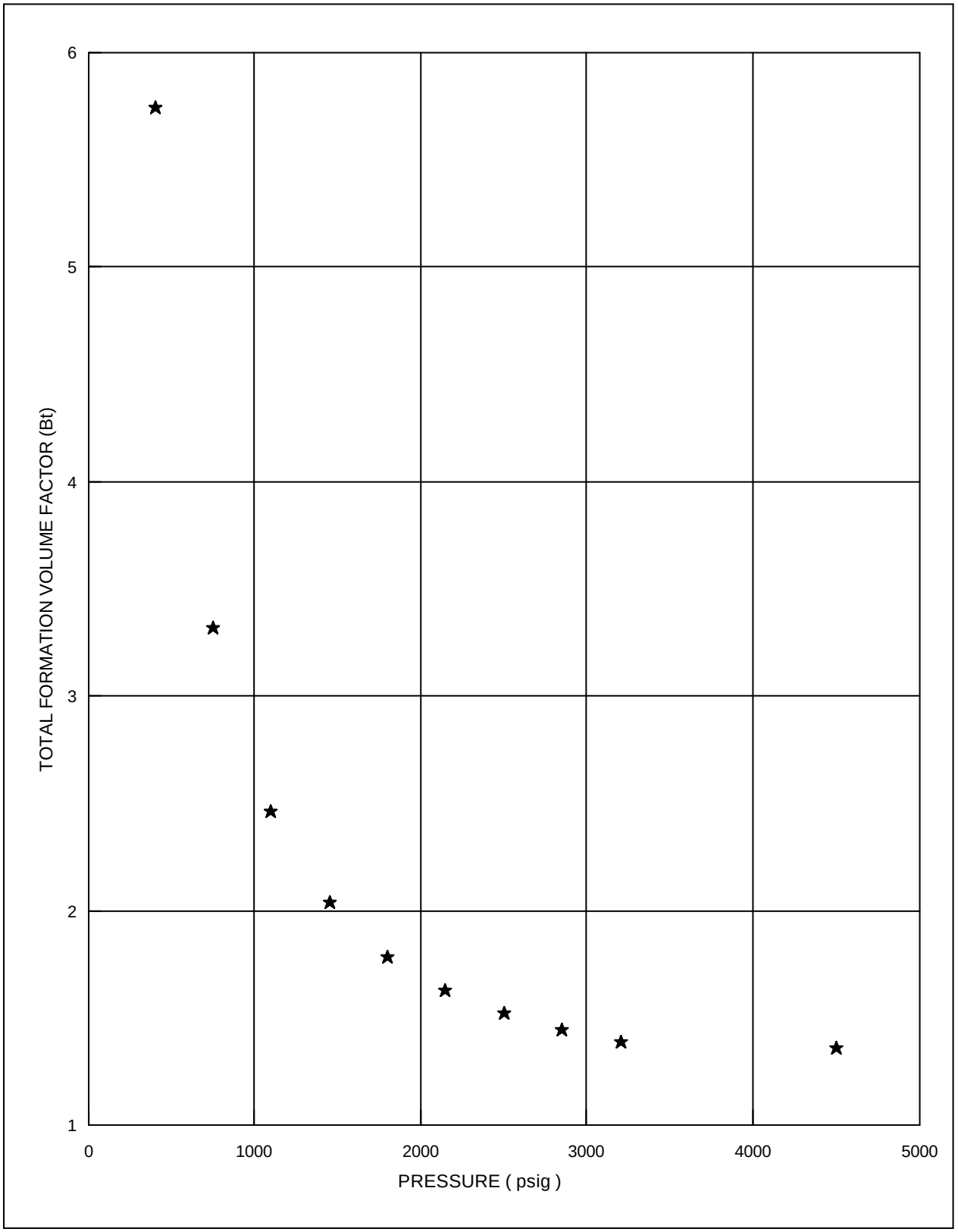


TOTAL FORMATION VOLUME FACTOR

DIFFERENTIAL DATA CORRECTED WITH SEPARATOR TEST

Equation of best fit

Bt = +1.06E+01 -1.62E-02 * P +1.14E-05 * P^2 -3.56E-09 * P^3 +4.07E-13 * P^4



OIL DENSITY

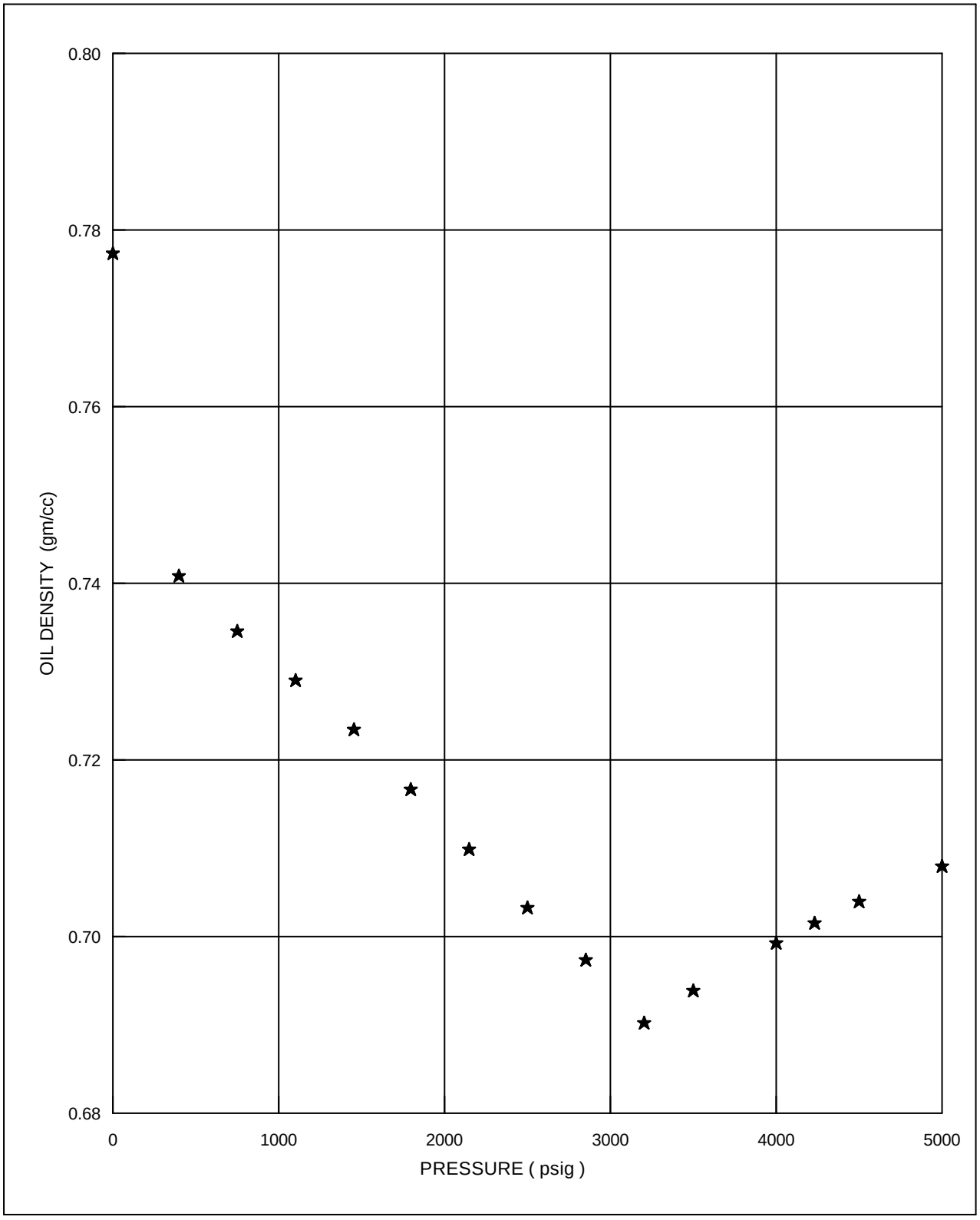
Equation of best fit

ABOVE Psat

Þ = +6.24E-01 +2.95E-05 * P -3.24E-09 * P^2 +1.37E-13 * P^3 +0.00E+00 * P^4

BELOW Psat

Þ = +7.76E-01 -1.08E-04 * P +9.13E-08 * P^2 -3.57E-11 * P^3 +4.73E-15 * P^4



OIL VISCOSITY

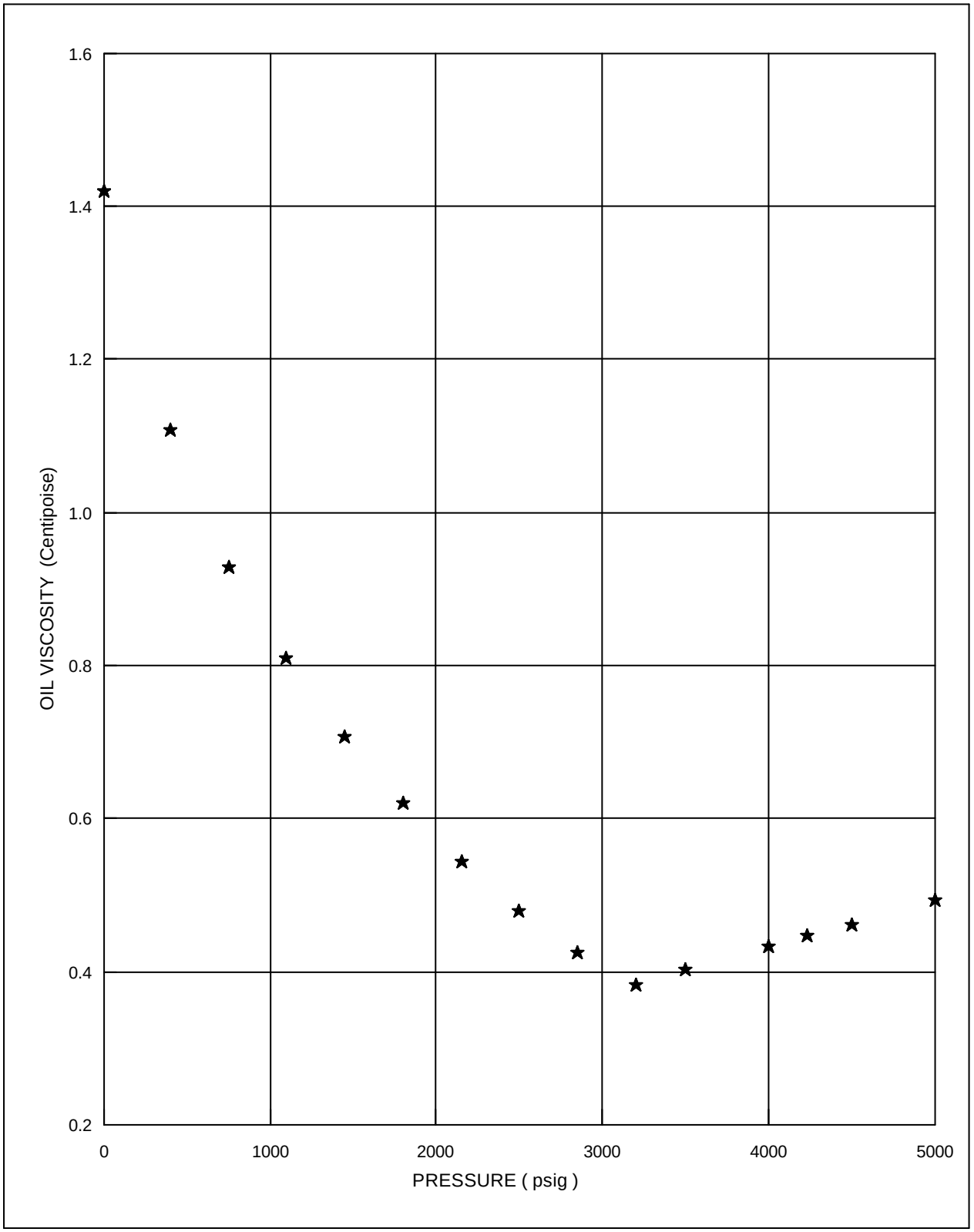
Equation of best fit

ABOVE Psat

μo = -7.35E-02 +2.55E-04 * P -4.70E-08 * P^2 +3.76E-12 * P^3 +0.00E+00 * P^4

BELOW Psat

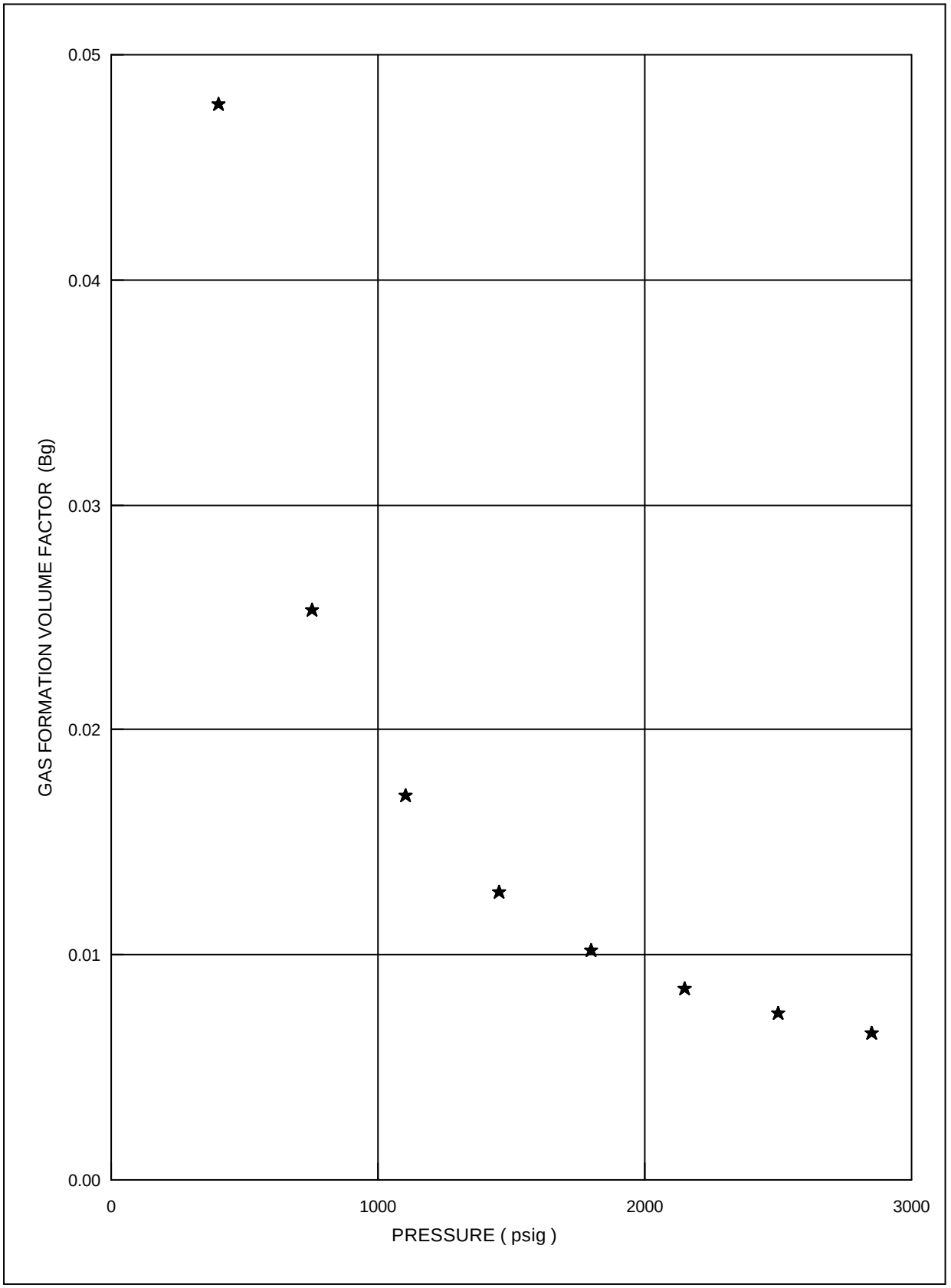
μo = +1.42E+00 -9.63E-04 * P +5.42E-07 * P^2 -1.84E-10 * P^3 +2.44E-14 * P^4



GAS FORMATION VOLUME FACTOR

Equation of best fit

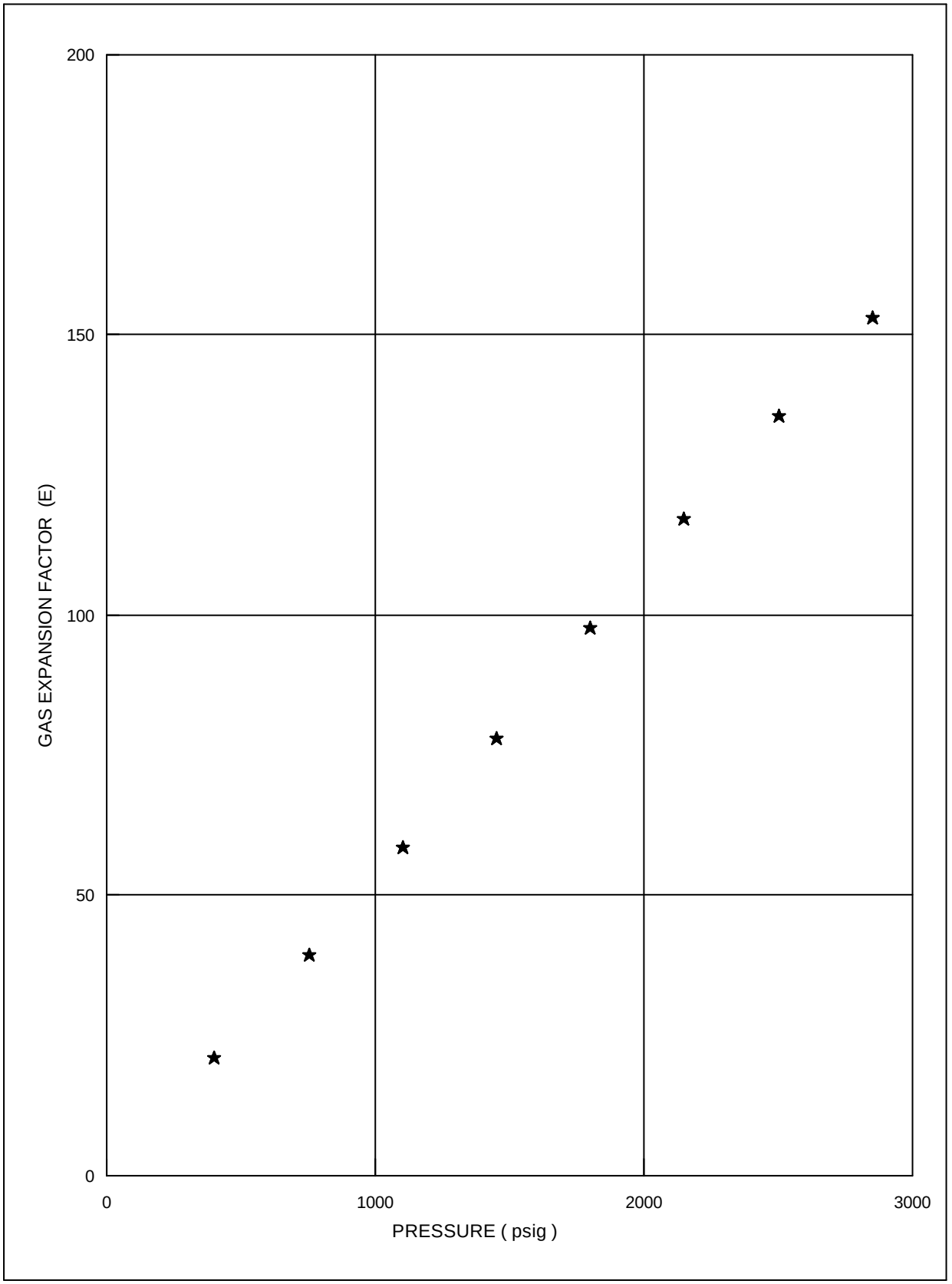
Bg = +9.67E-02 -1.66E-04 * P +1.25E-07 * P^2 -4.28E-11 * P^3 +5.39E-15 * P^4



GAS EXPANSION FACTOR

Equation of best fit

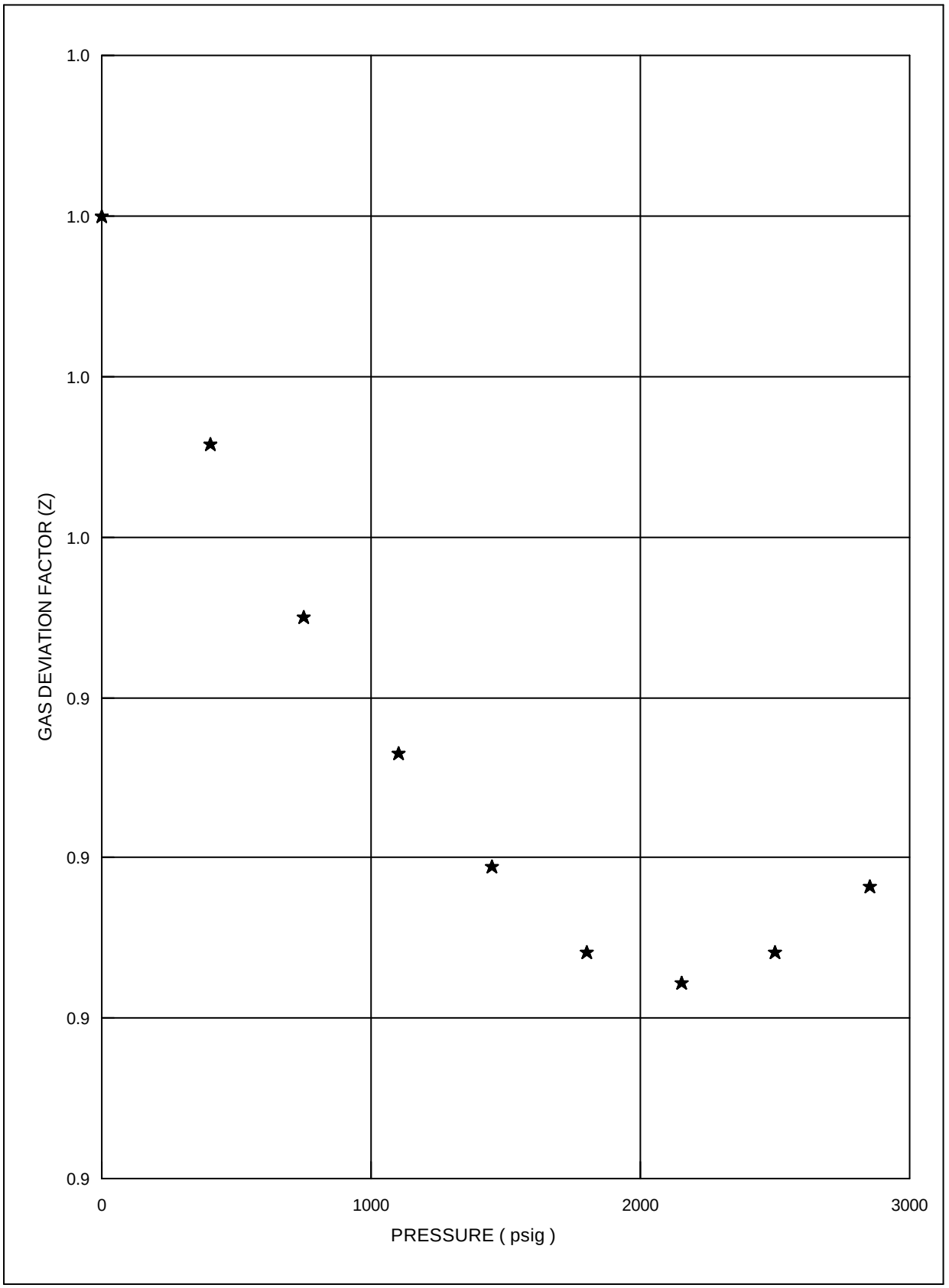
E = +1.15E+00 +4.74E-02 * P +5.48E-06 * P^2 -9.38E-10 * P^3 -9.04E-14 * P^4



GAS DEVIATION FACTOR

Equation of best fit

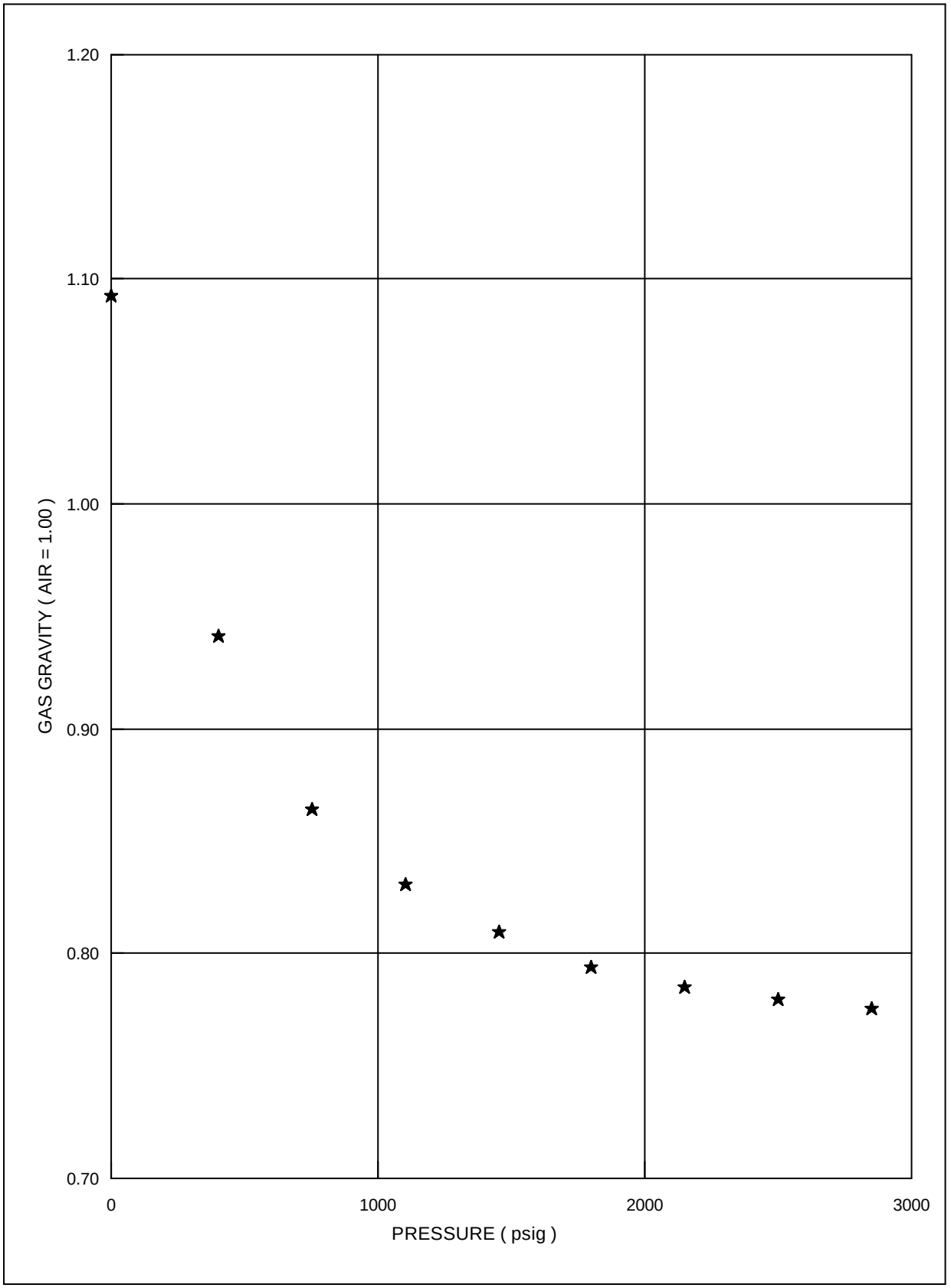
Z = +1.00E+00 -7.50E-05 * P +1.12E-08 * P^2 +6.99E-13 * P^3 +3.54E-16 * P^4



GAS GRAVITY

Equation of best fit

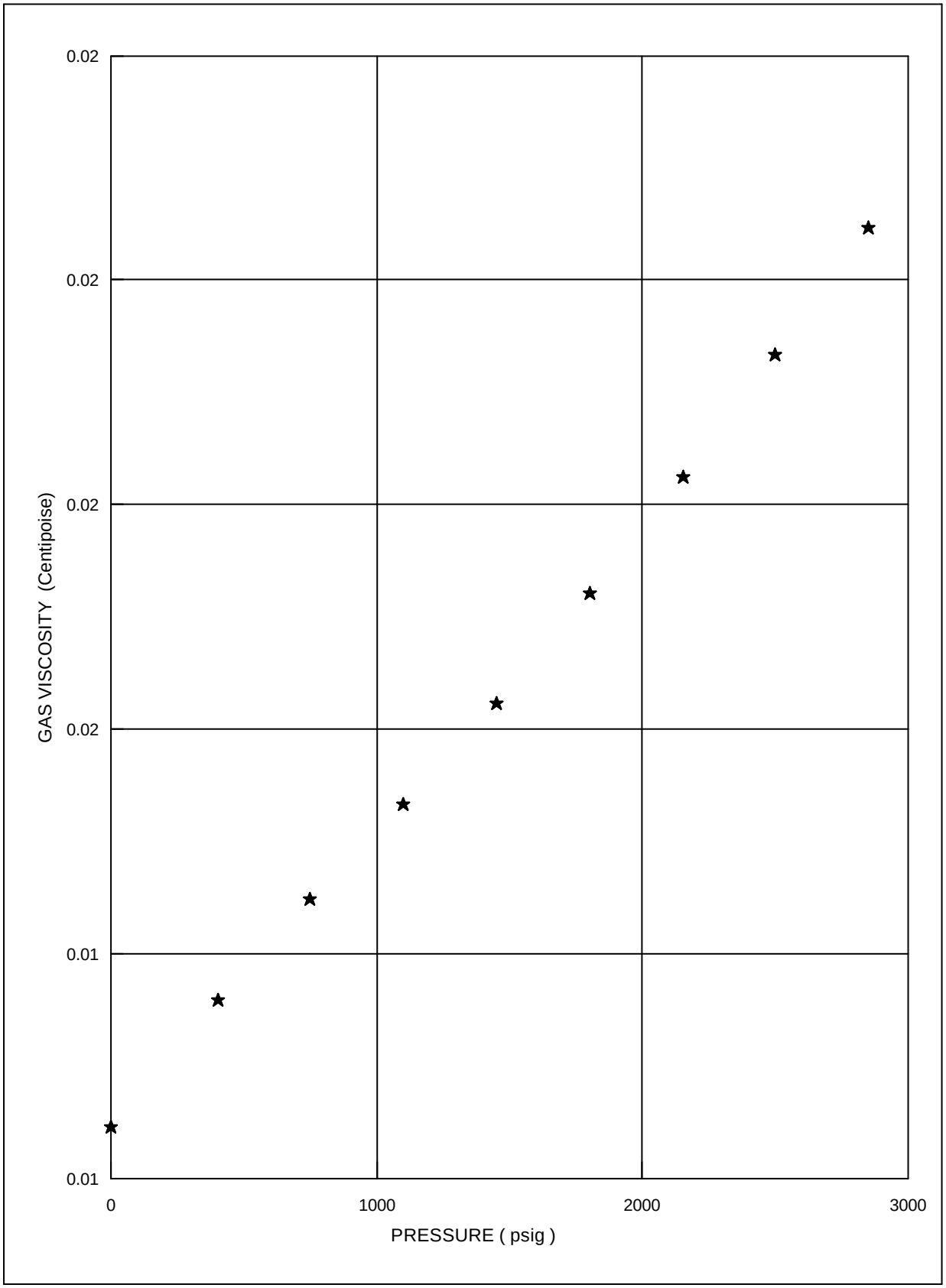
GG = +1.09E+00 -5.08E-04 * P +3.52E-07 * P^2 -1.16E-10 * P^3 +1.45E-14 * P^4



GAS VISCOSITY

Equation of best fit

μg = +1.24E-02 +3.30E-06 * P -1.07E-09 * P^2 +5.35E-13 * P^3 -7.64E-17 * P^4



FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812641 Ex MPSR 0286

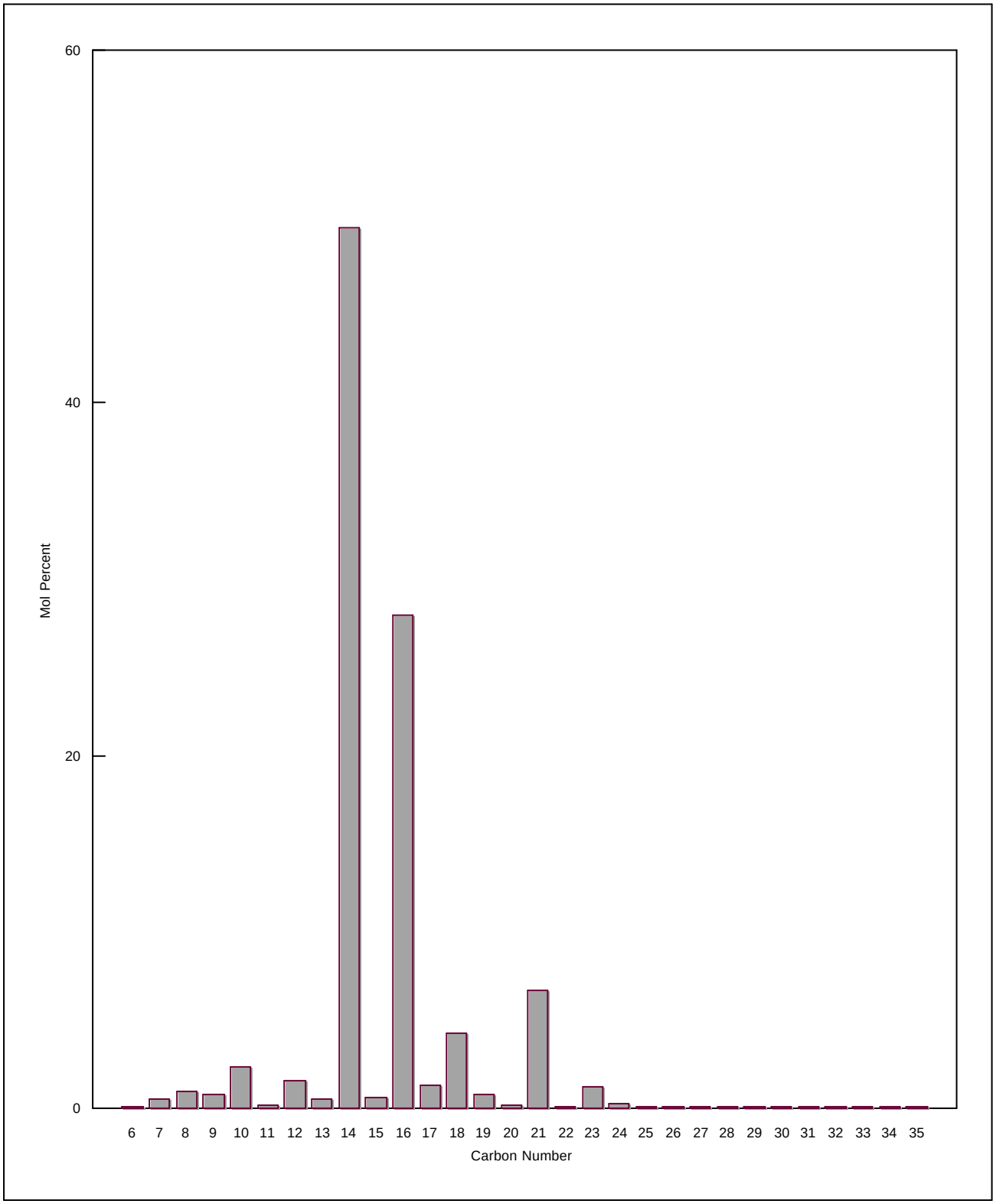
Component		Mol %
Hexanes minus	C6-	0.03
Hexanes	C6	0.07
Heptanes	C7	0.46
Octanes	C8	0.94
Nonanes	C9	0.76
Decanes	C10	2.31
Undecanes	C11	0.16
Dodecanes	C12	1.54
Tridecanes	C13	0.49
Tetradecanes	C14	49.98
Pentadecanes	C15	0.58
Hexadecanes	C16	27.99
Heptadecanes	C17	1.28
Octadecanes	C18	4.22
Nonadecanes	C19	0.80
Eicosanes	C20	0.12
Heneicosanes	C21	6.65
Docosanes	C22	0.03
Tricosanes	C23	1.17
Tetracosanes	C24	0.20
Pentacosanes	C25	0.02
Hexacosanes	C26	0.04
Heptacosanes	C27	0.03
Octacosanes	C28	0.02
Nonacosanes	C29	0.02
Triacontanes	C30	0.02
Hentriacontanes	C31	0.02
Dotriacontanes	C32	0.02
Tritriacontanes	C33	0.01
Tetratriacontanes	C34	0.01
Pentatriacontanes Plus	C35+	0.01
TOTAL		100.00

Molecular Weight Calculated *	:	208.2
Density @ 60 °F Calculated *	:	0.8327
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.7884

*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 # 812641 Ex MPSR 0286



PETROLAB

Company : Esso Australia Pty. Ltd. | Page : 118 of 136
Well : Snapper A21-A | File : E - 28005

COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

3036 mMD depth

Sample 9, Cylinder # 812641 Ex MPSR 0286

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.26	18.39	18.17
Nitrogen	N2	0.00	0.04	0.04
Methane	C1	0.45	77.98	77.05
Ethane	C2	0.09	2.70	2.67
Propane	C3	0.06	0.49	0.48
Iso-Butane	iC4	0.03	0.09	0.09
N-Butane	nC4	0.04	0.09	0.09
Iso-Pentane	iC5	0.05	0.04	0.04
N-Pentane	nC5	0.03	0.02	0.02
Hexanes	C6	0.07	0.04	0.04
Heptanes	C7	0.46	0.09	0.09
Octanes	C8	0.93	0.01	0.02
Nonanes	C9	0.75	0.01	0.02
Decanes	C10	2.29	0.01	0.04
Undecanes	C11	0.16	0.00	0.00
Dodecanes Plus	C12+	94.34	0.00	1.14
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.0120	0.9880	1.0000
Mass Ratio	:	0.1023	0.8977	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	47.6276 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	44214 SCF	--
Stream Properties				
Molecular Weight	:	206.5	21.95	24.2
Density obs. (gm/cc)	:	0.8319 @ 60 °F	--	0.1713 @ PT*
Gravity (AIR = 1.000)	:	38.4 °API @ 60 °F	0.760	--
GHV (BTU/scf)	:	--	869	--
Hexanes Plus Properties				
Mol %	:	99.00	0.16	1.35
Molecular Weight	:	208.2	97.6	195.2
Density (gm/cc @ 60 °F)	:	0.8328	0.6859	0.8224
Gravity (°API @ 60 °F)	:	38.2	74.6	40.4
Heptanes Plus Properties				
Mol %	:	98.92	0.12	1.31
Molecular Weight	:	208.3	102.2	198.7
Density (gm/cc @ 60 °F)	:	0.8328	0.6919	0.8250
Gravity (°API @ 60 °F)	:	38.2	72.8	39.9
Decanes Plus Properties				
Mol %	:	96.79	0.01	1.18
Molecular Weight	:	210.5	133.9	209.8
Density (gm/cc @ 60 °F)	:	0.8339	0.7277	0.8333
Gravity (°API @ 60 °F)	:	38.0	62.8	38.1
Undecanes Plus Properties				
Mol %	:	94.50	0.00	1.14
Molecular Weight	:	212.3	--	212.3
Density (gm/cc @ 60 °F)	:	0.8348	--	0.8348
Gravity (°API @ 60 °F)	:	37.8	--	37.8
Dodecanes Plus Properties				
Mol %	:	94.34	0.00	1.14
Molecular Weight	:	212.5	--	212.5
Density (gm/cc @ 60 °F)	:	0.8349	--	0.8349
Gravity (°API @ 60 °F)	:	37.8	--	37.8

* (P)ressure : 4272 psig * (T)emperature : 266 °F

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812641 Ex MPSR 0286

OBM Mathematically Cleaned Up

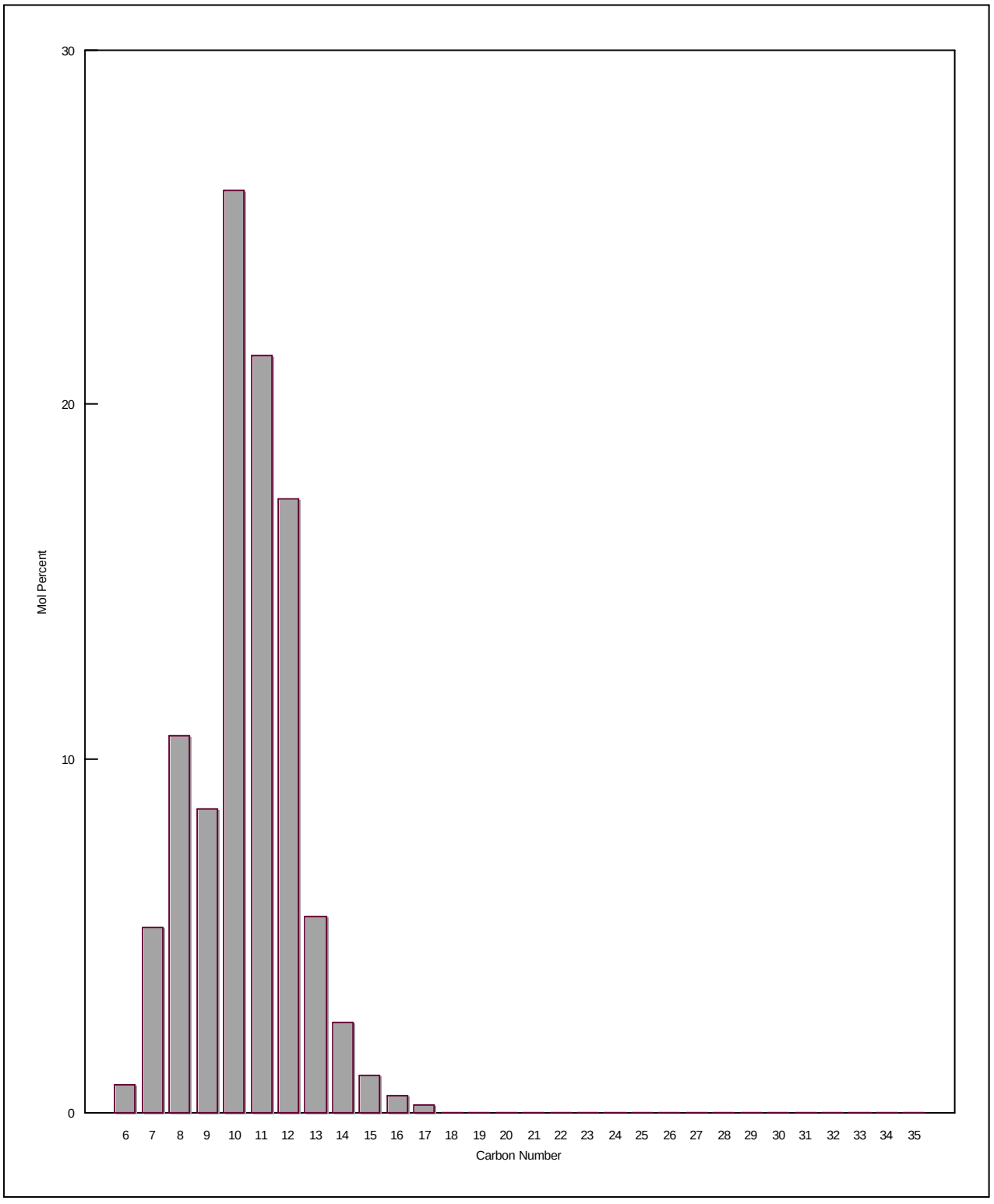
Component		Mol %
Hexanes minus	C6-	0.19
Hexanes	C6	0.80
Heptanes	C7	5.21
Octanes	C8	10.63
Nonanes	C9	8.58
Decanes	C10	26.04
Undecanes	C11	21.35
Dodecanes	C12	17.34
Tridecanes	C13	5.55
Tetradecanes	C14	2.53
Pentadecanes	C15	1.05
Hexadecanes	C16	0.49
Heptadecanes	C17	0.23
Octadecanes	C18	0.01
Nonadecanes	C19	0.00
Eicosanes	C20	0.00
Heneicosanes	C21	0.00
Docosanes	C22	0.00
Tricosanes	C23	0.00
Tetracosanes	C24	0.00
Pentacosanes	C25	0.00
Hexacosanes	C26	0.00
Heptacosanes	C27	0.00
Octacosanes	C28	0.00
Nonacosanes	C29	0.00
Triacontanes	C30	0.00
Hentriacontanes	C31	0.00
Dotriacontanes	C32	0.00
Tritriacontanes	C33	0.00
Tetratriacontanes	C34	0.00
Pentatriacontanes Plus	C35+	0.00
TOTAL		100.00

Molecular Weight Calculated *	:	141.0
Density @ 60 °F Calculated *	:	0.7830
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.7830

*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 # 812641 Ex MPSR 0286
OBM Mathematically Cleaned Up



PETROLAB

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Well : Snapper A21-A	File : E - 28005

COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

3036 mMD depth - OBM Mathematically Cleaned Up

Sample 9, Cylinder # 812641 Ex MPSR 0286

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.26	18.39	18.37
Nitrogen	N2	0.00	0.04	0.04
Methane	C1	0.45	77.98	77.90
Ethane	C2	0.09	2.70	2.70
Propane	C3	0.06	0.49	0.49
Iso-Butane	iC4	0.03	0.09	0.09
N-Butane	nC4	0.04	0.09	0.09
Iso-Pentane	iC5	0.05	0.04	0.04
N-Pentane	nC5	0.03	0.02	0.02
Hexanes	C6	0.79	0.04	0.04
Heptanes	C7	5.17	0.09	0.10
Octanes	C8	10.54	0.01	0.02
Nonanes	C9	8.51	0.01	0.02
Decanes	C10	25.83	0.01	0.04
Undecanes	C11	21.18	0.00	0.02
Dodecanes Plus	C12+	26.98	0.00	0.02
TOTAL		100.00	100.00	100.00
Ratios				
Molar Ratio	:	0.0010	0.9990	1.0000
Mass Ratio	:	0.0065	0.9935	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	992.5767 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	721501 SCF	--
Stream Properties				
Molecular Weight	:	139.3	21.95	22.1
Density obs. (gm/cc)	:	0.7823 @ 60 °F	--	0.1212 @ PT*
Gravity (AIR = 1.000)	:	49.2 °API @ 60 °F	0.760	1034.7
GHV (BTU/scf)	:	--	869	--
Hexanes Plus Properties				
Mol %	:	99.00	0.16	0.26
Molecular Weight	:	140.4	97.6	114.3
Density (gm/cc @ 60 °F)	:	0.7833	0.6859	0.7294
Gravity (°API @ 60 °F)	:	49.0	74.6	62.3
Heptanes Plus Properties				
Mol %	:	98.21	0.12	0.22
Molecular Weight	:	140.9	102.2	119.9
Density (gm/cc @ 60 °F)	:	0.7839	0.6919	0.7386
Gravity (°API @ 60 °F)	:	48.8	72.8	59.9
Decanes Plus Properties				
Mol %	:	73.98	0.01	0.08
Molecular Weight	:	151.1	133.9	149.1
Density (gm/cc @ 60 °F)	:	0.7930	0.7277	0.7857
Gravity (°API @ 60 °F)	:	46.8	62.8	48.4
Undecanes Plus Properties				
Mol %	:	48.16	0.00	0.04
Molecular Weight	:	160.3	--	160.3
Density (gm/cc @ 60 °F)	:	0.7999	--	0.7999
Gravity (°API @ 60 °F)	:	45.2	--	45.2
Dodecanes Plus Properties				
Mol %	:	26.98	0.00	0.02
Molecular Weight	:	170.7	--	170.7
Density (gm/cc @ 60 °F)	:	0.8074	--	0.8074
Gravity (°API @ 60 °F)	:	43.6	--	43.6

* (P)ressure : 4272 psig * (T)emperature : 266 °F

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812485 Ex MPSR 0497

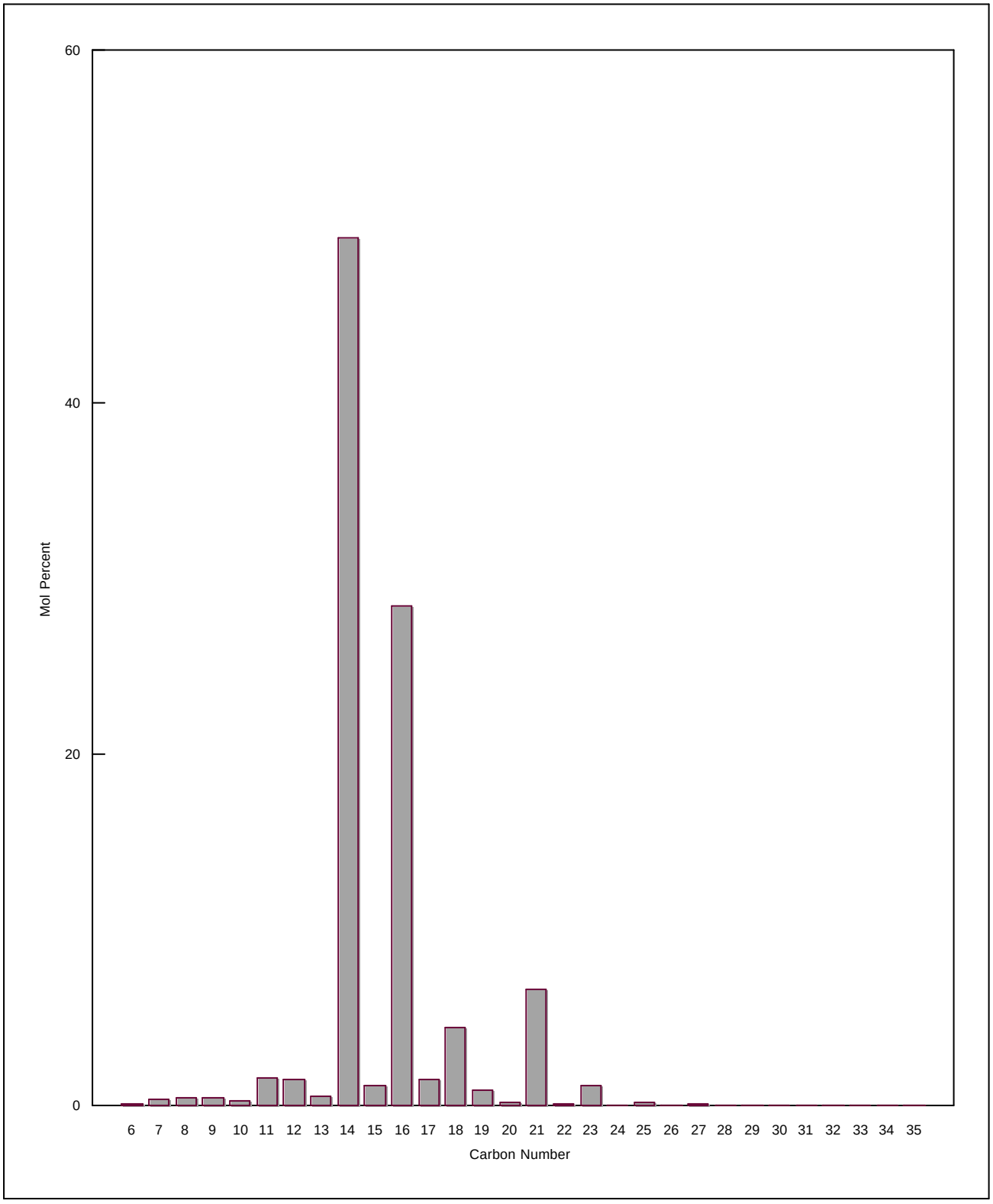
Component		Mol %
Hexanes minus	C6-	0.22
Hexanes	C6	0.09
Heptanes	C7	0.36
Octanes	C8	0.47
Nonanes	C9	0.50
Decanes	C10	0.30
Undecanes	C11	1.57
Dodecanes	C12	1.51
Tridecanes	C13	0.53
Tetradecanes	C14	49.34
Pentadecanes	C15	1.17
Hexadecanes	C16	28.45
Heptadecanes	C17	1.48
Octadecanes	C18	4.49
Nonadecanes	C19	0.90
Eicosanes	C20	0.16
Heneicosanes	C21	6.60
Docosanes	C22	0.08
Tricosanes	C23	1.16
Tetracosanes	C24	0.07
Pentacosanes	C25	0.24
Hexacosanes	C26	0.06
Heptacosanes	C27	0.08
Octacosanes	C28	0.05
Nonacosanes	C29	0.03
Triacontanes	C30	0.02
Hentriacontanes	C31	0.02
Dotriacontanes	C32	0.01
Tritriacontanes	C33	0.01
Tetratriacontanes	C34	0.01
Pentatriacontanes Plus	C35+	0.02
TOTAL		100.00

Molecular Weight Calculated *	:	210.1
Density @ 60 °F Calculated *	:	0.8337
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.8421

*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 # 812485 Ex MPSR 0497



PETROLAB

Company : Esso Australia Pty. Ltd. | Page : 124 of 136
Well : Snapper A21-A | File : E - 28005

COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

3036 mMD depth

Sample 10, Cylinder # 812485 Ex MPSR 0497

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.26	18.23	18.05
Nitrogen	N2	0.00	0.05	0.05
Methane	C1	0.45	78.24	77.47
Ethane	C2	0.09	2.68	2.65
Propane	C3	0.06	0.46	0.46
Iso-Butane	iC4	0.02	0.08	0.08
N-Butane	nC4	0.03	0.08	0.08
Iso-Pentane	iC5	0.03	0.03	0.03
N-Pentane	nC5	0.03	0.02	0.02
Hexanes	C6	0.09	0.03	0.03
Heptanes	C7	0.36	0.08	0.08
Octanes	C8	0.47	0.02	0.02
Nonanes	C9	0.50	0.00	0.00
Decanes	C10	0.30	0.00	0.00
Undecanes	C11	1.56	0.00	0.02
Dodecanes Plus	C12+	95.76	0.00	0.96
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.0098	0.9902	1.0000
Mass Ratio	:	0.0867	0.9133	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	60.2416 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	53401 SCF	--
Stream Properties				
Molecular Weight	:	208.7	21.85	23.7
Density obs. (gm/cc)	:	0.8331 @ 60 °F	--	0.1599 @ PT*
Gravity (AIR = 1.000)	:	38.2 °API @ 60 °F	0.756	752.5
GHV (BTU/scf)	:	--	868	--
Hexanes Plus Properties				
Mol %	:	99.02	0.13	1.11
Molecular Weight	:	210.4	94.9	196.9
Density (gm/cc @ 60 °F)	:	0.8339	0.6822	0.8236
Gravity (°API @ 60 °F)	:	38.0	75.7	40.1
Heptanes Plus Properties				
Mol %	:	98.94	0.10	1.08
Molecular Weight	:	210.5	98.2	200.2
Density (gm/cc @ 60 °F)	:	0.8340	0.6867	0.8259
Gravity (°API @ 60 °F)	:	38.0	74.4	39.7
Decanes Plus Properties				
Mol %	:	97.62	0.00	0.98
Molecular Weight	:	211.9	--	211.9
Density (gm/cc @ 60 °F)	:	0.8346	--	0.8346
Gravity (°API @ 60 °F)	:	37.9	--	37.9
Undecanes Plus Properties				
Mol %	:	97.32	0.00	0.98
Molecular Weight	:	212.1	--	212.1
Density (gm/cc @ 60 °F)	:	0.8348	--	0.8348
Gravity (°API @ 60 °F)	:	37.8	--	37.8
Dodecanes Plus Properties				
Mol %	:	95.76	0.00	0.96
Molecular Weight	:	213.2	--	213.2
Density (gm/cc @ 60 °F)	:	0.8353	--	0.8353
Gravity (°API @ 60 °F)	:	37.7	--	37.7

* (P)ressure : 4272 psig * (T)emperature : 266 °F

FINGERPRINT ANALYSIS
BY CAPILLARY GAS CHROMATOGRAPHY

On Stock Tank Oil from atmospheric flash of sample in cylinder # 812485 Ex MPSR 0497

OBM Mathematically Cleaned Up

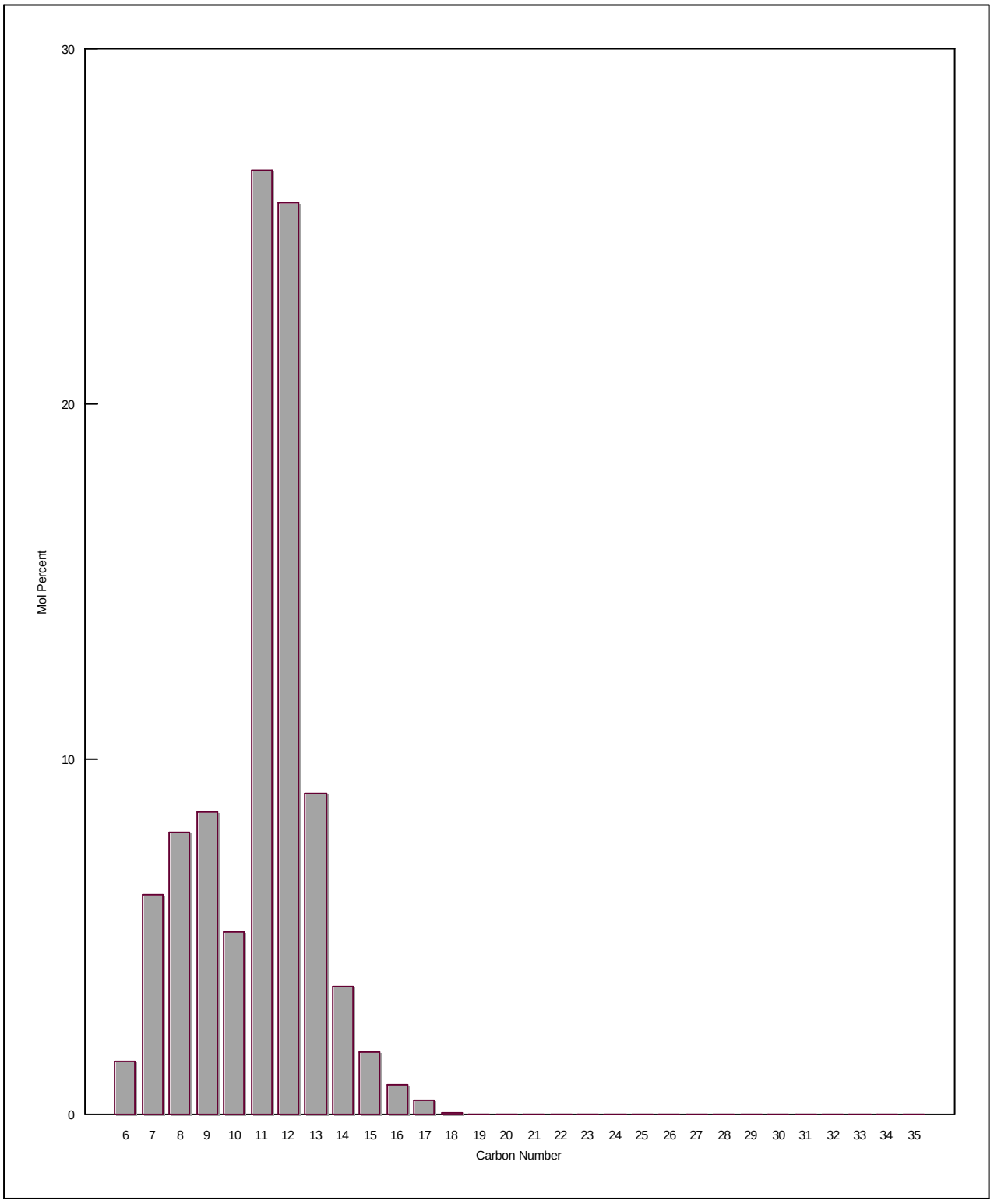
Component		Mol %
Hexanes minus	C6-	2.98
Hexanes	C6	1.48
Heptanes	C7	6.18
Octanes	C8	7.93
Nonanes	C9	8.49
Decanes	C10	5.13
Undecanes	C11	26.57
Dodecanes	C12	25.68
Tridecanes	C13	9.03
Tetradecanes	C14	3.57
Pentadecanes	C15	1.74
Hexadecanes	C16	0.82
Heptadecanes	C17	0.39
Octadecanes	C18	0.01
Nonadecanes	C19	0.00
Eicosanes	C20	0.00
Heneicosanes	C21	0.00
Docosanes	C22	0.00
Tricosanes	C23	0.00
Tetracosanes	C24	0.00
Pentacosanes	C25	0.00
Hexacosanes	C26	0.00
Heptacosanes	C27	0.00
Octacosanes	C28	0.00
Nonacosanes	C29	0.00
Triacontanes	C30	0.00
Hentriacontanes	C31	0.00
Dotriacontanes	C32	0.00
Tritriacontanes	C33	0.00
Tetratriacontanes	C34	0.00
Pentatriacontanes Plus	C35+	0.00
TOTAL		100.00

Molecular Weight Calculated *	:	144.4
Density @ 60 °F Calculated *	:	0.7851
Molecular Weight Measured	:	--
Density @ 60 °F Measured	:	0.7851

*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 # 812485 Ex MPSR 0497
OBM Mathematically Cleaned Up



PETROLAB

COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

3036 mMD depth - OBM Mathematically Cleaned Up

Sample 10, Cylinder # 812485 Ex MPSR 0497

Component		Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide	H2S	0.00	0.00	0.00
Carbon Dioxide	CO2	0.26	18.23	18.22
Nitrogen	N2	0.00	0.05	0.05
Methane	C1	0.45	78.24	78.19
Ethane	C2	0.09	2.68	2.68
Propane	C3	0.06	0.46	0.46
Iso-Butane	iC4	0.02	0.08	0.08
N-Butane	nC4	0.03	0.08	0.08
Iso-Pentane	iC5	0.03	0.03	0.03
N-Pentane	nC5	0.03	0.02	0.02
Hexanes	C6	1.51	0.03	0.03
Heptanes	C7	6.31	0.08	0.08
Octanes	C8	8.09	0.02	0.02
Nonanes	C9	8.67	0.00	0.01
Decanes	C10	5.24	0.00	0.00
Undecanes	C11	27.12	0.00	0.02
Dodecanes Plus	C12+	42.09	0.00	0.03
TOTAL		100.00	100.00	100.00

Ratios				
Molar Ratio	:	0.0006	0.9994	1.0000
Mass Ratio	:	0.0039	0.9961	1.0000
Liquid Ratio (bbl/bbl)	:	1.0000 @ SC	--	1714.7418 @ PT*
Gas Liquid Ratio	:	1.0000 bbl @ SC	1210633 SCF	--
Stream Properties				
Molecular Weight	:	145.4	21.85	21.9
Density obs. (gm/cc)	:	0.7877 @ 60 °F	--	0.1168 @ PT*
Gravity (AIR = 1.000)	:	48.0 °API @ 60 °F	0.756	1078.6
GHV (BTU/scf)	:	--	868	--
Hexanes Plus Properties				
Mol %	:	99.02	0.13	0.19
Molecular Weight	:	146.5	94.9	111.0
Density (gm/cc @ 60 °F)	:	0.7887	0.6822	0.7224
Gravity (°API @ 60 °F)	:	47.7	75.7	64.2
Heptanes Plus Properties				
Mol %	:	97.51	0.10	0.16
Molecular Weight	:	147.5	98.2	116.3
Density (gm/cc @ 60 °F)	:	0.7898	0.6867	0.7312
Gravity (°API @ 60 °F)	:	47.5	74.4	61.8
Decanes Plus Properties				
Mol %	:	74.44	0.00	0.05
Molecular Weight	:	159.3	--	159.3
Density (gm/cc @ 60 °F)	:	0.7995	--	0.7995
Gravity (°API @ 60 °F)	:	45.3	--	45.3
Undecanes Plus Properties				
Mol %	:	69.21	0.00	0.05
Molecular Weight	:	161.2	--	161.2
Density (gm/cc @ 60 °F)	:	0.8009	--	0.8009
Gravity (°API @ 60 °F)	:	45.0	--	45.0
Dodecanes Plus Properties				
Mol %	:	42.09	0.00	0.03
Molecular Weight	:	170.4	--	170.4
Density (gm/cc @ 60 °F)	:	0.8077	--	0.8077
Gravity (°API @ 60 °F)	:	43.5	--	43.5

* (P)ressure : 4272 psig * (T)emperature : 266 °F

CONSTANT MASS STUDY
@ 266 °F
On Bottom Hole Sample from Cylinder # 812485

Pressure (psig)		Relative Volume (V/Vsat) (1)	Formation Volume Factor (Bg) (2)	Gas Expansion Factor (E) (3)	Deviation Factor (Z)	Specific Volume (CFT/LB)	Gas Viscosity (Centipoise) (4)
7000		0.8960	0.00301	332.25	1.029	0.04824	0.0444
6800		0.9106	0.00306	326.90	1.016	0.04903	0.0434
6600		0.9261	0.00311	321.42	1.003	0.04986	0.0423
6400		0.9426	0.00317	315.80	0.990	0.05075	0.0412
6300		0.9508	0.00319	313.09	0.983	0.05119	0.0407
6200		0.9602	0.00323	310.02	0.977	0.05170	0.0401
6100		0.9689	0.00325	307.24	0.970	0.05216	0.0396
6000		0.9789	0.00329	304.09	0.964	0.05270	0.0390
5900		0.9893	0.00332	300.91	0.958	0.05326	0.0385
5800	*	1.0000	0.00336	297.69	0.952	0.05384	0.0379

* Dew Point Pressure

(1) Cubic feet of gas at indicated pressure and temperature per cubic foot at reservoir pressure
(2) Cubic feet of gas at indicated pressure and temperature per cubic foot at 14.696 psia and 60 °F
(3) Cubic feet of gas at 14.696 psia and 60 °F per cubic foot at indicated pressure and temperature
(4) Calculated from correlation of Lee, Gonzales and Eakin

CONSTANT MASS STUDY
@ 266 °F
On Bottom Hole Sample from Cylinder # 812485

Pressure (psig)		Relative Volume (V/Vsat) (1)	Retrograde Liquid Deposit (Bbl/MMSCF) (2)	(Volume%) (3)
5800	*	1.0000	0.00	0.00
5500		1.0367	2.45	0.41
5200		1.0764	7.66	1.28
4900		1.1247	13.70	2.29
4272	* *	1.2510	24.05	4.02
3700		1.4141	30.57	5.11
3100		1.6590	34.76	5.81
2500		2.0354	37.04	6.19
1900		2.6573	36.50	6.10
1300		3.8700	34.10	5.70
700		7.3069	29.14	4.87

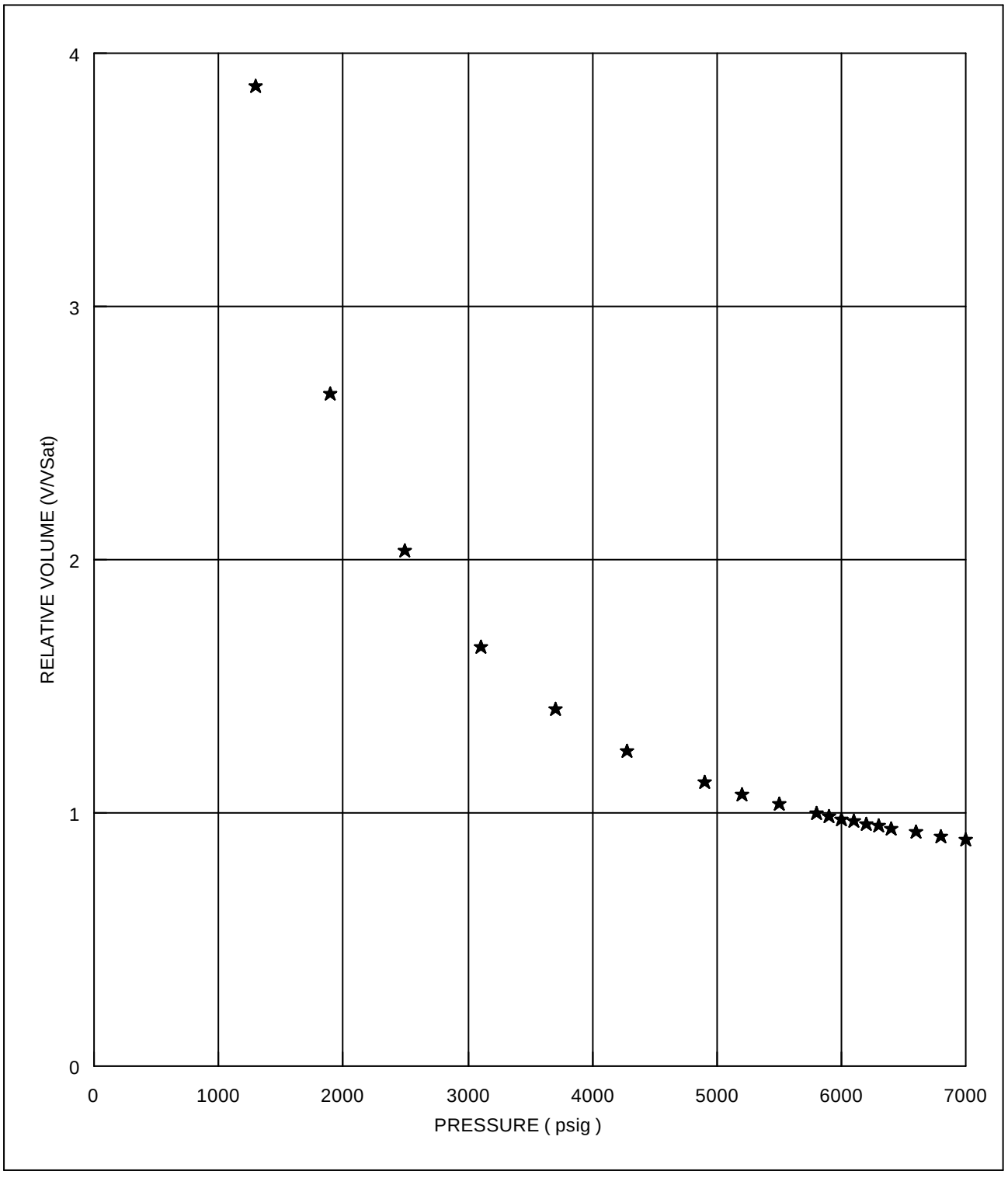
* Dew Point Pressure
* * Reservoir Pressure

(1) Cubic feet of gas at indicated pressure and temperature per cubic foot at saturation pressure
(2) Barrels of liquid at indicated pressure and temperature per MMSCF of original reservoir fluid
(3) Percent of reservoir hydrocarbon pore space at dew point

RELATIVE VOLUME

Equation of best fit

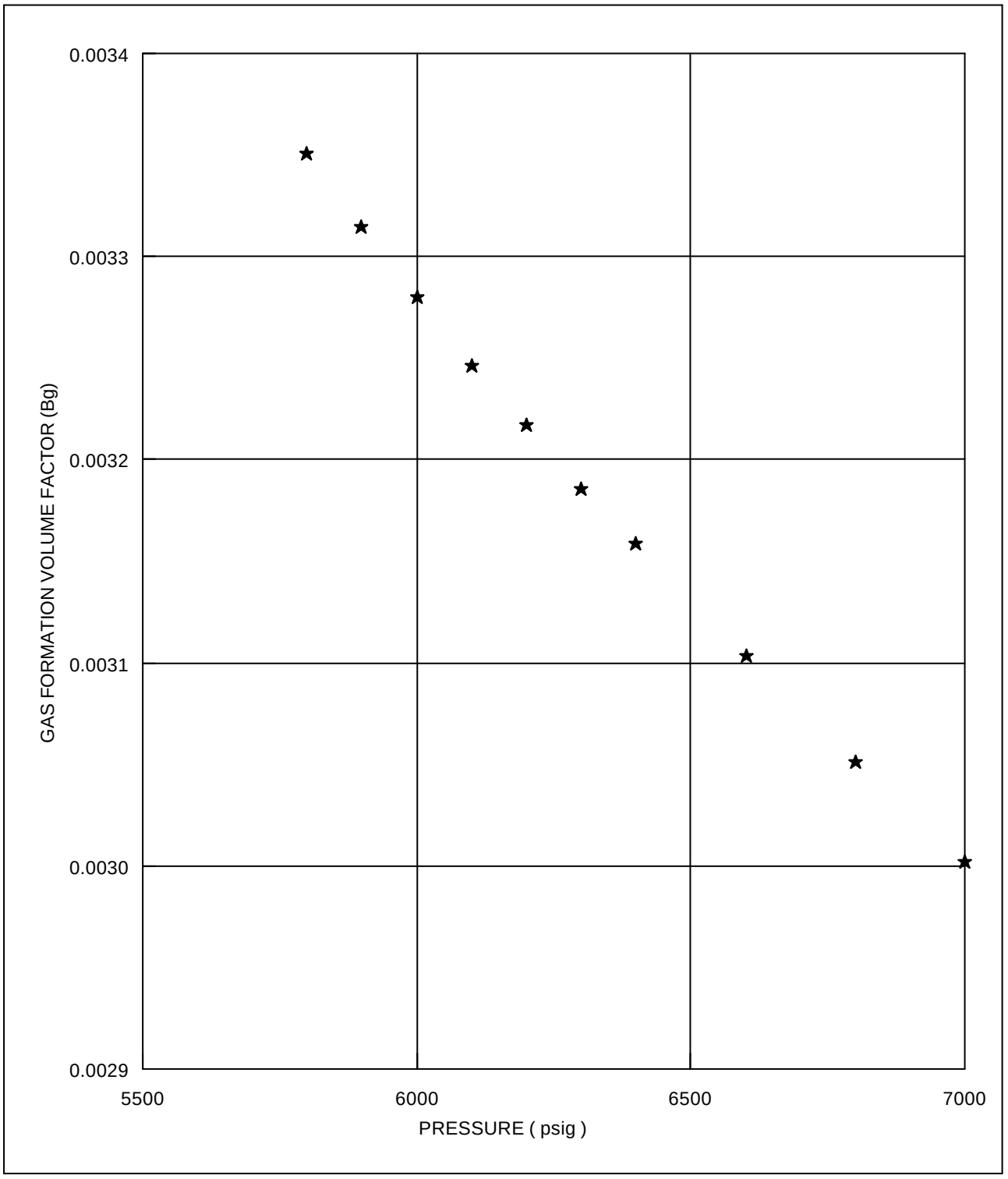
V/VSat = +1.30E+01 -1.04E-02 * P +3.49E-06 * P^2 -5.11E-10 * P^3 +2.72E-14 * P^4



GAS FORMATION VOLUME FACTOR

Equation of best fit

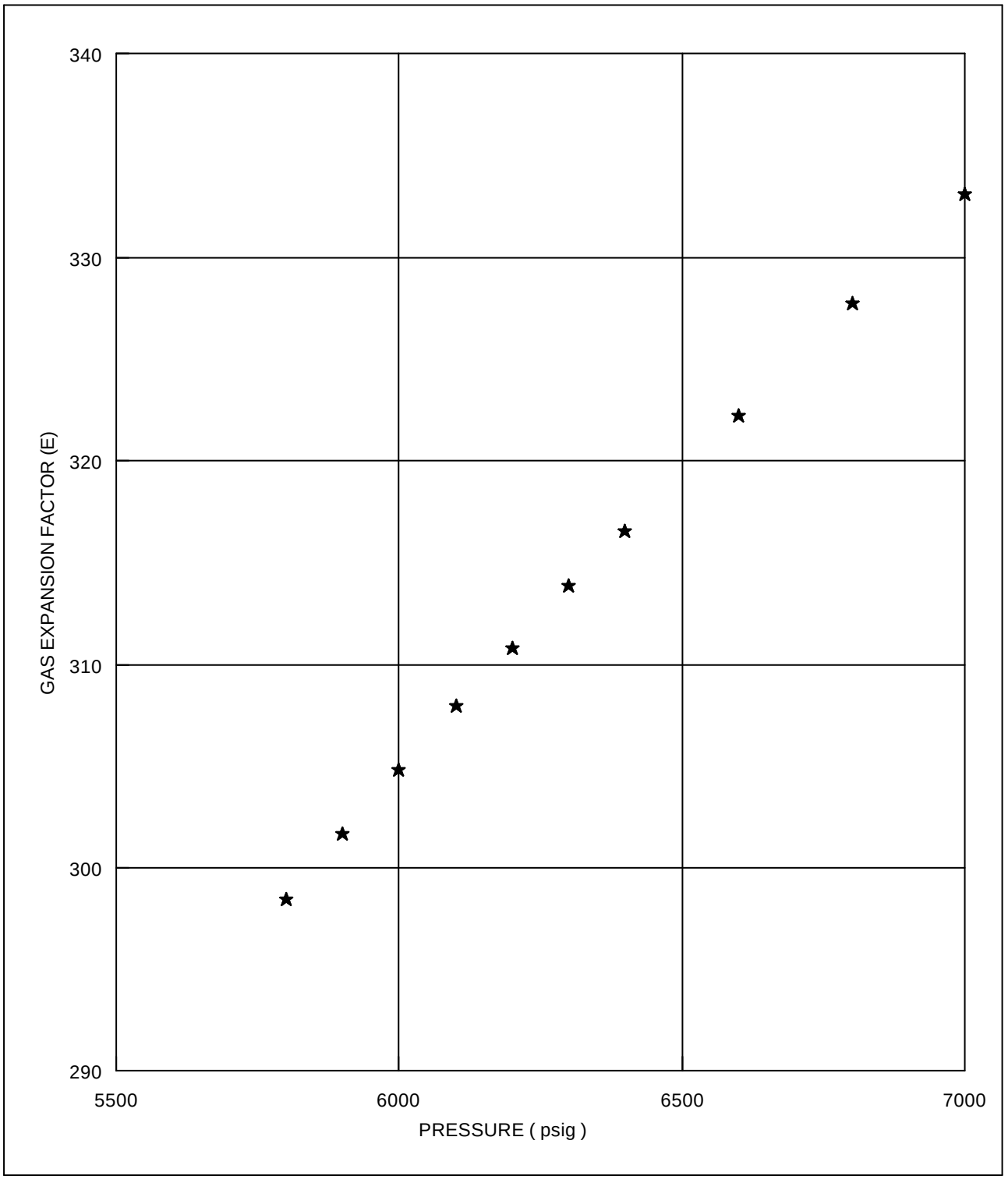
Bg = +1.35E-02 -3.94E-06 * P +5.20E-10 * P^2 -2.44E-14 * P^3 +0.00E+00 * P^4



GAS EXPANSION FACTOR

Equation of best fit

E = -4.14E+02 +2.70E-01 * P -3.53E-05 * P^2 +1.71E-09 * P^3 +0.00E+00 * P^4

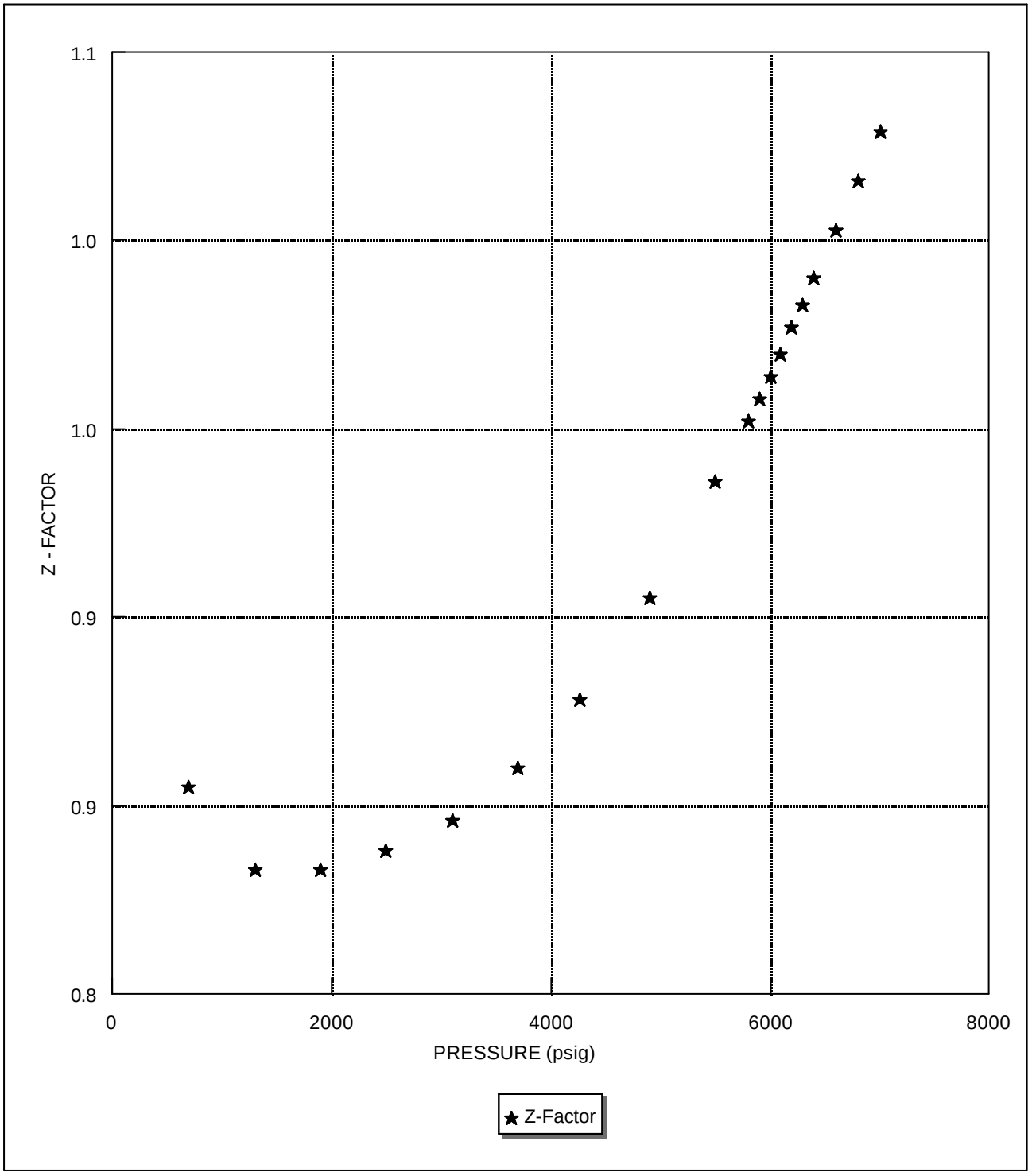


GAS DEVIATION FACTOR

Equation of best fit

Z

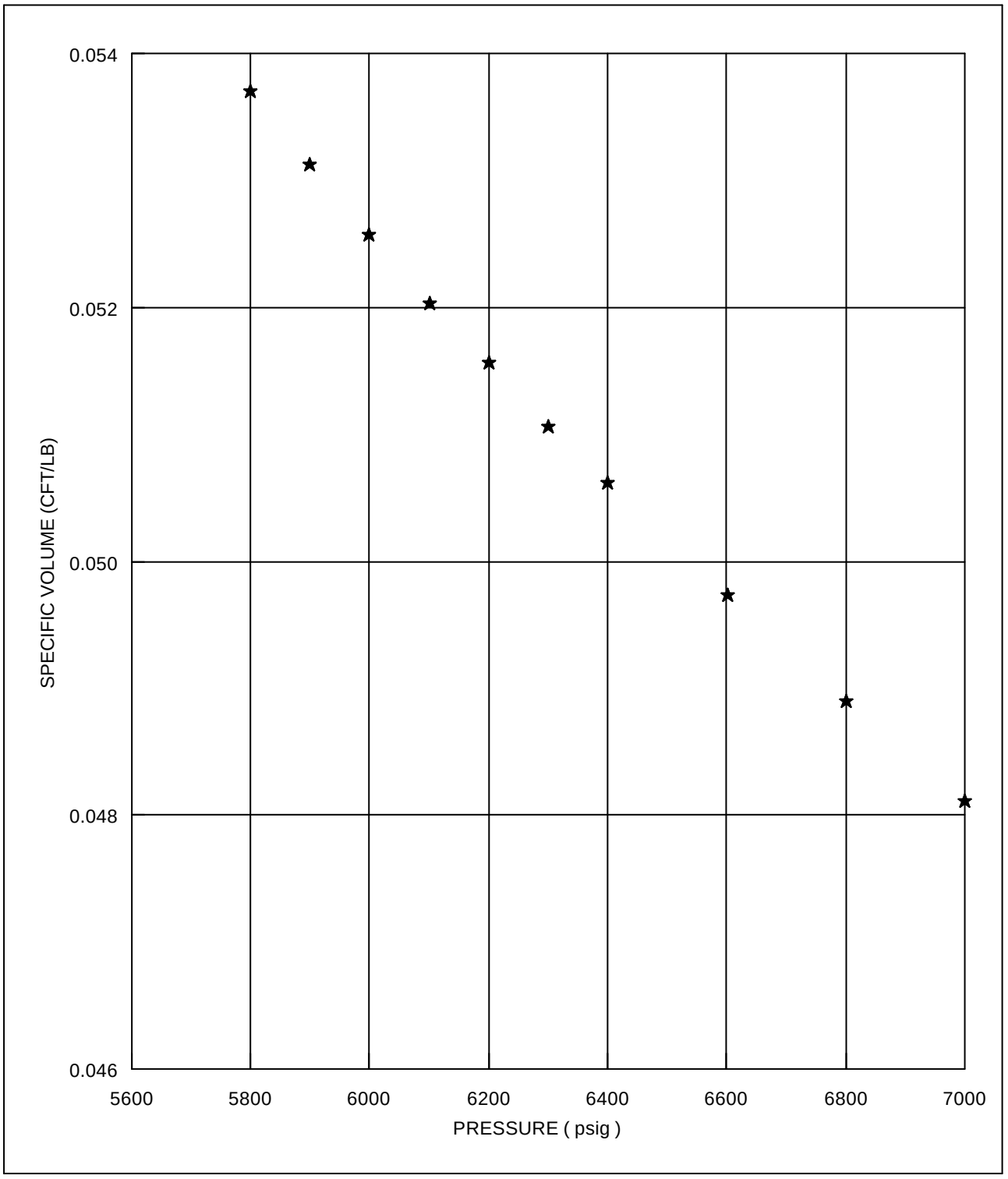
Z = +6.08E-10 +6.54E-04 * P -1.90E-07 * P^2 +2.50E-11 * P^3 +-1.17E-15 * P^4



RESERVOIR FLUID SPECIFIC VOLUME

Equation of best fit

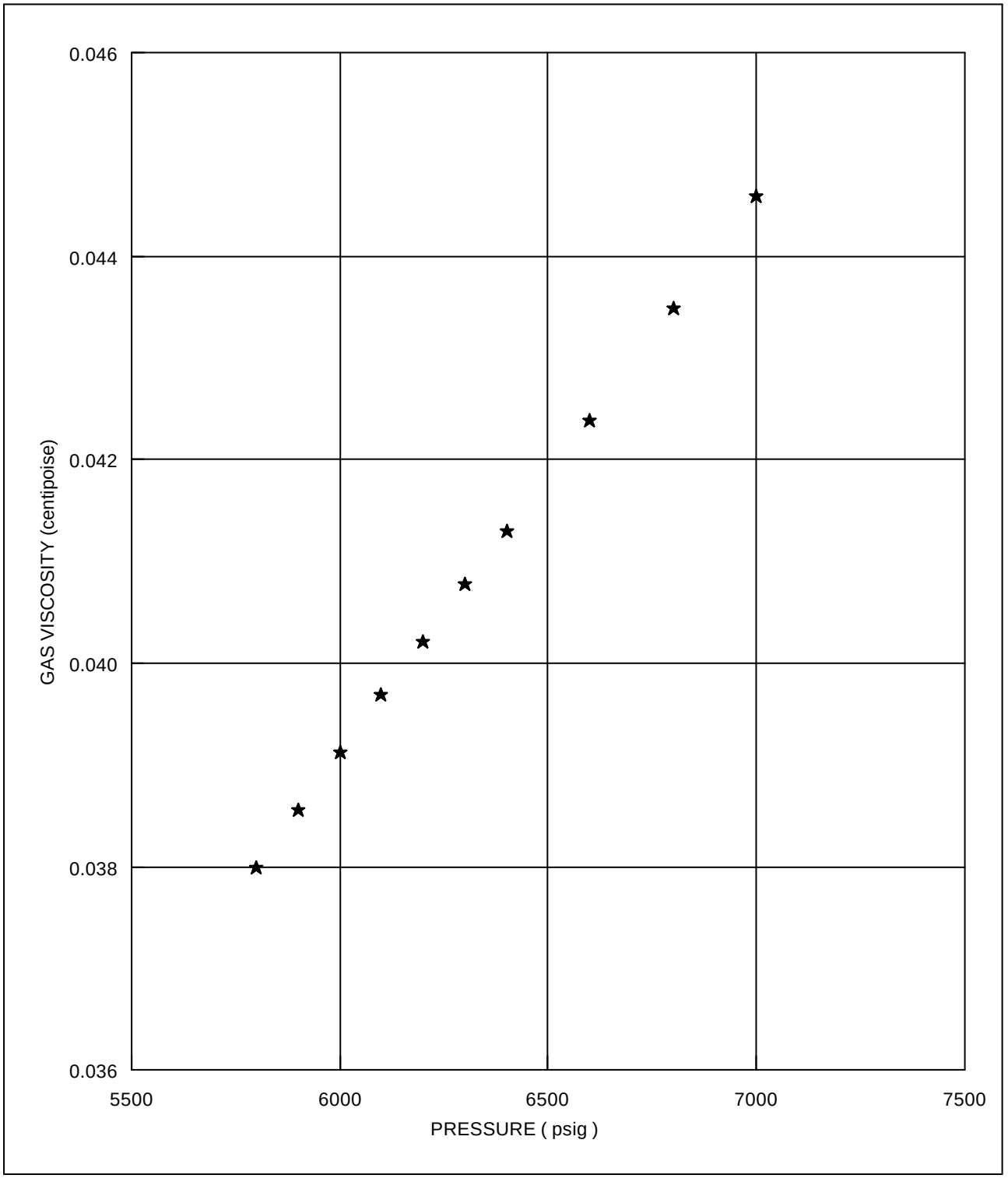
SV = +2.16E-01 -6.31E-05 * P +8.34E-09 * P^2 -3.91E-13 * P^3 +0.00E+00 * P^4



VISCOSITY OF RESERVOIR FLUID

Equation of best fit

$\mu = -6.49E\text{-}02 + 3.88E\text{-}05 * P - 5.20E\text{-}09 * P^2 + 2.69E\text{-}13 * P^3 + 0.00E+00 * P^4$



RETROGRADE CONDENSATION

Equation of best fit

Constant Mass

RLD = +4.24E+00 +5.62E-04 * P +7.42E-07 * P^2 -3.28E-10 * P^3 +2.76E-14 * P^4