

OIL CONSERVATION DIVISION

P. O. BOX 2088

Form C-122
Revised 10-1-78STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

SANTA FE, NEW MEXICO 87501

MULTIPOINT AND ONE POINT BACK PRESSURE TEST FOR GAS WELL

Type Test ☐ Initial ☐ Annual ☒ Special					Test Date 9-30-82				
Company ARCO Oil and Gas Company					Connection Northern Natural Gas Company				
Pool Kemnitz, Atoka, Morrow South Gas					Formation Atoka		Unit		
Completion Date 3-26-82			Total Depth 13200		Plug Back TD 12968		Elevation G.L. 4153		
Ceq. Size 5 1/2"			WI. 17#		d 4.892		Set At 13,105		
Thq. Size 2 3/8			WI. 4.7#		d 1.995		Set At 12577		
Type Well - Single - Bradenhead - G.C. or G.O. Multiple Single					Packer Set At 12570		County Lea		
Producing Thru Tbg.			Reservoir Temp. °F 174°		Mean Annual Temp. °F 60°		Baro. Press. - P _a 13.2		
L			H		Cq .621		% CO ₂ .67		
					% N ₂ 1.22		% H ₂ S 2.54PPM		
					Prover		Meter Run 4.026		
							Taps Flg.		
FLOW DATA					TUBING DATA		CASING DATA		
NO.	Prover Line Size	X	Orifice Size	Press. p.s.i.g.	Diff. h _w	Temp. °F	Press. p.s.i.g.	Temp. °F	
SI	4" x 2.500						3575		
1.	4" x 2.500			240	1.95"	66°	3350	68°	
2.	4" x 2.500			255	3.95"	65°	3192	69°	
3.	4" x 2.500			269	7.25"	61°	2968	70°	
4.	4" x 2.500			296	14"	55°	2580	72°	
5.									
RATE OF FLOW CALCULATIONS									
NO.	Coefficient (24 Hour)	$\sqrt{h_w P_m}$	Pressure P _m	Flow Temp. Factor Ft.	Gravity Factor F _g	Super Compress. Factor, F _{pv}	Rate of Flow Q, Mcfd		
1	32.64	21.78	243.2	.9943	1.269	1.023	917.62		
2	32.64	32.55	268.2	.9952	1.269	1.024	1373.96		
3	32.64	45.23	282.2	.9990	1.269	1.026	1920.22		
4	32.64	65.79	309.2	1.0050	1.269	1.029	2818.08		
5									
NO.	P _t	Temp. °R	T _r	Z	Gas Liquid Hydrocarbon Ratio 234 Mcf/bbl.				
1	.36	526	1.46	.956	A.P.I. Gravity of Liquid Hydrocarbons 48 @ 60°				
2	.40	525	1.45	.953	Specific Gravity Separator Gas .621				
3	.42	521	1.44	.950	Specific Gravity Flowing Fluid .634				
4	.46	515	1.43	.945	Critical Pressure 674 P.S.I.A.				
5					Critical Temperature 361 R				
P _c 3588.2 P _c ² 12875.2					(1) $\frac{P_c^2}{P_e^2 - P_w^2} = 2.194$				
					(2) $\left[\frac{P_c^2}{P_e^2 - P_w^2} \right]^n = 2.004$				
NO.	P _t ²	P _w	P _w ²	P _c ² - P _w ²	AOF = Q $\left[\frac{P_c^2}{P_e^2 - P_w^2} \right]^n = 5.649$				
1		3381.3	11433.6	1442.0					
2		3215.9	10342.0	2533.2					
3		3004.9	9029.4	3845.8					
4		2646.9	7006.1	5869.1					
5									
Absolute Open Flow 5.649 Mcfd @ 15.025					Angle of Slope @ 48° 29'		Slope, n .885		
Remarks:									
Approved By Division			Conducted By: Larry Henson		Calculated By: Larry Henson		Checked By: James Cogburn		

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AKCO Oil & Gas

State 19 #1

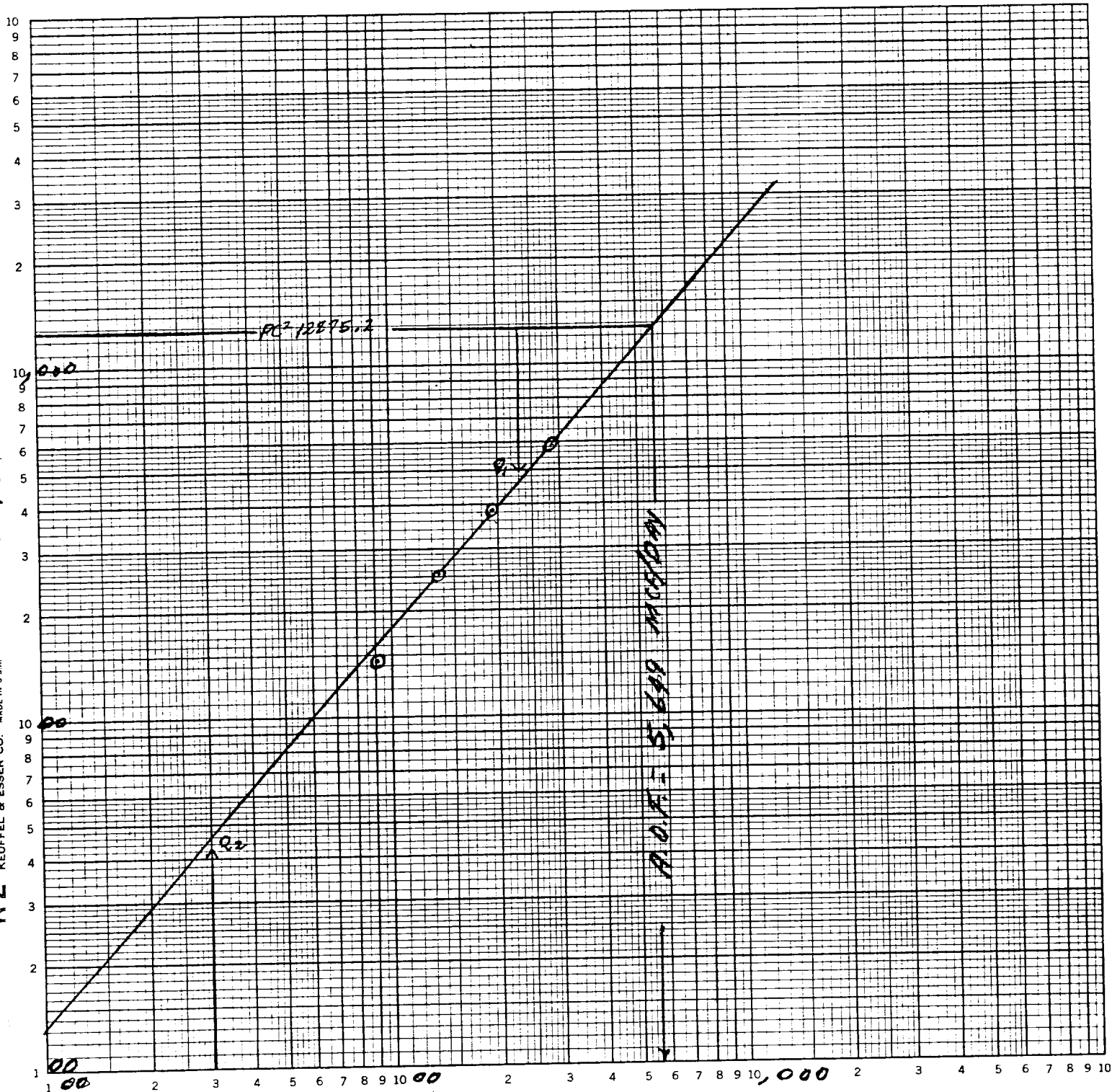
O 19 T16S R34E

Lea County

9-30-82

PC² PW² = 5867.7400

K*E LOGARITHMIC 3 X 3 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.



$$Q_1 = 2300 \text{ MCFd} \quad \log Q_1 = 3.3617278$$

$$Q_2 = 300 \text{ MCFd} \quad \log Q_2 = 2.4771213$$

$$N = 0.8846065 = .885$$

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WORK SHEET FOR STEPWISE CALCULATION (SUBSURFACE) PRESSURE (P_f & P_s)
(SURFACE) (P_g & P_h)

Form C-122E
Adopted 9-1-55

COMPANY MCCO LEASE ST 19 WELL NO. 1 DATE 9-20-62
LOCATION: Unit 0 Section 19 Township 16 Range 34
L 12, 5' 77 H 12, 5' 77 L/H 1.000 G Max. 6.54 % CO₂ .67 % N₂ 1.22 % H₂S 0
d 1.095 F_r 1.125 Q_m .918 M₂ cfd (L/H) (F_r Q_m)² .000280 P_{CT} 673 T_{CT} 364
TABLE IX & X TABLE IX & X

LINE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		0	6288.5		125' 77						
2	GH		0	3586.9		7923.8						
3	37.5GH		0	149.509		799.018						
4	P _c or P _n		3363.2	3964.1	3951.1	4537.7	4519.9					
5	P _r		4.997925	5.8802349	5.8703537	6.74244312	6.76071632					
6	T		534	584	584	634	634					
7	T _r		1.4670329	1.66439604	1.66439604	1.74754322	1.74175022					
8	Z		.787	.886	.885	.952	.951					
9	P/Z		4273.444	4472.1006	4466.4884	4766.45476	4752.60754					
10	P/TZ		8.002702	7.6013124	7.64467186	7.57067820	7.49655562					
11	(P/TZ) ² /1000 (Q) ² /1000		.064143254	.058672336	.058441078	.057521349	.056190413					
12	L/H(F _r Q _m) ²		.000280	.000280	.000280	.000280	.000280					
13			.064323358	.058672336	.058441078	.057521349	.056190413					
14	I _n		124.4138354	128.9092102	128.186394	132.357224	132.733425					
15	M=P _n -P _{n-1}		600.85	587.87	586.59	568.03						
16	N=I _n +I _{n-1}		254.327102	254.50319	262.543221	262.919615						
17	M x N		149671.9668	149346.1702	149346.1702	149346.1702						
18	Σ (M x N)		149346.1702									

P₅ = P₃₁ + ΔP = 4516.4

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WORK SHEET FOR STEPWISE CALCULATION
(SUBSURFACE) PRESSURE (P_f & P_s)
(SURFACE) ~~(P_f & P_s)~~

Form C-122E
Adopted 9-1-55

COMPANY NECO LEASE ST. 19 WELL NO. 1 DATE 9-30-62
LOCATION: Unit 0 Section 19 Township 14 Range 34
L 12, 577 H 12, 577 L/H 1.000 G Mix. 634 % CO₂ 67 % N₂ 122 % H₂S 0
d 1.995 F_r 1.000 Q_m 1.374 M₂cid (L/H) (F₁Q_m)² .0006275 P_{Cr} 673 T_{Cr} 364
TABLE IX & X

LINE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		0	6288.5		12577						
2	GH		0	3986.9		7923.8						
3	37.5GH		0	147.509		299.018						
4	P _c or P _n		3205.2	3772.3	3768.8	4331.8	4323.7					
5	P _f		4762555791	5.60529759	5.59972299	6.43661259	6.42460765					
6	T		534	584	584	634	634					
7	T _f		1.661032947	1.604395604	1.604395604	1.781758242	1.781758242					
8	Z		.800	.872	.872	.938	.937					
9	P/Z		4006.5	4326.1	4322.0	4618.2	4614.5					
10	P/TZ		250280989	7.40763444	7.40683665	7.28417927	7.27849993					
11	(P/TZ) ² /1000	(10) ² /1000	.056292427	.0645729816	.0567906196	.051059662	.0529726384					
12	L/H(F ₁ Q _m) ²		.000280	.000280	.000280	.000280	.000280					
13	I _n	I ₁ + I ₂	.056414427	.055509684	.0552125648	.0546847628	.0536008524					
14	I _n	I ₀ ÷ I ₃	136.5140563	133.4696458	133.5921483	135.6782346	135.7653855					
15	M = P _n - P _{n-1}		562.7	563.6	563.1	555						
16	N = I _n + I _{n-1}		245.283438	245.406463	269.270214	269.3773855						
17	M x N	15 x 16	149578.044	149578.044	149578.044	149578.044						
18	Σ (M x N)	Σ 17	149578.044	149578.044	149578.044	149578.044						

PS = P_s + ΔP = 4323.7

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Form C-122E
Adopted 9-1-55

LINE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		0	62865		12597						
2	GH		0	3586.9		7923.8						
3	37.5GH		0	149,509		299,018						
4	P _c or P _n		2981.2	3523.7	3523.0	4064.8	4060.5	$P_5 = P_{51} \times \Delta P_5 = 4061.4$				
5	P _r		402977612	523507304	523492355	603775845	603460014					
6	T		539	584	584	634	659					
7	T _r		1.417032967	1.604395404	1.604395404	1.701758202	1.701758202					
8	Z		.788	.854	.854	.920	.919					
9	P/Z		3763.248731	4126.18983	4125.33579	4418.22681	4418.412735					
10	P/TZ		7.064735481	7.06339286	7.06398012	6.918812131	6.9210526					
11	(P/TZ) ² /1000	(10) ² /1000	.0509386784	.049191605	.0498991087	.0485643005	.048584281					
12	L/H(F _r Q _m) ²		.000290	.000280	.000280	.000280	.000280					
13		I ₁ + I ₂	.0514168744	.0511443015	.0511243087	.0497815425	.497836281					
14	I _n	I ₀ - I ₃	137.7852552	136.1452268	136.1716505	139.9651776	139.9578005					
15	M = P _n - P _{n-1}			542.5	541.8	541.7	537.5					
16	N = I _n + I _{n-1}			275.9302268	275.9516005	278.137778	278.137805					
17	M x N	15 x 16			149523.3173		14949.6742					
18	Σ (M x N)	Σ I ₇			149494.6102		149516.3228					

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WORK SHEET FOR STEPWISE CALCULATION (SUBSURFACE) PRESSURE (P_f & P_s)
(SURFACE)

Form C-122E
Adopted 9-1-65

COMPANY NECO LEASE ST. 19 WELL NO. 1 DATE 9-30-62

LOCATION: Unit 0 Section 19 Township 16 Range 34

L 12.577 H 12.577 L/H 1.000 G MIX. 634 % CO₂ .67 % N₂ 1.22 % H₂S 0
d 1.995 F_i 1.183 O_m 2.818 M₂cid (L/H) (F_i O_m)² .002639 P_{cr} 6.73 T_{cr} 364
TABLE IX & X TABLE IX & X

LINE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		0	6288.5		12.577						
2	GH		0	3526.9		7923.8						
3	37.5GH		0	149.509		299.018						
4	P _c or P _n		2593.2	3094.2	3094.2	3601.6	3604.9					
5	P _r		3.853114514	5.976653914	6.42099637	5.35162994	5.350516048					
6	T		539	584	584	634	634					
7	T _r		1.46709287	1.144395604	1.04395644	1.32173002	1.74173002					
8	Z		.773	.832	.832	.891	.891					
9	P/Z		3344.721863	3714.025009	3722.611846	4042.28329	4055.843004					
10	P/TZ		6.28225668	6.361973919	6.376353551	6.375762128	6.371629716					
11	(P/TZ) ² /1000 (10 ² /1000)		.0916661736	.040535866	.0406321572	.04061307258	.0407249826					
12	L/H(F _i O _m) ²		.000289	.000280	.000280	.000280	.000280					
13			.0421056776	.043192886	.0432711572	.043287253	.043287253					
14	I _n		149.2010942	147.4361572	147.3143345	147.2818802	147.1636457					
15	M=P _n -P _{n-1}		501	504	504	504.4	507.7					
16	N=I _n +I _{n-1}		296.4371572	296.5154306	296.508812	296.674037						
17	M x N		149446.6421			149511.4465						
18	Σ (M x N)		149571.3579			149511.4465						

P₃ = P₃₁ + ΔP = 3606.1

Form C-122E
Adopted 9-1-55

$$\frac{P_{\text{Cr}}}{T_{\text{Cr}}} = \frac{273}{298}$$

LINE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		12507	62885		0						
2	GH		7972.8	3986.9		0						
3	37.5GH		299.018	109.509		0						
4	P _c or P _n		4516.4	3955.8	3950.4	3384.6	3385.2	3385.1	$P_{20} = P_{51} - \Delta P = 3381.5$			
5	P _r		6.71	5.88	5.87	5.03	5.03	5.03				
6	T		634	584	584	534	534	534				
7	T _r		1.74	1.60	1.60	1.47	1.47	1.47				
8	Z		.950	.886	.885	.847	.847	.847				
9	P/Z		4754.11	4466.84	4463.74	3995.95	3996.68	3996.59				
10	P/TZ		74485887	7.6458693	7.6434030	7.4830585	7.4893606	7.4845022				
11	(P/TZ)/2/1000	(10) 2/1000										
12	L/H(F ₁ Q _m) ²											
13		I ₁ + I ₂										
14	I _n	I ₀ ÷ I ₃	133.358427	130.799389	130.837771	133.635904	133.641948	133.613986				
15	M = P _n - P _{n-1}			560.6	566	566	565	565				
16	N = I _n + I _{n-1}		266.716427	264.157899	264.184771	264.466366	264.442948	264.444986				
17	M × N	15 × 16			14527.0765			149992.0375				
18	Σ (M × N)	Σ 17			149449.925			149525.9625				

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WORK SHEET FOR STEPWISE CALCULATION
(SUBSURFACE) PRESSURE $(P_c \& P_w)$
(SURFACE)

Form C-122E
Adopted 9-1-55

COMPANY ARCO LEASE ST. 19 WELL NO. 1 DATE 9-5-62

LOCATION: Unit 0 Section 19 Township 16 Range 30

L 12 S 77 H 12 S 77 L/H 1.664 G max 634 % CO₂ .67 % N₂ 1.22 % H₂S 0
d F_r Q_m M₂cid (L/H) (F_rQ_m)² P_{cr} 175 T_{cr} 2660
TABLE IX & X TABLE IX & X

LINE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		12.577	6.34		0						
2	GH		7972.8	3986.9		0						
3	37.5GH		299.018	149.509		0						
4	P _c or P _n		4323.7	3779.6	3774.3	3225.7	3216.2	3228.8	P _w = P _{s1} + ΔP = 3215.9			
5	P _r		6.42	5.62	5.61	4.79	4.78	4.80				
6	T		634	584	584	534	534	534				
7	T _r		1.74	1.60	1.60	1.47	1.47	1.47				
8	Z		.937	.872	.872	.802	.837	.802				
9	P/Z	$\bar{4} = \bar{8}$	4014.41	4334.43	4328.33	4022.03	3842.51437	4025.96				
10	P/TZ	$\bar{9} = \bar{5}$	12.78245539	7.421661185	7.41151600	7.53185677	7.193714294	7.53956235				
11	(P/TZ) ² /1000	(10) ² /1000										
12	L/H(F _r Q _m) ²											
13		$\bar{11} + \bar{12}$										
14	I _n	$\bar{10} - \bar{13}$	137.395749	134.7353778	134.9251617	132.7688767	134.9716099	132.6391132				
15	M = P _n - P _{n-1}			544	544	544	558	545				
16	N = I _n + I _{n-1}		274.79709	272.131275	272.321147	267.635819	273.896699	267.564132				
17	M x N	$\bar{15} \times \bar{16}$			49613.3224			42950.4376				
18	Σ (M x N)	Σ $\bar{17}$			149449.676			153062.5614				

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WORK SHEET FOR STEPWISE CALCULATION (SUBSURFACE) PRESSURE (P_c & P_w) (SURFACE)

Form C-1225
Adopted 9-1-55

COMPANY ARCO LEASE ST. 19 WELL NO. 1 DATE 9-30-82

LOCATION: Unit 0 Section 19 Township 16 Range 30

L 17507 H 17507 L/H 1.000 G MIX. 6.34 % CO₂ .67 % N₂ 1.22 % H₂S 0

d Fr Q_m P M²cid (L/H) (F₁Q_m)² P_{cr} 875 T_{cr} 2500

TABLE IX & X

LINE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		12547	62820		0						
2	GH		79728	3986.9		0						
3	37.5GH		299.018	14.9509		0						
4	P _c or P _n		4061.4	3540.3	3536.2	3016.6	3004.9	3005.5	$P_w = P_{s1} - \Delta P = 3004.9$			
5	P _r		6.03	5.26	5.25	4.47	4.46	4.47				
6	T		634	584	584	534	534	534				
7	T _r		1.74	1.60	1.60	1.47	1.47	1.47				
8	Z		.919	.856	.856	.789	.789	.789				
9	P/Z	$\frac{4}{3}$	4419.37	4135.88	4132.06	3816.95	3808.55	3808.28				
10	P/TZ	$\frac{9}{6}$	697061374	208108866	2.07372744	2.14278534	2.13409049	2.13349224				
11	(P/TZ) ² /1000	(10) ² /1000										
12	L/H(F ₁ Q _m) ²											
13		$\frac{11}{1} + \frac{12}{1}$										
14	I _n	$\frac{10}{1} + \frac{13}{1}$										
15	M=P _n -P _{n-1}			521	525	525	531	531				
16	N=I _n +I _{n-1}		2869183482	484.642272	2848271844	281274167	28.578994	281.551703				
17	M x N	$\frac{15}{1} \times \frac{16}{1}$										
18	Σ(M x N)	Σ17			14902.857			14960.0408				

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