

Sun Petrochemicals Private Limited

(SunPetro)

Commercial & Supply Chain Management

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CIN: U24219GJ1995PTC028519



No. SunPetro/Gujarat/Well Fluid/2023-24/SPPL-164/Bulletin-2

Date:15.02.2024

BULLETIN #2

Sub: Additional Well Fluid Processing Train & Associated Equipment at CPF, Bhaskar Field.

Ref: Tender No.: SunPetro/Gujarat/Well Fluid/2023-24/SPPL-164

Sun Petrochemicals Private Limited (SunPetro), hereby authorized following amendment / clarification in the above referred Tender:

SunPetro hereby attached herewith **Oil analysis report and PVT report at Appendix-1. This shall be part of scope of work as envisaged in the tender document.**

All other terms and conditions of the tender remain unchanged.

Regards,

Sun Petrochemicals Pvt. Ltd

Appendix-1

Oil Analysis Report and PVT Report

(Enclosed)

CRUDE OIL ANALYSIS REPORT

GULF-A-1

OIL ANALYSIS REPORT NO. : 24

PROJECT : ANKLESHWAR

FIELD : GULF OF CAMBAY

WELL NO : CAMBAY GULF#3(A-1)

FIELD DESCRIPTION OF THE SAMPLE

1. Laboratory Sl. No.	:	24
2. Date and time of collection	:	23.09.1992 (14.00 to 16.00 hrs.)
3. Collected by	:	-
4. Bean size(mm)	:	1/8
5. Interval perforated (M) / Depth (M)	:	1269-1273
6. Object / Sand	:	III
7. CHP (psi) / (kg/cm ²)	:	-
8. FTHP (psi) / (kg/cm ²)	:	575
9. Source of receipt	:	Geol. Office, Ank Pr.
10. Letter No. & Date	:	07.10.1992
11. Date of receipt in the lab.	:	07.10.1992
12. Remarks	:	-

GENERAL ANALYSIS BY STANDARD METHODS

		METHOD	UNIT	RESULTS
1. Water content	:	IP-74	% vol	Trace
2. B.S. & W.	:	IP-75	% vol	0.1
3. Pour point	:	IP-15	°C	30
4. Density at 15 °C	:	IP-160	Kg/litre	0.8079
5. Specific gravity at 60 / 60 °F	:	IP-200	0.8083
6. API gravity	:	IP-200	Degrees	43.56
7. Salinity as NaCl as on received basis	:	IP-77	Lbs / 1000 bbls	-
8. R.V.P. at 100 °F	:	IP-69	psi	-
9. Viscosity at 37.8 °C / °F	:	IP-267/71	ops / cst	4.076
		Using Rheometer		

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P-V RELATION

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(CONSTANT MASS EXPANSION STUDY At RES. TEMP. = 99.0 °C)

Sl. No.	Pressure		Pump Scale Reading
	Psig	Kg/cm ²	(CC)
1	2500	175.8	112.76
2	2000	140.6	111.82
3	1860	130.7	111.61
4	1500	105.5	110.78
5	1000	70.3	109.90
6	600	42.2	109.30
7	500	35.2	108.88
8	400	28.1	108.16
9	390	27.4	107.86
10	380	26.7	106.86
11	370	26.0	105.86

CONSTANT MASS EXPANSION STUDY At RES. TEMP. = 99.0 °C

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Y-FACTOR AND RELATIVE VOLUME

Sl. No.	Pressure		Relative Volume Pb = 1.00	Relative Volume Smoothened	Y-Factor Smoothened
	Psig	Kg/cm ²			
1	380	26.7	1.0125	1.0075	10.0835
2	335	23.6	1.0741	1.0232	9.2229
3	250	17.6	1.3013	1.0795	7.5972
4	205	14.4	1.5279	1.1385	6.7366
5	180	12.7	1.7552	1.1817	6.3158
6	160	11.3	1.9828	1.2435	5.8760

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DIFFERENTIAL VAPORISATION AT RESERVOIR TEMP. (99.0°C)

Gas gravity, Cumulative Gas gravity and Gas FVF (Bg)
At Different Pressures.

S. No.	Pressure		Gas Gravity Gravity (Air=1.0000)	Cumulative Gas Gravity	Gas FVF (Bg)
	Psig	Kg/cm ²			
1	300	21.1	1.0779	1.0779	0.0484
2	200	14.1	1.0242	1.0432	0.0777
3	100	7.0	1.2434	1.1573	0.1451
4	00	0.0	1.9375	1.6562	-

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DIFFERENTIAL VAPORISATION AT RESERVOIR TEMP. (99.0 °C)

Reservoir oil Density, Reservoir Oil Formation Volume Factor(Bo), Liberated and Solution GOR at Different Pressures.

S. No.	Pressure		Res. Oil FVF V/V	Res. Oil Density gm/cc	Solution GOR (V/V)	Liberated GOR (V/V)
	Psig	Kg/cm ²				
1	1860	130.8	1.9325	0.7287	-	-
2	410	28.8	1.2267	0.7088	38.75	-
3	300	21.1	1.2194	0.7116	36.48	2.27
4	200	14.1	1.1936	0.7223	32.36	6.39
5	100	7.0	1.1609	0.7383	24.78	13.97
6	00	00.0	1.0203	0.7824	0.00	38.75

DIFFERENTIAL VAPORISATION AT RESERVOIR TEMP. (99.0°C)

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Oil Viscosity (Cp) At Different Pressures

Sl. No.	Pressure		Oil Viscosity (Cp)
	Psig	Kg/cm ²	
1	2500	175.8	0.588
2	1860 (Pb)	130.8	0.573
3	1000	70.3	0.550
4	500	35.2	0.538
5	350	24.1	0.543
6	150	10.5	0.581
7	00	0.0	0.775

Chromatographic Analysis Of Flashed Gas (Vol %) *

Sl.No.	Composition	Volume (%)
1	Methane	31.24
2	Ethane	6.88
3	Propane	19.17
4	iso-Butane	10.53
5	n-Butane	10.33
6	n-Pentane	2.67
7	Iso-pentane	3.49
8	C ₆ ⁺	0.72
9	N ₂	13.26
10	CO ₂	0.71

* Non Hydrocarbon Free Basis

Chromatographic Analysis of Differentially Liberated Gases*

Components	Pressure Stages (Psig)
	200
N ₂	3.56
CO ₂	0.91
Methane	13.98
Ethane	4.65
Propane	23.76
n-Butane	16.07
iso-Butane	17.92
n-Pentane	7.16
iso-Pentane	10.24
C ₆ ⁺	1.75

* Non Hydrocarbon Free Basis

DISTILLATION		CHARACTERISTICS
POUR POINT	$^{\circ}\text{C}$: 30.00
IBP	$^{\circ}\text{C}$: 42.00
WAX CONTENT	%	: 6.78
RECOVERY UPTO 300	$^{\circ}\text{C}$: 53.97
RESIDUE AT 300	$^{\circ}\text{C}$: 43.69

LIST OF PLATES

1. PRESSURE VS. PUMP SCALE READING
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3. PRESSURE VS. OIL FVF
4. PRESSURE VS. RESERVOIR OIL DENSITY
5. PRESSURE VS. SOLUTION & LIBERATED GOR
6. PRESSURE VS. GAS GRAVITY
7. PRESSURE VS. CUMULATIVE GAS GRAVITY
8. PRESSURE VS. GAS FVF
9. PRESSURE VS. RESERVOIR OIL VISCOSITY

PLATE -1

CAMBAY GULF #3 (A-1)
PRESSURE Vs. PUMP SCALE READING
(CONSTANT MASS EXPANSION STUDY AT RES. TEMP. 99°C)

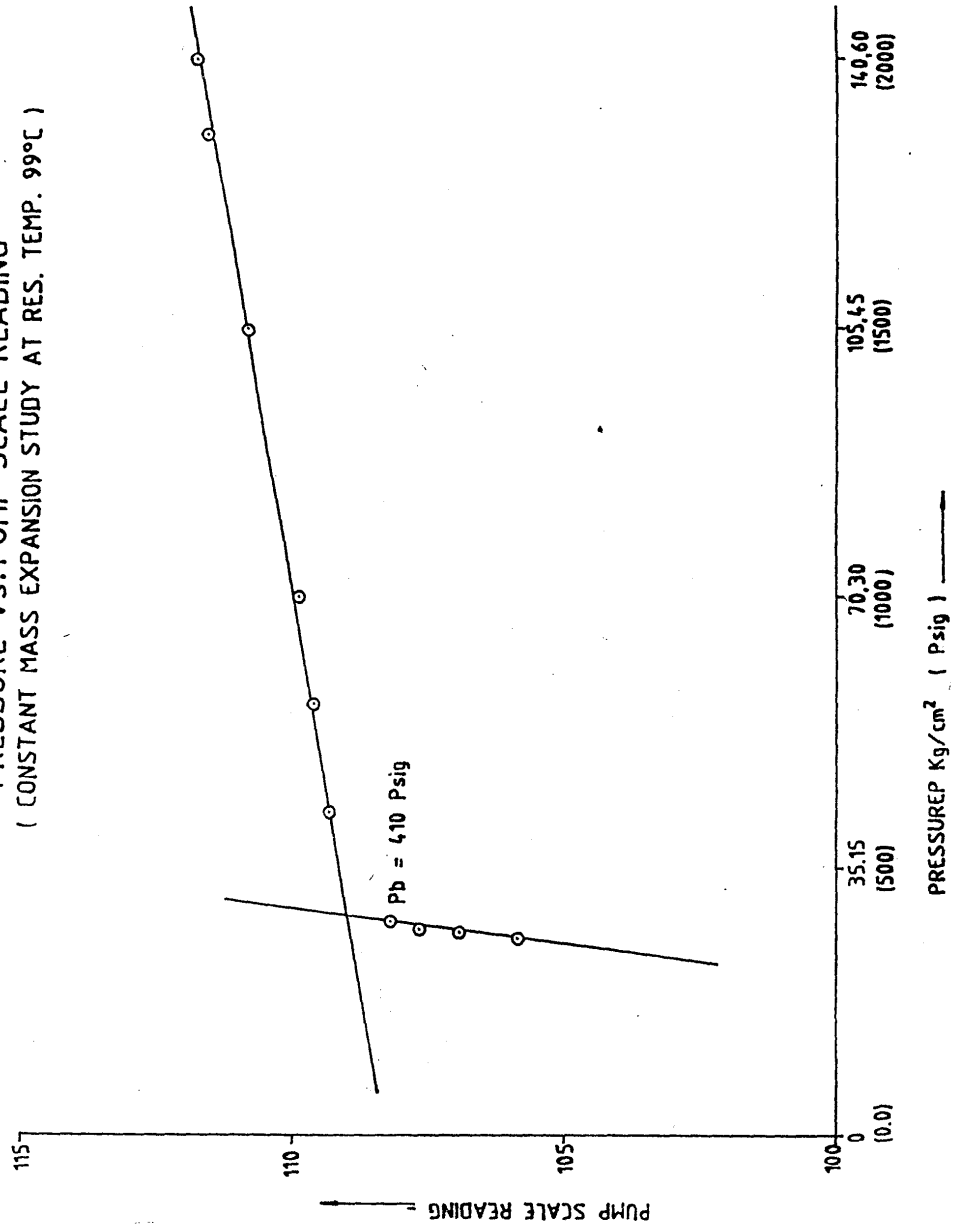
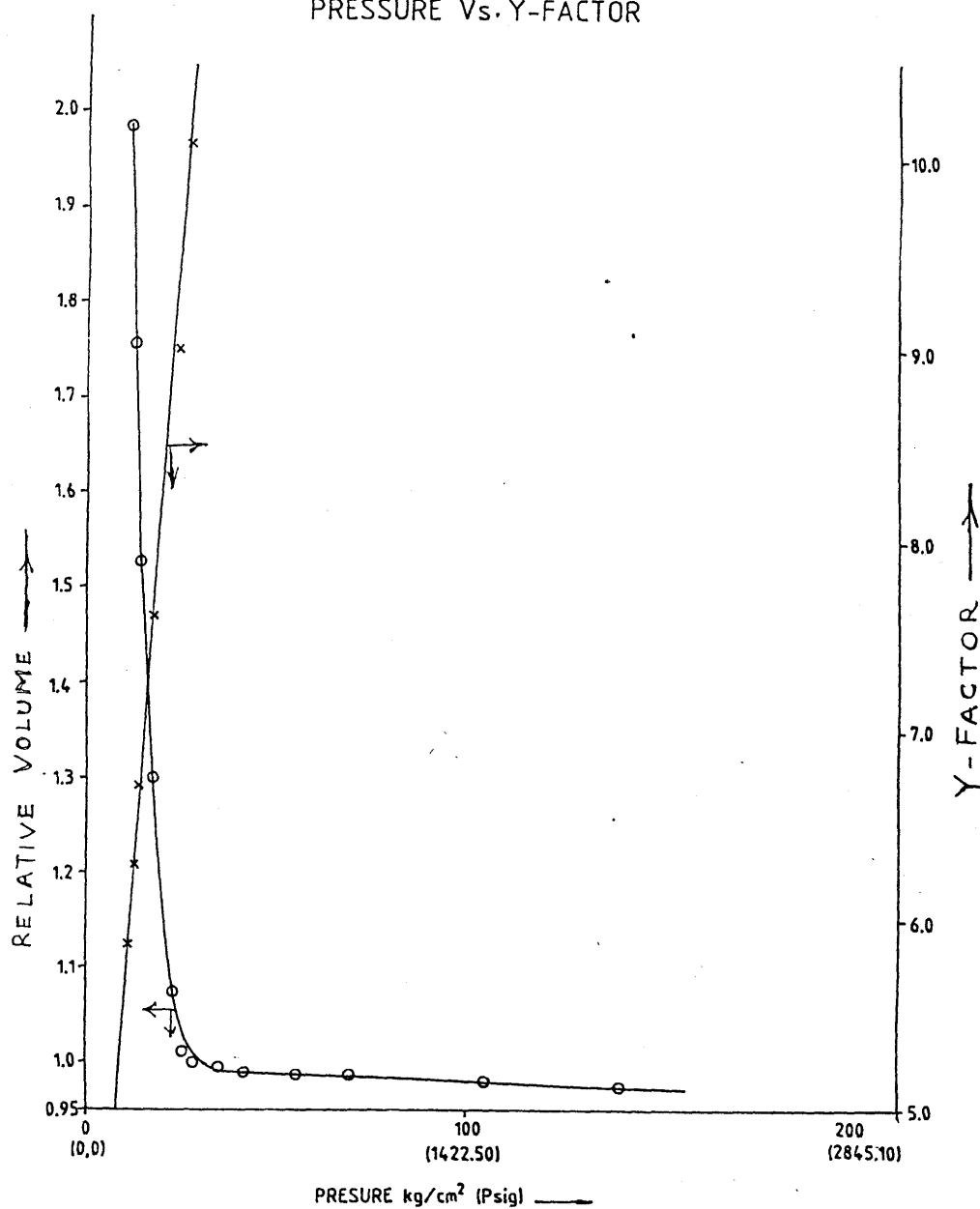
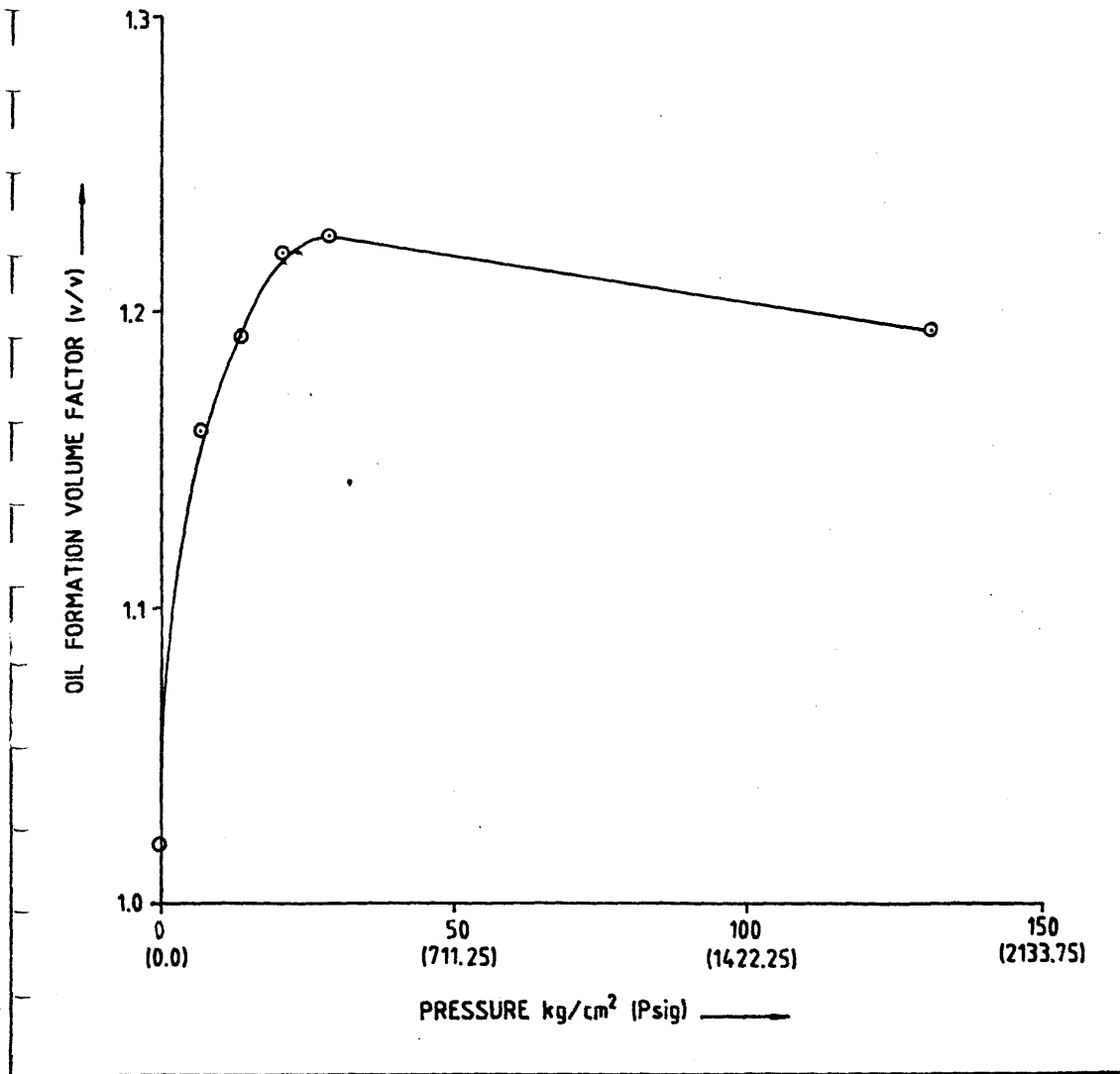


PLATE-2

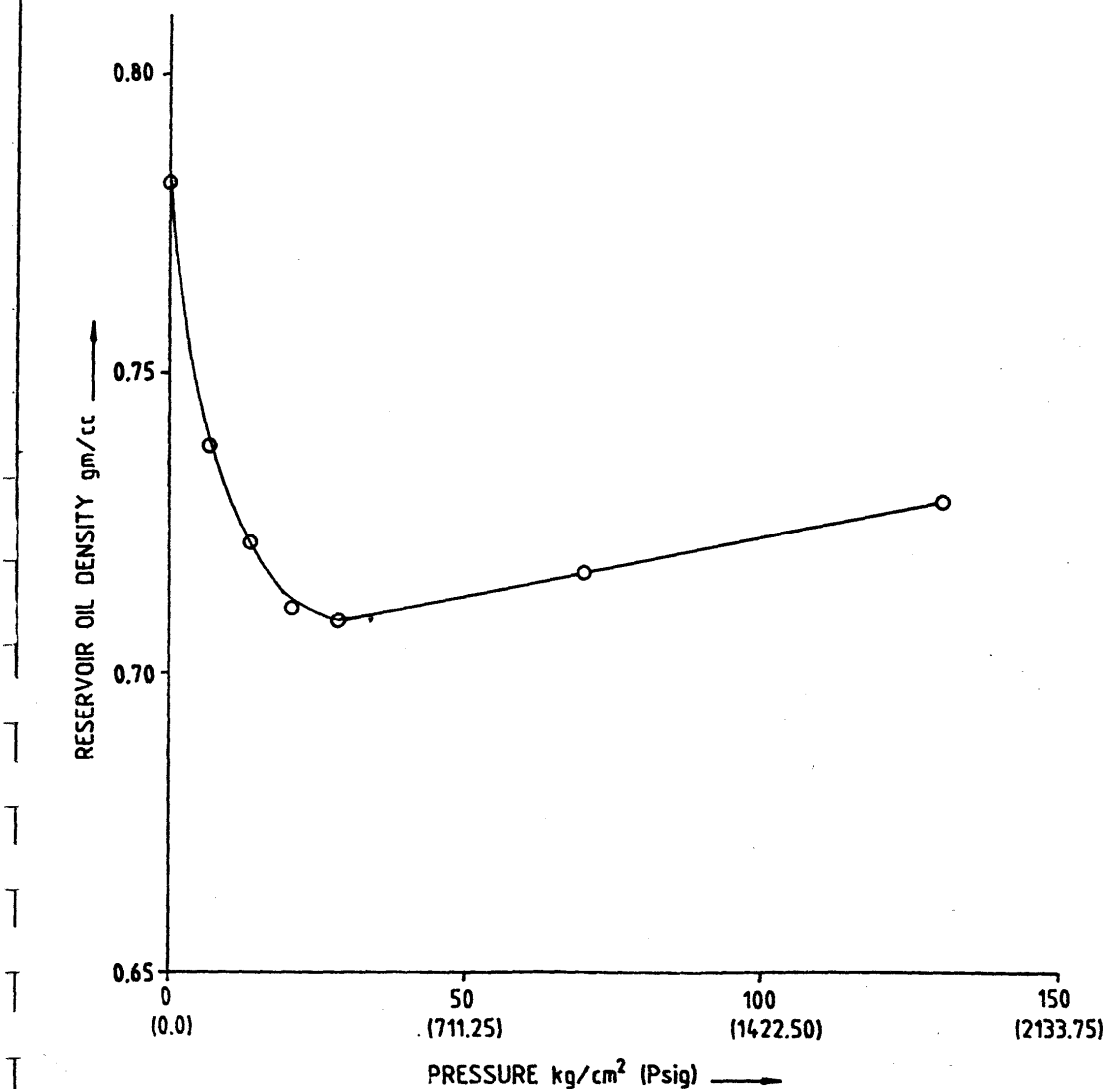
CAMBAY GULF #3(A-1)
PRESSURE Vs. RELATIVE VOLUME
PRESSURE Vs. Y-FACTOR



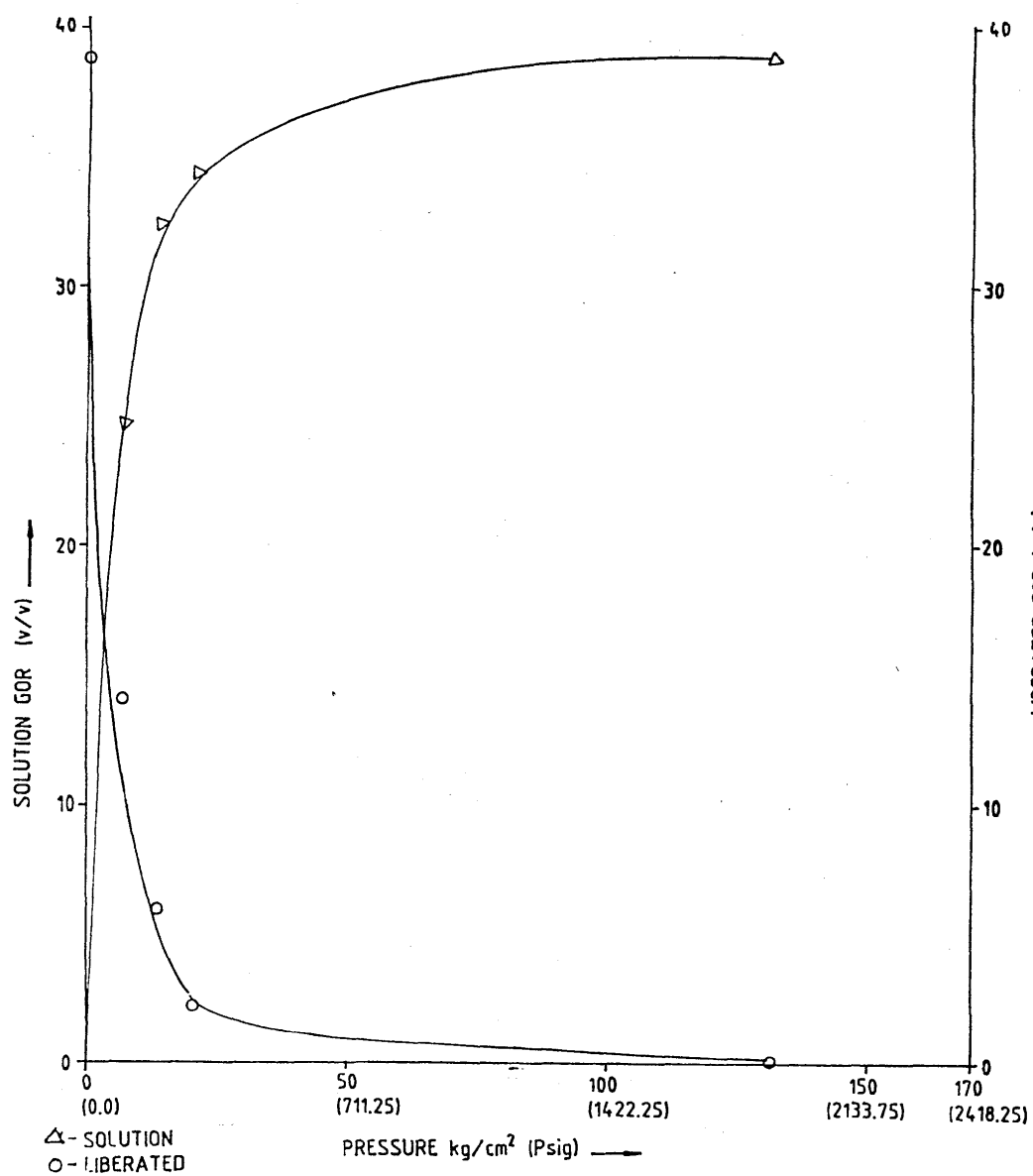
CAMBAY GULF # 3 (A-1)
PRESSURE Vs. OIL FORMATION VOLUME FACTOR
(DIFFERENTIAL LIBERATION STUDY AT RES. TEMP. 99°C)



CAMBAY GULF #3 (A-1)
PRESSURE Vs. RESERVOIR OIL DENSITY
(DIFFERENTIAL LIBERATION STUDY AT RES. TEMP. 99°C)

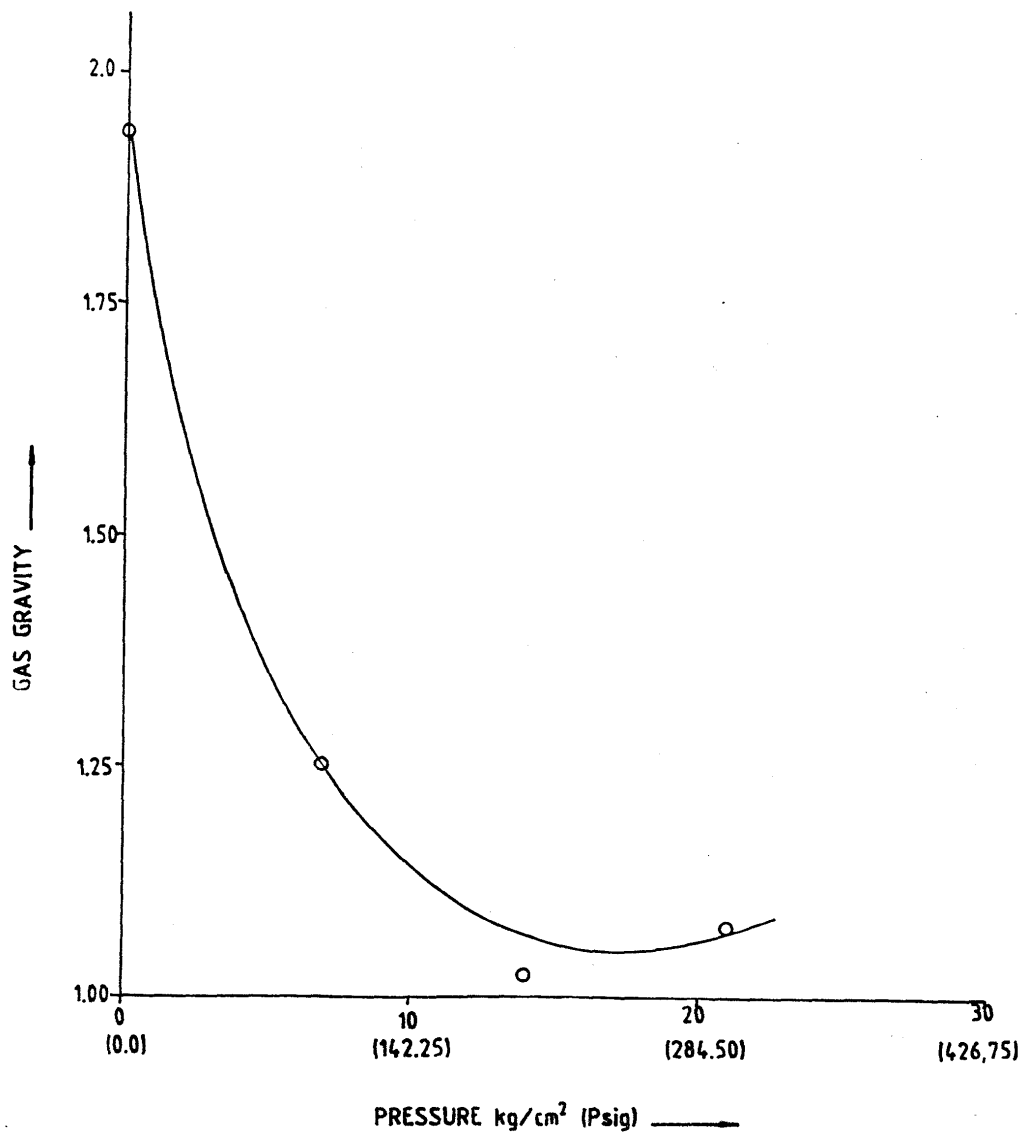


CAMBAY GULF#3 (A-1)
PRESSURE Vs. SOLUTION GAS OIL RATIO
PRESSURE Vs. LIBERATED GAS OIL RATIO

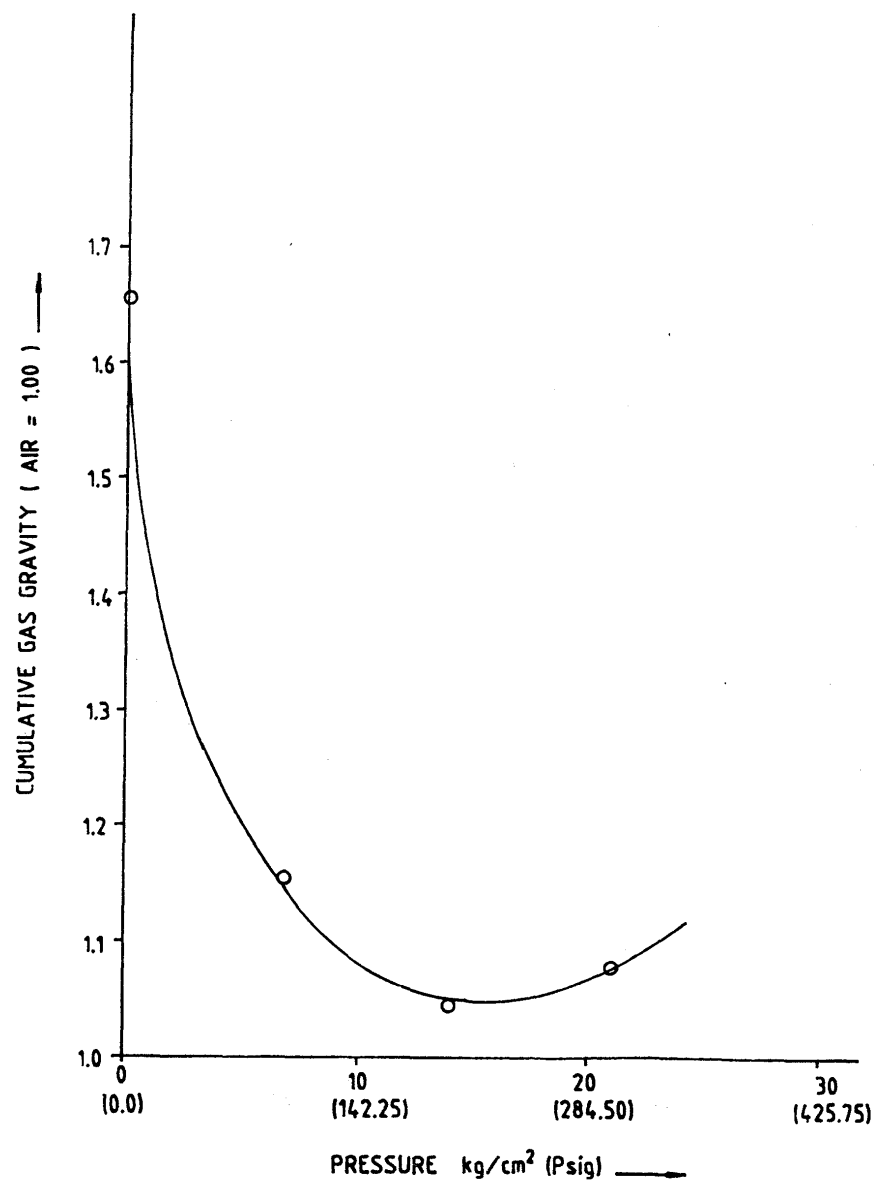


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CAMBAY GULF #3 (A-1)
PRESSURE Vs. GAS GRAVITY
(DIFFERENTIAL LIBERATION STUDY AT RES. TEMP. 99°C)

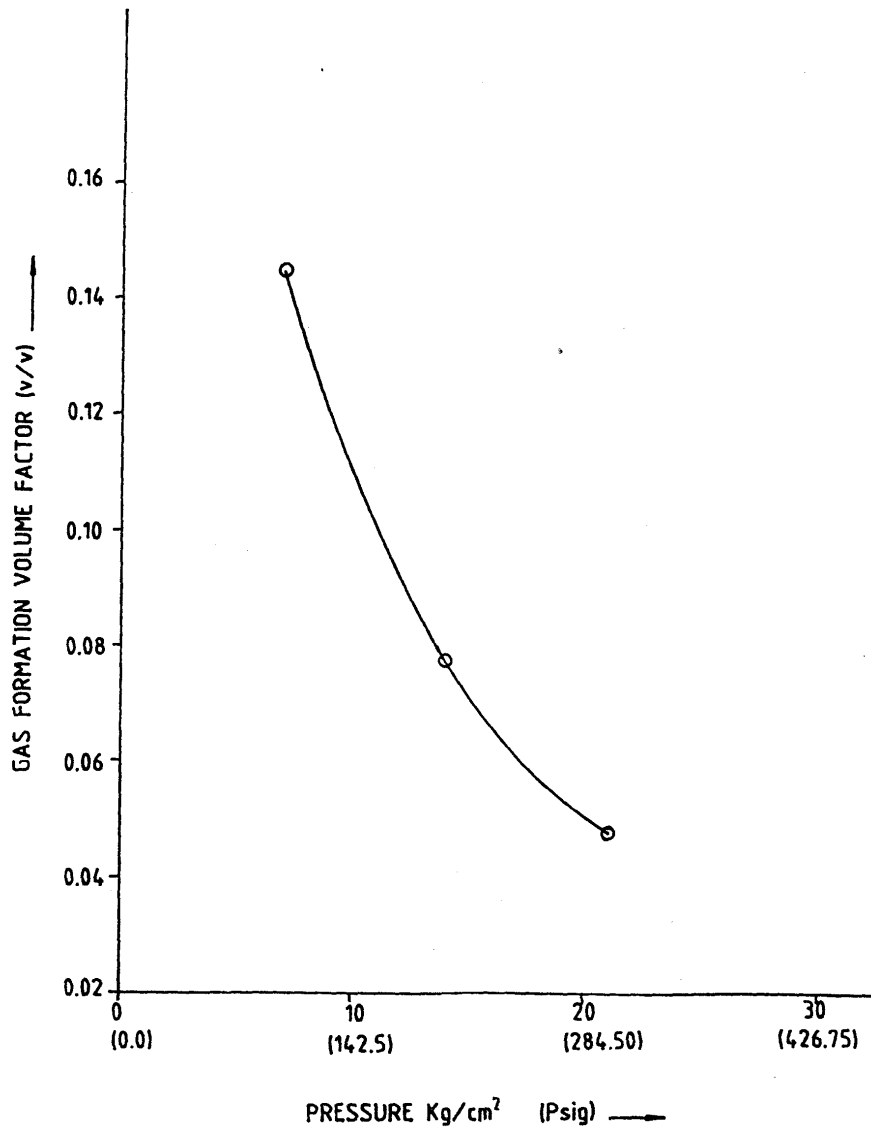


CAMBAY GULF #3(A-1)
PRESSURE Vs. CUMULATIVE GAS GRAVITY

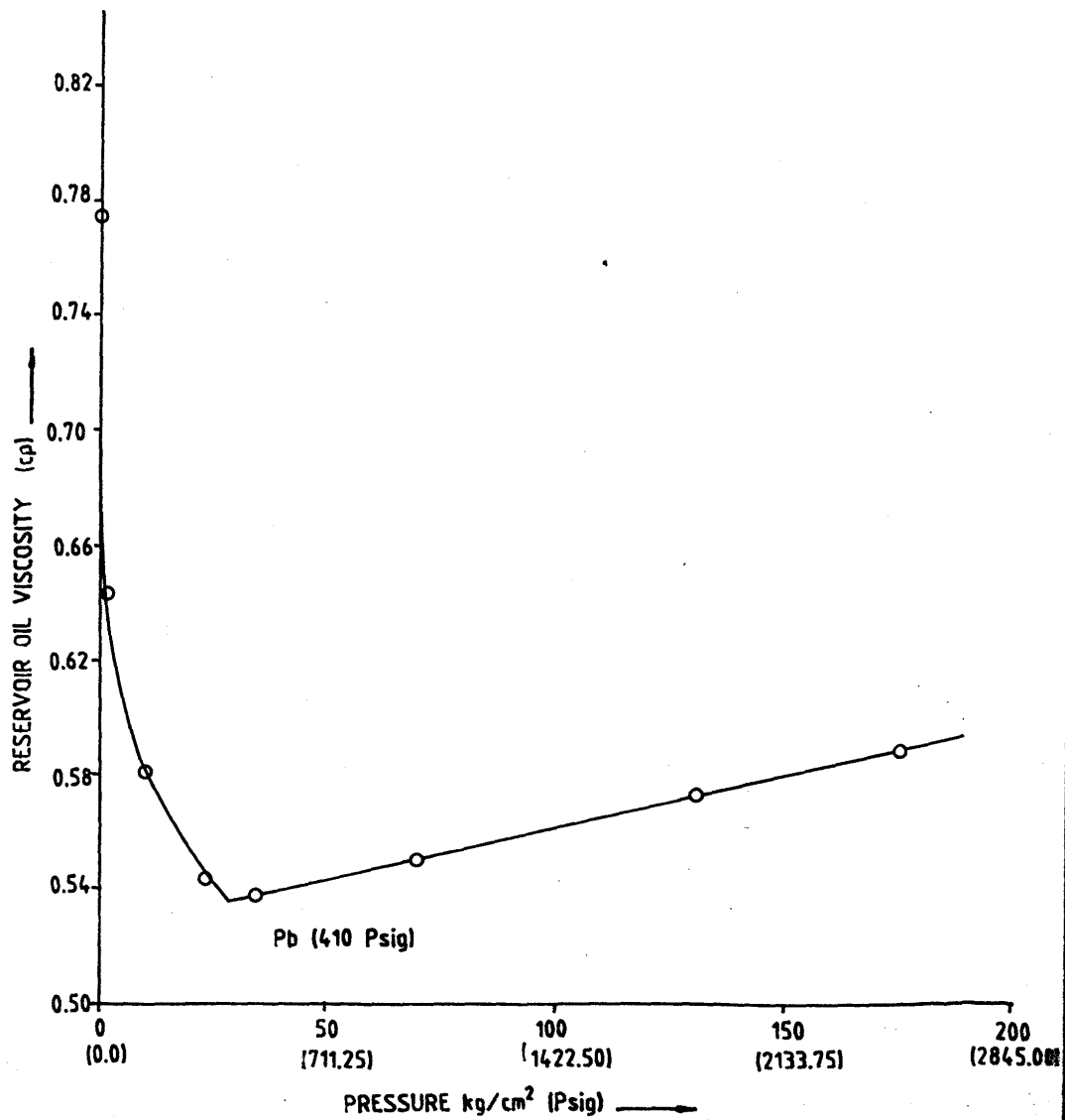


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CAMBAY GULF#3(A-1)
PRESSURE Vs. GAS FORMATION VOLUME FACTOR
(DIFFERENTIAL LIBERATION STUDY ATRES. TEMP. AT 99°C)



CAMBAY GULF # 3 (A-1)
PRESSURE Vs. RESERVOIR OIL VISCOSITY
(DIFFERENTIAL LIBERATION STUDY AT RES. TEMP. 99°C)



DISTILLATION ANALYSIS BY IP-24

Preliminary distillation with 100 ml. of oil sample was carried out.

IBP=55 Deg C Temperature range (°C) From IBP to		Recovery % volume (Cumulative)	
	50	-	
	75	2	
	100	7	
	125	12	
	150	21	
	175	26	
	200	31	
	225	34	
	250	40	
	275	44.5	
	300	51	
Residue		46	% vol.
Residue		46.98	% weight
Vapor loss		3	% vol.
ASPHALTENE		: 0.1116 %	
WAX		: 19.09%	

OIL ANALYSIS REPORT NO. : 32

PROJECT : ANKLESHWAR

FIELD : GULF OF CAMBAY

WELL NO : CAMBAY GULF#3(A-1)

FIELD DESCRIPTION OF THE SAMPLE

1. Laboratory Sl. No.	:	32
2. Date and time of collection	:	-
3. Collected by	:	-
4. Bean size(mm)	:	1/4"
5. Interval perforated (M) / Depth (M)	:	1269-1273 (Int. Perf.)1264-1266 Add Perf. 1266-1268
6. Object / Sand	:	III
7. CHP (psi) / (kg/cm ²)	:	-
8. FTHP (psi) / (kg/cm ²)	:	637
9. Source of receipt	:	Chief Geol. , Ank. Proj.
10. Letter No. & Date	:	15.09.1992
11. Date of receipt in the lab.	:	15.10.1992
12. Remarks	:	-

GENERAL ANALYSIS BY STANDARD METHODS

	METHOD	UNIT	RESULTS
1. Water content	IP-74	% vol	Traces
2. B.S. & W.	IP-75	% vol	Traces
3. Pour point	IP-15	°C	33
4. Density at 15 °C	IP-160	Kg/litre	0.8130
5. Specific gravity at 60 / 60 °F	IP-200	0.8134
6. API gravity	IP-200	Degrees	42.46
7. Salinity as NaCl as on received basis	IP-77	Lbs / 1000 bbls -	
8. R.V.P. at 100 oF	IP-69	Psi	-
9. Viscosity at 37.8 oC / °F	IP-267/71	ops / cst	-
	Using		At 50°C 6(600), 4(300)
	Rheometer		At 60°C 6(600), 3(300)

DISTILLATION ANALYSIS BY IP-24

Preliminary distillation with 100 ml. of oil sample was carried out.

IBP=44 Deg C
Temperature range
(oC)

Recovery % volume
(Cumulative)

From IBP to

50
75
100
125
150
175
200
225
250
275
300

-
3.0
6.0
14
22
27
32
36
40.5
42.5
54

Residue

46

% vol.

Residue

47.11

% weight

Vapour loss

-

% vol.

ASPHALTENE (%) : 0.27

WAX(%) : 9.7

SAMPLE OF CAMBAY GULF # 3 (A-1)

The laboratory study indicate that the reservoir fluid is undersaturated at reservoir conditions (i.e. at reservoir pressure 130.70 Kg/cm² and reservoir temperature 99°C).

Some of important parameters obtained from PVT studies are as follows.

- a) Viscosity of Reservoir fluid at Reservoir condition (Cp) = 0.573
- b) Flash-Oil formation volume factor at Reservoir Pressure (V/V) = 1.226
- c) Flash gas oil ratio, (V/V) = 43.21

WELL CHARACTERISTICS & SAMPLING DETAILS

PROJECT : Ankleshwar
FIELD : GULF
WELL NO. : GULF # 3 (A-1)
INTERVAL PERFORATED (MTS) : 1269 - 1273
HORIZON : OBJECT-III

RESERVOIR PARAMETERS

INITIAL RESERVOIR PRESSURE,
At 1200 Mts KG/CM² : 130.7
 PSIG : 1859.2
RESERVOIR TEMPERATURE, °C : 99
DATE OF SAMPLING : 24-9-92
DEPTH OF SAMPLING, MTS : 1200.00
WELL CONDITION DURING SAMPLING : SHUT IN
SAMPLING PRESS. AT 1200 MTS, KG/CM² : 130.7
NOS. OF SAMPLE COLLECTED : THREE
VOP OF THE SAMPLES COLLECTED, KG/CM² : 30.0 (SAMPLE ANALYSED)
FIELD GOR (V/V) : 200

FLASH VAPORIZATION

1. BUBBLE POINT PRESSURE (PSIG)/KG/CM²) : 410/28.82
2. MEAN OIL COMPRESSIBILITY AT RESERVOIR: 2.2737×10^{-4}
PRESSURE & TEMP ABOVE Pb
(CC/CC/KG/SQ.CM)
3. THERMAL EXPANSION COEFFICIENT OF : 3.372965×10^{-4}
DEAD OIL AT 500 PSIG BETWEEN 40°C
AND 99°C
4. FLASH GOR AT 1860 PSIG : 43.21
5. FLASH FVF AT 1860 PSIG : 1.22598
410 PSIG (Pb) :
6. MEAN GAS SOLUBILITY (CC/CC/KG/SQ.CM) : 1.49931
7. SHRINKAGE OF RESERVOIR OIL AT : 18.43
RESERVOIR PRESSURE (%)
8. SPECIFIC GRAVITY OF FLASHED GAS : 1.6697
(AIR = 1.0000)
9. RESERVOIR OIL DENSITY AT 99°C (GM/CC): 0.7288
10. STOCK TANK OIL DENSITY AT 15.5°C : 0.7984
(GM/CC)
11. °API OF FLASHED OIL AT 15.5°C : 45.57

CONCLUSION

- The studies show that the crude is undersaturated with a saturation pressure of 28.82 Kg/cm².
- The crude obtained in object-III is heavier than that of object-IV (Observed in well No. Gulf # 2).