

COMPANY: North Central Oil Corporation WELL: State 14-1

TEST IDENTIFICATION
 Test Type: J.H. Straddle
 Test No.: 314
 Formation: Atoka
 Test Interval (ft): 1129 to 11250
 Depth Reference: #8
 Elevation (ft): 4325

WELL LOCATION
 Field: Wilcatt
 County: Lea
 State: New Mexico
 Sec/Twp/Rng: 14/135/32E
 Elevation (ft): 4325

TEST CONDITIONS
 Total Depth (MD/TVD) (ft): 13135
 Hole Size (in): 7.875
 Casing/Liner I.D. (in): 7.875
 Perforated Interval/Net Pay (ft): 16
 Shot Density/Diameter (in): 16
 Initial Hydrostatic (psf): 5278.10
 Gas Cushion Type: Fresh Water
 Surface Pressure (psf): 728
 Liquid Cushion Type: Fresh Water
 Cushion Length (ft): 728

MUD PROPERTIES
 Mud Type: Gel/Chem.
 Mud Weight (lb/gal): 9.1
 Mud Resistivity (ohm.m): 4.0 60F
 Filtrate Resistivity (ohm.m): 18000
 Filtrate Chlorides (ppm): 18000

TEST STRING CONFIGURATION
 Pipe Length (ft)/I.D. (in): 10456 / 3.83
 Collar Length (ft)/I.D. (in): 632 / 2.25
 Packer Depth (ft): 11129, 11134, 112
 Bottomhole Choke Size (in): 0.94
 Gauge Depth (ft)/Type: 11236/J200-1975

NET PIPE RECOVERY
 Volume: Fluid Type Properties
 267 ft Cuhion
 3.8 bbl
 853 ft Drilg. Mud
 5.6 bbl w/Water Mix
 Ru. 4660F 18000ppm

NET SAMPLE CHAMBER RECOVERY
 Volume: Fluid Type Properties
 2.05 cuft Gas
 25 cc Oil
 1925 cc Water
 Ru. 5660F 14000ppm
 Pressure: 1400 GOR: 13088 GLR: 168

ROCK/FLUID/CELLBORE PROPERTIES
 Oil Density (deg. API): n/a
 Basic Solids (%): 0.65 (est.)
 Gas Gravity: 1.68
 GLR (scf/STB): 100
 Water Cut (%): 0.016(g) 0.44(w)
 Viscosity (cp): 2.2e-4
 Total Compressibility (1/psf): 11
 Porosity (%): 11
 Reservoir Temperature (F): 150
 Form. Vol. Factor (bbl/STB): 0.0013(g) 1.017(w)

INTERPRETATION RESULTS
 Model of Behavior: Homogeneous
 Fluid Type Used for Analysis: Gas & Water
 Reservoir Pressure (psf): 3841
 Transmissibility (md-ft/cp): 21.3 (total)
 Effective Permeability (md): 9.1(w) 0.008(g)
 Skin Factor: Image Ratio: 3.5 (total)
 Storativity Ratio: Omega: 3.5 (total)
 Interporosity Flow Coef.: Lambda: 11
 Distance to an Anomaly (ft): 11
 Radius of Investigation (ft): 8 (total)

COMMENTS:
 This drill stem test was mechanically successful. The tested interval flowed a final rate of 475 bbl of water into the test string with a surface gas rate of 8.9 mcf/d. This semilog interpretation indicates a low total transmissibility to the produced fluid with a total skin of 3.5. The diagnostic plot indicates possible boundaries, however this may be due to fingering of a gas through the water. A higher downhole gas rate (indicated from the sample chamber) and a lower H (from fingering) will increase the permeability to gas. The radius of investigation is indicated to be 8 feet. Thank you for using Schlumberger.

FINAL RATE DURING TEST: 475 bwpd + 8.9 mcf/d

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Last calculated production prior to shut-in was 475 STB/D water, and 8.9 MSCF/D gas at surface.

Note that the gas rate under cushion have been higher as indicated by the sample chamber. Oil production was not assumed as only 25 cc were indicated in the sample chamber.

Downhole rates are computed as follows:

$$Q_B \text{ (total)} = Q_{oB} + Q_{wB} + CQ_g - Q_{oB} - Q_{wB} - Q_{gB}$$

$$\text{With } Q_o = 0 \text{ STB/D } Q_w = 475 \text{ STB/D } Q_g = 1.017 \text{ BBL/STB}$$

$$Q_{oB} = 0 \text{ SCF/STB } Q_{wB} = 10.94 \text{ SCF/STB (Gas solubility in Oil & Water)}$$

$$Q_g = 8910 \text{ SCF/D } Q_g = 0.00132 \text{ BBL/SCF}$$

This gives downhole rates of 0 RES. BBL/DAT oil, 476 RES. BBL/DAT Water, and 11.76 RES. BBL/DAT Free Gas. The total downhole rate is 494.8 RES. BBL/DAT

Effective permeability for each flowing phase (oil, water, & gas) is computed from the log-log pressure match using the following equations:

$$K = 162.6 \cdot Q \cdot \mu / (H \cdot M)$$

With $Q =$ Downhole rate of oil, water, or gas in RES. BBL/DAT
 $\mu =$ Downhole viscosity in centipoise
 $H =$ Net reservoir thickness in feet
 $M =$ Horner Slope in psi/cycle

Using a net thickness of 16 feet and a slope of 236.4 psi/cycle from the Horner plot total kh/u is 21.3 (md-ft/cp). The effective permeabilities are:

$$\text{Water: } \mu = 0.440 \quad Q = 483 \text{ RES. BBL/DAT} \quad \text{-----} \quad K_w = 9.136 \text{ md}$$

$$\text{Gas: } \mu = 0.0163 \quad Q = 11.7 \text{ RES. BBL/DAT} \quad \text{-----} \quad K_g = 0.008 \text{ md}$$

DATE	TIME	DESCRIPTION	ET (MINS)	BHP (PSIA)	MHP (PSIG)
12-JAN	01:00	Set Packers	-59		
	01:01	START FLOW	-58		1 oz
	01:04	END FLOW & START SHUTIN	-55		7 oz
	01:34	END SHUTIN	-25		
	01:35	START FLOW	-24		1 oz
	01:37		-22		5 oz
	01:38	Seat Failed	-21		
	01:38	END FLOW	-21		
	01:38	Move Packers Down 15'			
	01:58	Set Packers	-1	5279	
	01:59	START FLOW	0	927	1 oz
	02:01	good blow on 1/8" choke	2		5 oz
	02:02	END FLOW & START SHUTIN	3	1020	7 oz
	02:33	END SHUTIN	34	3801	
	02:34	START FLOW	35	1005	1 oz
	02:38	strong blow on 1/8" choke	39		16 oz
	02:43		44		2.3
	02:48		49		3.2
	02:53		54		4
	02:58		59		4.7
	03:03		64		5.7
	03:08		69		6.8
	03:13		74		8
	03:18		79		9.2
	03:23		84		10.1
	03:40	END FLOW & START SHUTIN	101	1968	12
	07:01	END SHUTIN	302	3715	
	07:05	Pulled Loose	306	5183	

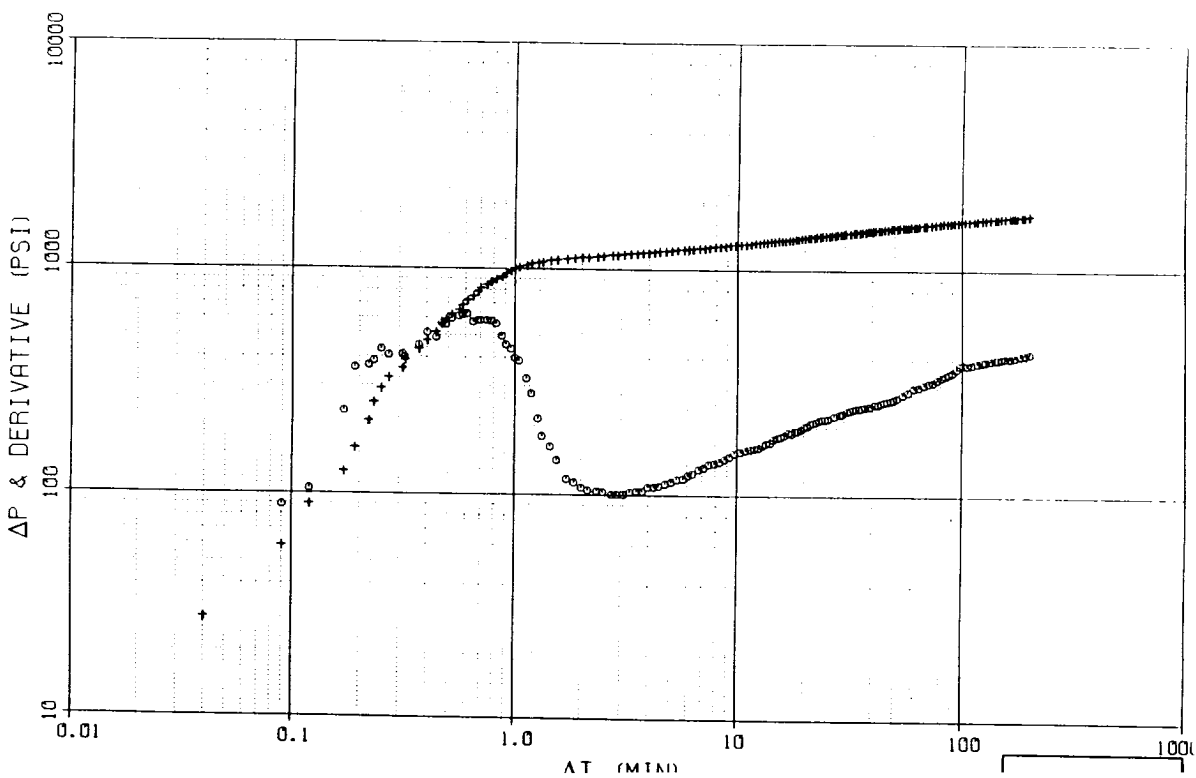
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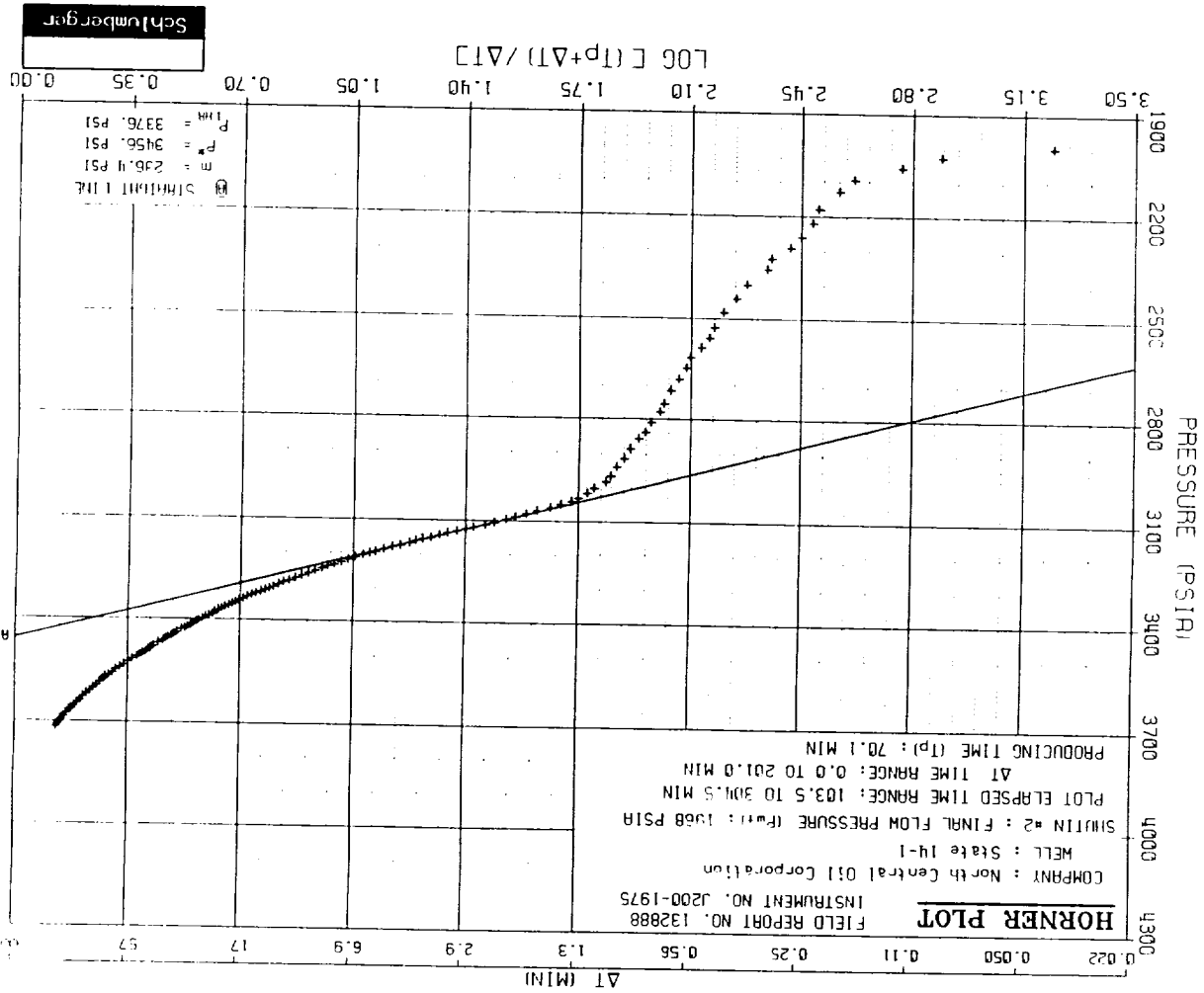
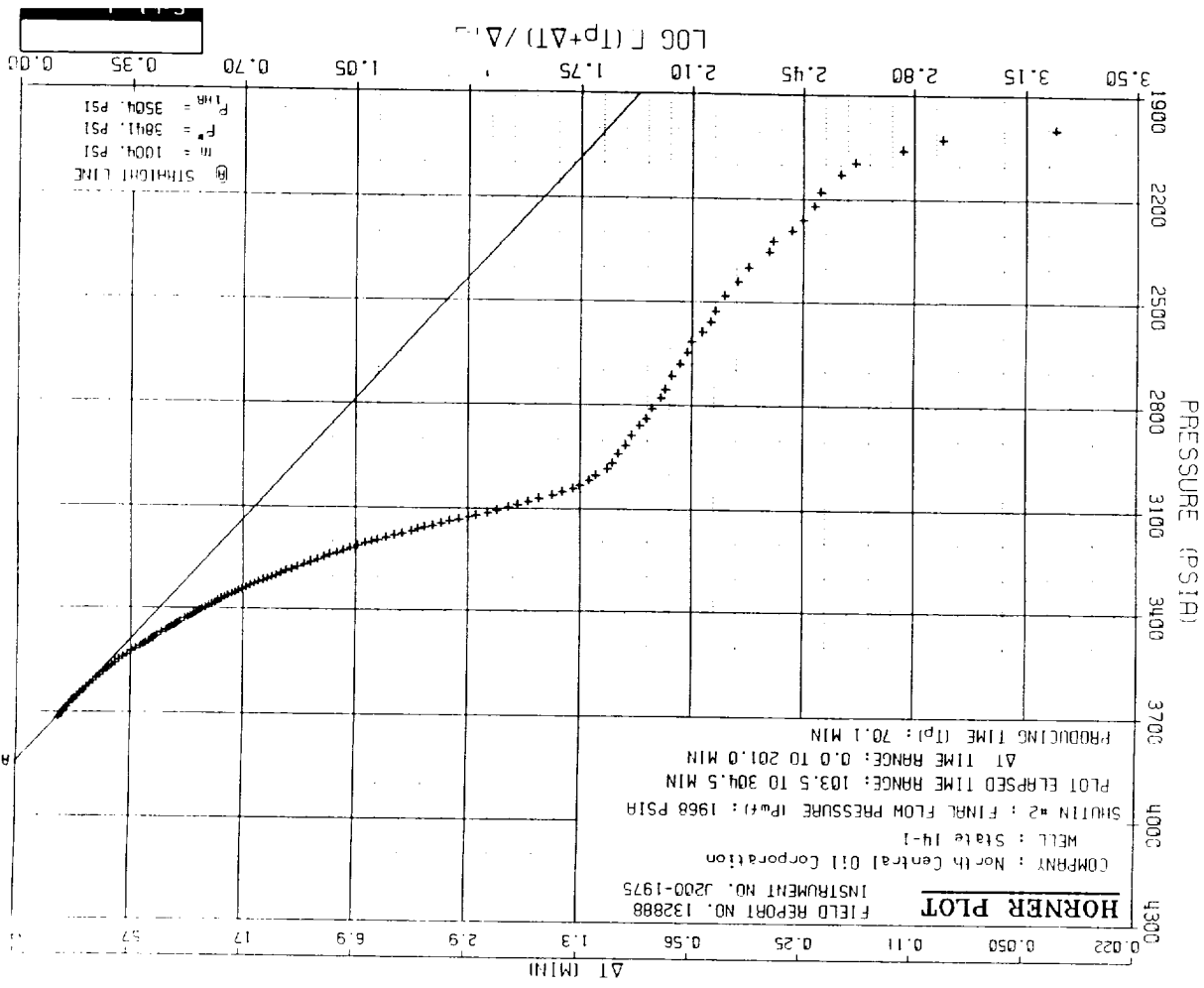
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LOG LOG PLOT

COMPANY : North Central Oil Corporation
 WELL : State 14-1
 FIELD REPORT NO. 132888
 INSTRUMENT NO. J200-1975

SHUTIN #2 : PRODUCING TIME (T_{pl}) : 70.1 MIN
 FINAL FLOW PRESSURE (P_{wf}) : 1968 PSIA
 PLOT ELAPSED TIME RANGE: 103.5 TO 304.5 MIN
 ΔT TIME RANGE: 0.0 TO 201.0 MIN





COMPANY: North Central Oil Corporation
WELL: State 14-1
RECORDER CAPACITY: 9000 PSI
TEMPERATURE: 150 DEG F
PORT OPENING: OUTSIDE
DEPTH: 11236 FT
FIELD REPORT NO. 132888
INSTRUMENT NO. J200-1975

LABEL POINT INFORMATION

TIME OF DAY	DATE	EXPLANATION	ELAPSED TIME, MIN	BOT HOLE PRESSURE PSIA
1 1:52:10	17-JAN	HYDROSTATIC MUD	-6.84	5278
2 1:59:00	17-JAN	START FLOW	0.00	927
3 2:03:04	17-JAN	END FLOW & START SHUT-IN	4.06	1020
4 2:35:59	17-JAN	SHUT-IN	36.99	3801
5 2:36:28	17-JAN	START FLOW	37.46	1005
6 3:42:29	17-JAN	END FLOW & START SHUT-IN	103.48	1968
7 7:03:28	17-JAN	SHUT-IN	304.47	3715
8 7:15:50	17-JAN	HYDROSTATIC MUD	316.83	5183

SUMMARY OF FLOW PERIODS

PERIOD	START TIME, MIN	END TIME, MIN	DURATION MIN	START PRESSURE PSIA	END PRESSURE PSIA	INITIAL PRESSURE PSIA
1	0.00	4.06	4.06	927	1020	927
2	37.46	103.48	66.02	1005	1968	1005

SUMMARY OF SHUTIN PERIODS

PERIOD	START TIME, MIN	END TIME, MIN	DURATION MIN	START PRESSURE PSIA	END PRESSURE PSIA	FINAL FLOW PRESSURE PSIA	PRODUCING TIME, MIN
1	4.06	36.99	32.93	1020	3801	1020	4.06
2	103.48	304.47	200.99	1968	3715	1968	70.08

TEST PHASE: FLOW PERIOD # 1

TIME OF DAY	DATE	ELAPSED TIME, MIN	DELTA TIME, MIN	BOT HOLE PRESSURE PSIA
HH:MM:SS DD-MMM				
2:03:04 17-JAN		4.06	0.00	1020
2:04:04 17-JAN		5.06	1.00	2852
2:05:07 17-JAN		6.12	2.06	3434
2:06:17 17-JAN		7.28	3.22	3526
2:07:22 17-JAN		8.37	4.31	3570
2:08:25 17-JAN		9.42	5.36	3605
2:09:40 17-JAN		10.67	6.61	3635
2:11:00 17-JAN		12.00	7.94	3662
2:12:26 17-JAN		13.43	9.37	3683
2:13:55 17-JAN		14.91	10.85	3699
2:15:55 17-JAN		17.91	13.85	3726
2:19:04 17-JAN		20.07	16.01	3742
2:21:20 17-JAN		22.34	18.28	3755
2:23:28 17-JAN		24.47	20.41	3764
2:25:51 17-JAN		26.85	22.79	3773
2:27:58 17-JAN		28.97	24.91	3780
2:30:20 17-JAN		31.34	27.28	3787
2:32:48 17-JAN		33.80	29.74	3793
2:35:32 17-JAN		36.54	32.48	3800
2:35:59 17-JAN		36.99	32.93	3801

TEST PHASE: SHUTIN PERIOD # 1
FINAL FLOW PRESSURE = 1020 PSIA
PRODUCING TIME = 4.06 MIN

TIME OF DAY	DATE	ELAPSED TIME, MIN	DELTA TIME, MIN	BOT HOLE PRESSURE PSIA	DELTA P PSI	LOG HORN TIME
HH:MM:SS DD-MMM						
2:03:04 17-JAN		4.06	0.00	1020	0	0.7042
2:04:04 17-JAN		5.06	1.00	2852	1832	0.4729
2:05:07 17-JAN		6.12	2.06	3434	2413	0.3543
2:06:17 17-JAN		7.28	3.22	3526	2506	0.2882
2:07:22 17-JAN		8.37	4.31	3570	2550	0.2449
2:08:25 17-JAN		9.42	5.36	3605	2584	0.2080
2:09:40 17-JAN		10.67	6.61	3635	2615	0.1794
2:11:00 17-JAN		12.00	7.94	3662	2642	0.1563
2:12:26 17-JAN		13.43	9.37	3683	2662	0.1380
2:13:55 17-JAN		14.91	10.85	3699	2679	0.1116
2:15:55 17-JAN		17.91	13.85	3726	2706	0.0982
2:19:04 17-JAN		20.07	16.01	3742	2722	0.0871
2:21:20 17-JAN		22.34	18.28	3755	2734	0.0788
2:23:28 17-JAN		24.47	20.41	3764	2744	0.0712
2:25:51 17-JAN		26.85	22.79	3773	2752	0.0656
2:27:58 17-JAN		28.97	24.91	3780	2760	0.0603
2:30:20 17-JAN		31.34	27.28	3787	2767	0.0556
2:32:48 17-JAN		33.80	29.74	3793	2772	0.0512
2:35:32 17-JAN		36.54	32.48	3800	2780	0.0505
2:35:59 17-JAN		36.99	32.93	3801	2780	0.0505

TEST PHASE: FLOW PERIOD # 2

TIME OF DAY	DATE	ELAPSED TIME, MIN	DELTA TIME, MIN	BOT HOLE PRESSURE PSIA
HH:MM:SS DD-MMM				
2:36:28 17-JAN		37.46	0.00	1005
2:51:42 17-JAN		52.70	15.24	1295
3:07:05 17-JAN		68.09	30.63	1532
3:22:55 17-JAN		83.92	46.46	1746
3:38:13 17-JAN		99.22	61.76	1921
3:42:29 17-JAN		103.48	66.02	1968

FIELD REPORT # 132888 INSURMENT # J200-1973
TFTC PHASE: SHUTIN PERIOD # 2 FINAL FLOW PRESSURE = 1968 PSIA
PRODUCING TIME = 70.08 MIN

TIME OF DAY HH:MM:SS	DATE DD-MM	ELAPSED TIME, MIN	DELTA TIME, MIN	BOT HOLE PRESSURE PSIA	DELTA P PSI	LOG HORNBR TIME
3:42:29	17-JAN	103.48	0.00	1968	0	1.8517
3:43:29	17-JAN	104.48	1.00	2965	997	1.5568
3:44:29	17-JAN	105.48	2.00	3088	1120	1.3744
3:45:29	17-JAN	106.57	3.09	3130	1163	1.2466
3:46:29	17-JAN	107.69	4.21	3161	1194	1.1469
3:47:29	17-JAN	108.86	5.38	3187	1220	1.0574
3:48:29	17-JAN	110.21	6.73	3212	1244	0.9939
3:49:29	17-JAN	111.39	7.91	3232	1264	0.9341
3:50:29	17-JAN	112.71	9.23	3252	1284	0.8919
3:51:29	17-JAN	113.79	10.31	3266	1299	0.8200
3:52:29	17-JAN	115.98	12.50	3292	1325	0.7644
3:53:29	17-JAN	118.04	14.56	3314	1347	0.7115
3:54:29	17-JAN	120.38	16.90	3335	1368	0.6657
3:55:29	17-JAN	122.78	19.30	3356	1389	0.6232
3:56:29	17-JAN	125.38	21.90	3375	1408	0.5940
3:57:29	17-JAN	127.43	23.95	3390	1423	0.5649
3:58:29	17-JAN	129.71	26.23	3405	1437	0.5370
3:59:29	17-JAN	132.16	28.68	3419	1452	0.5128
4:00:29	17-JAN	134.53	31.05	3432	1465	0.4609
4:01:29	17-JAN	140.56	37.08	3461	1494	0.4229
4:02:29	17-JAN	146.00	42.52	3483	1515	0.3891
4:03:29	17-JAN	151.83	48.35	3505	1537	0.3595
4:04:29	17-JAN	157.87	54.39	3521	1554	0.3328
4:05:29	17-JAN	164.33	60.85	3537	1570	0.3091
4:06:29	17-JAN	171.02	67.54	3553	1586	0.2931
4:07:29	17-JAN	176.20	72.72	3564	1596	0.2751
4:08:29	17-JAN	182.76	79.28	3578	1623	0.2598
4:09:29	17-JAN	189.08	85.60	3591	1634	0.2456
4:10:29	17-JAN	195.67	92.19	3602	1644	0.2352
4:11:29	17-JAN	200.67	97.49	3611	1651	0.2255
4:12:29	17-JAN	206.44	102.96	3618	1661	0.2142
4:13:29	17-JAN	213.38	109.90	3628	1669	0.2048
4:14:29	17-JAN	219.77	116.29	3637	1677	0.1960
4:15:29	17-JAN	226.34	122.86	3645	1686	0.1872
4:16:29	17-JAN	233.51	130.03	3653	1693	0.1795
4:17:29	17-JAN	240.44	136.96	3661	1700	0.1715
4:18:29	17-JAN	248.17	144.69	3667	1708	0.1645
4:19:29	17-JAN	255.69	152.21	3675	1714	0.1583
4:20:29	17-JAN	262.87	159.39	3681	1720	0.1512
4:21:29	17-JAN	271.77	168.29	3688	1728	0.1445
4:22:29	17-JAN	281.05	177.57	3695	1734	0.1389
4:23:29	17-JAN	289.46	185.98	3702	1747	0.1299
4:24:29	17-JAN	304.47	200.99	3715	1747	0.1299

REGION: 1320	DISTRICT: Midland	FIELD: Midland
BASE: Hobbs	DISTRIBUTION OF REPORTS	ZONE: Atoka
ENGINEER: Mike Fraley		WELL: State 14-1
		LOCATION: 14/135/32E

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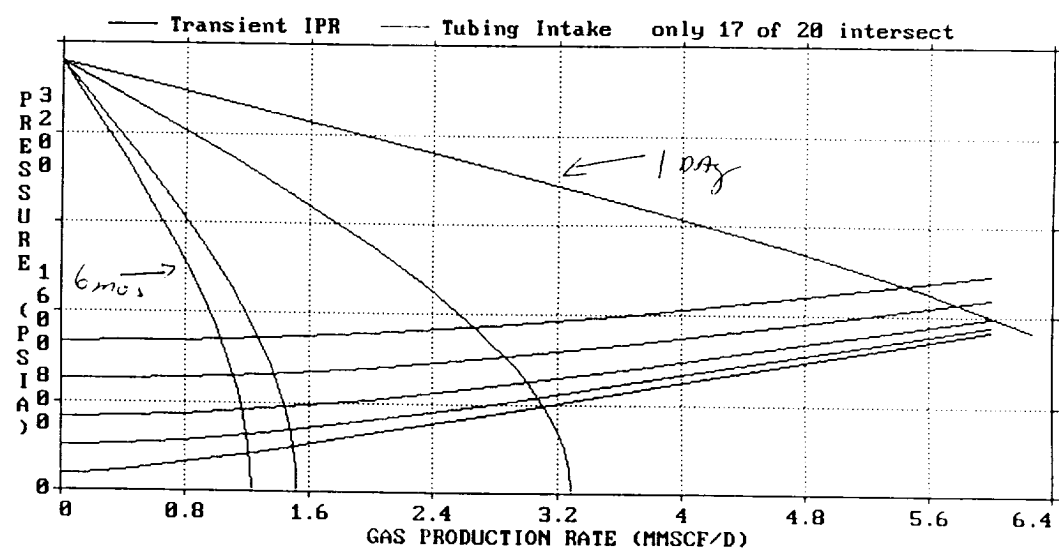
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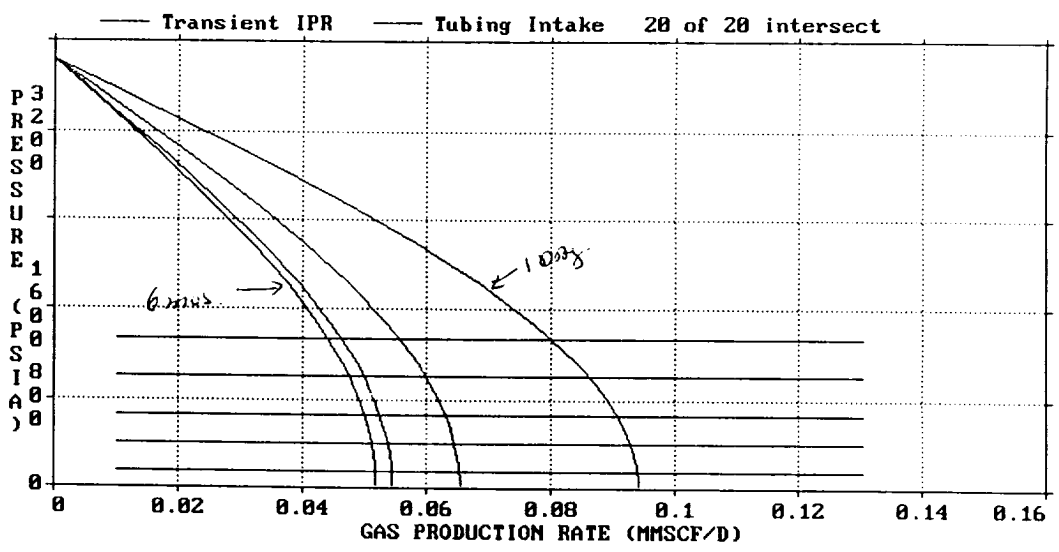
0.10 ml
Gas
400' FRITC
500 ml 14 cur.

ISS Plot, 18-JAN-93 14:52



0.02 ml
Gas

ISS Plot, 18-JAN-93 14:41



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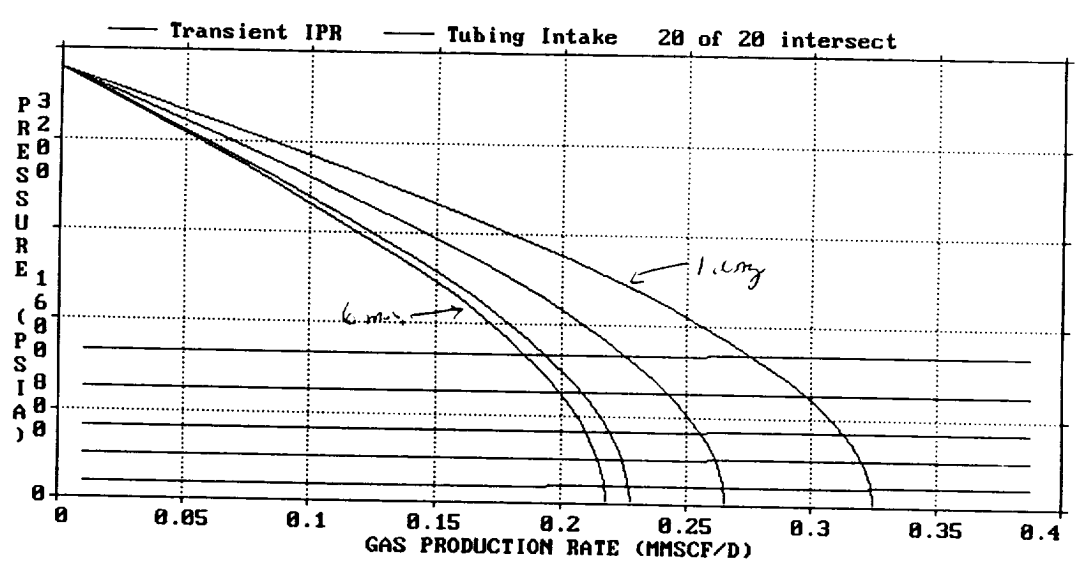
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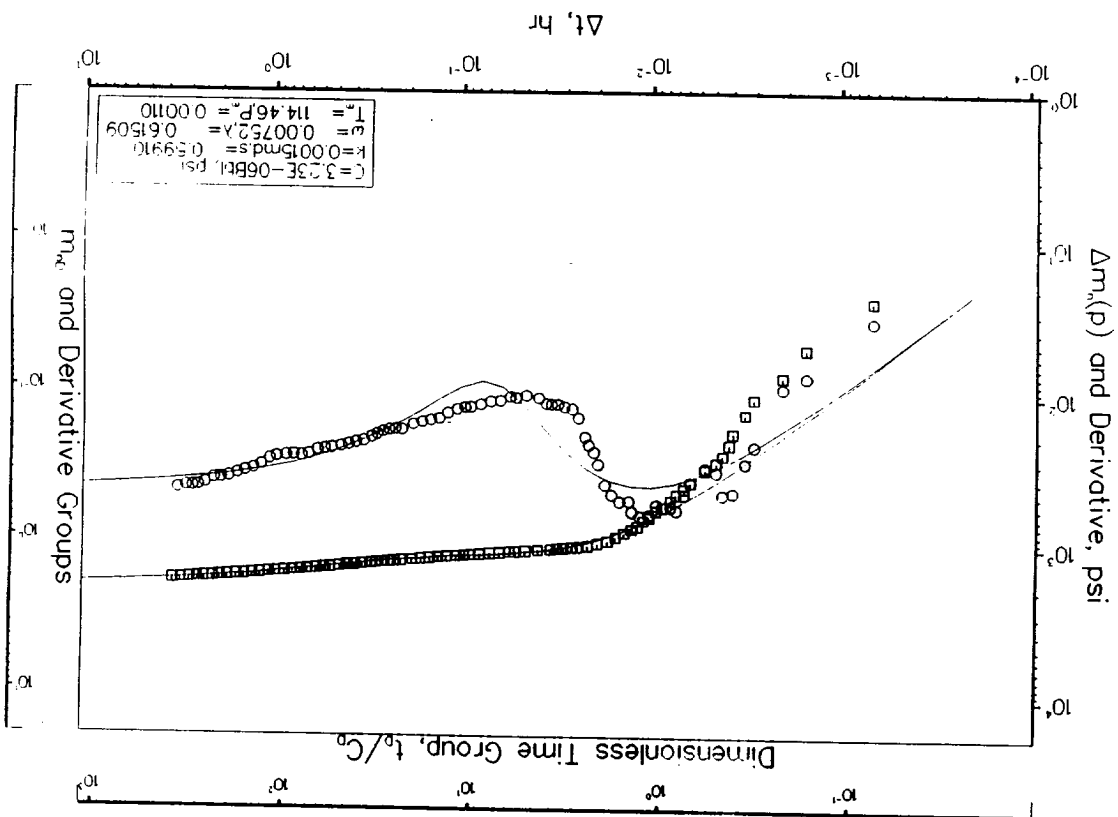
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ISS Plot, 18-JAN-93 14:49



Multi-Rate Type Curve and Derivative Match



Multi-Rate Type Curve and Derivative Match

