RRGE - 1

	X		Y	
DT	Q	Q/Δσ	Δε	
02/02/76	871	54.65	15.9	DD
11/05/75	~~1786.5~~	131.2	4.86	DD
		68.9	2.55	REC
10/12/79	1000	9.40	106	DD
	1000	23.0	43.6	REC
08/18/80	900	30.6	29.4	DD
		26.3	39.3	REC
10/20/81	1100	20.4	54.0	DD
	1080	21.6	50.0	REC
10/28/81	1100	20.8	53	DD
	900	28.4	31.7	REC.
2/3/82	300			DD

Δ_s and Q/Δ_s data available for RRGE-1 as of 03/02/82

DATE	Y: Q (GPM)	X: Δ_s (PSI/LOG CYCLE)		Q/Δ_s (GPM/PSI/LOG CYCLE)	DRAWDOWN (DD) OR RECOVERY (REC)	
11/05/75	~~26.5~~	~~4.86~~		131.2	DD	
	~~26.5~~	~~2.55~~		68.9	REC	
SPACE >						
02/02/76	~~(811)~~	~~(15.9)~~		(54.65)	DD	
10/12/79	~~(1000)~~	~~(106)~~		(9.40)	DD	
	1000 3	43.6	1.6395	22.0	REC	
08/18/80	900 2.9542	29.4	1.4683	30.6	DD	
	900 2.9542	34.3	1.5353	26.3	REC	
10/20/81	1100 3.0414	54.0	1.7324	20.4	DD	.1
	1080 3.0334	50.0	1.6990	21.6	REC	.2
						.3
						.4
10/28/81	1100 3.0414	~~52.0~~	1.7243	20.5	DD	.6
	~~(900)~~	~~(51.3)~~		(17.2)	REC	.8
	900 2.9542	=1.7	1.5011	=20.4	REC	1
12/03/82	298 2.4742	7.79	.8915	38.4	DD	1.2
	298 2.4742	7.13	.8531	41.8	REC	4
						6
						8
						2.0

RACKETED VALUES ARE ESTIMATES

$r^2 = .9916$

$$\frac{S}{\phi ch} = \frac{.0167}{.0415}$$

$$\beta = \frac{144 \times .0415}{1364} = .00438$$

$$C_t = \frac{\phi ch}{\phi h} = \frac{.0415}{.01 \times 1364} = .00304$$

$$\beta \text{ II } \beta = \frac{\phi h}{E_w BE} = \frac{.01}{300000 \times .08} = 4.167 \times 10^{-7}$$

$$S = \frac{\phi \gamma h}{E_w BE} = \frac{.01 \times 52.94 \times 1364}{300000 \times .08} = 0.0329$$

$$\beta = \frac{S}{\gamma b} = \frac{.0167}{52.94 \times 1364} = 3.0384 \times 10^{-5}$$

Carry

~~Gail Taylor~~ ~~pit well 14~~

RRGE - 1 S from ΔE & ϕch

ϕch = ft/psi

porosity × compress × thickness

0.1 × ch = .0415

$= \frac{0.0415}{0.1} = 0.415$

$S = \frac{0.05 \times 59 \times 1364}{300,000 \times .84} = .0167 \approx 0.016$

ϕch $\quad c = \frac{.0415}{\phi h} = \frac{.0415}{.05 \times 1364} = .0006085$

$= 6.085 \times 10^{-4}\ psi^{-1}$

$S = .0167 = \beta (59)(1364)$

$= 2 \times 10^{-7}$

$\beta = \frac{S}{\gamma b} = \frac{.0167}{(59)1364} = 2.07 \times 10^{-7}$

$2.075 \times 10^{-7} = \frac{.05}{300,000} \times \frac{1}{E_b} = 2.07 \times 10^{-7}$

$\frac{1}{E_b} = 4.08 \times 10^{-8}$

$\frac{1}{E_b} = \frac{.05 \times 4.08 \times 10^{-8}}{(.05)(4.08 \times 10^{-8}) + 300,000}$

$= 0.803$

$C_t = 6.085 \times 10^{-4} = 3 \times 10^{-6} + c_f \phi$

$$c_f = 6.055 \times 10^{-4} = \frac{1}{E_s}$$

$$BE = \frac{\frac{.05}{6.055 \times 10^{-4}}}{\frac{.05}{6.055 \times 10^{-4}} \times \frac{3 \times 10^{-6}}{}} = .999999$$

∴ very rigid skeleton

$$\beta = \frac{.05}{300000} + \frac{1}{24.5 \times 10^{6}} = 2.075 \times 10^{-7}$$

$\beta = C_t = 6.085 \times 10^{-4}$

$S = 6.085 \times 10^{-4} \times .05 \times 1364 = 0.0415$

$S = 0.0167 = 6.085 \times 10^{-4} \times .05\ b$

$$b = \frac{.0167}{6.085 \times 10^{-4} \times .05} = 549'$$

$$BE = \frac{.05 \times 59 \times 549}{300{,}000 \times .0167} = 0.323$$

$\phi ch \quad c_t = \frac{.0415}{.05 \times 549} = 1.51 \times 10^{-3}$

$$b = \frac{.0167}{1.51 \times 10^{-3} \times .05} = 221$$

$$BE = \frac{.05 \times 59 \times 221}{300000 \times .0167} = 0.130$$

$$c = \frac{.0415}{.05 \times 221} = 0.00375$$

$$b = \frac{.0167}{.00375 \times .05} = 88.9$$

$$BE = \frac{.05 \times 59 \times 88.9}{300{,}000 \times .0167} = 0.0523$$

$$\phi ch = .04145$$

Walton $S = \gamma \theta \beta m \left(1 + \frac{\alpha}{\theta \beta}\right)$

$$.0167 = 59 \times .05 \times 3 \times 10^{-6} \times 1364 \left(1 + \frac{C_f}{.05 \times 3 \times 10^{-6}}\right)$$

$$.0167 = .01207 + \frac{.01207\, C_f}{.05 \times 3 \times 10^{-6}}$$

$$4.63 \times 10^{-3} = 8.047 \times 10^{4}\ C_f$$

$$C_f = 5.75 \times 10^{-8}$$

$$\beta = \frac{.0167}{59 \times 1364} = 2.075 \times 10^{-7}$$

$$C_t = \frac{.0415}{.05 \times 1364} = 6.085 \times 10^{-4}$$

$$\beta = C_t = \frac{S}{\gamma b} = \frac{\phi ch}{\phi b}$$

$$\frac{S}{\phi ch} = \frac{\gamma}{\phi} = \frac{.0167}{.0415} = \frac{59}{\phi} \qquad \phi =$$

$$\frac{S}{\phi ch} = \frac{.0167}{.0415} = 0.4024 \qquad \frac{\gamma}{144} = \frac{57.94}{144} = .4024$$

~~$\beta = 144 \times .05 \times \phi ch$~~

$$\beta = \frac{144\ \phi ch}{h} = \frac{144 \times .0415}{1364} = 0.00438 \ psi^{-1}$$

$$c_t = \frac{\phi ch}{\phi h} = \frac{.0415}{.05 \times 1364} = .0006085 \ psi^{-1}$$

$$\beta = \frac{\phi}{E_w} + \frac{1}{E_s} = .00438 = \frac{.05}{300000} + \frac{1}{E_s}$$

$$\frac{1}{E_s} = .004379\overline{8} \qquad E_s = 228.3 \ psi$$

$$E_s = \frac{\Delta p_c}{\Delta V_s} = \frac{psi}{ft^3}$$

$$\Delta V_s = -\frac{\Delta p_c}{E_s} = -\frac{300\ psi}{228.3\ psi} = -1.314$$

$$ft^3 = \frac{psi}{psi} ft^3$$

$$\beta = \frac{S}{\gamma_b} = \frac{.0167}{57.94 \times 1364} = \frac{.000288}{1364\phi} = 2.11 \times 10^{-7} \ \frac{ft^2}{lb} \cdot \frac{144\ in^2}{ft^2} = 3.0384 \times 10^{-5} \ psi^{-1}$$

$$\beta = \frac{\phi}{E_w BE} = \frac{.05}{300{,}000 \times .75} = 2.2 \times 10^{-7} \ \frac{in^2}{lb}$$

$$S = \frac{\phi \gamma_b}{E_w BE} = \frac{.05 \times 57.94 \times 1364}{300{,}000 \times .75} = .01756 \quad cal\ pump\ test = .0167$$

$$\frac{1}{E_s} = \beta - \frac{\phi}{E_w} = 2.11 \times 10^{-7} - \frac{.05}{300{,}000} = 4.433 \times 10^{-8} = C_f$$

$$E_s = 2.256 \times 10^7$$

$$c_t = 3\times10^{-6} + c_f = \frac{\phi ch}{\phi h} = \frac{.0415}{.05\times1364} = 6.085\times10^{-4}\ psi^{-1}$$

$$c_f = 6.085\times10^{-4} - 3\times10^{-6} = 6.055\times10^{-4}\ psi^{-1}$$

$$\beta = 3.04\times10^{-5} = \frac{\phi}{300{,}000\ BE}$$

$$\frac{\phi}{BE} = 9.12$$

$$\beta\phi_b = \frac{\alpha\phi_b}{E_w\ BE} =$$

$$\beta = \frac{\phi}{E_w\ BE} = \frac{.05}{300000\times.75} = 2.2\times10^{-7}\ psi^{-1}$$

$$\frac{S_{\gamma 144}}{\phi ch} = \gamma \qquad \frac{S}{\phi ch} = \frac{\gamma}{144}$$

$$S = \frac{\gamma \phi ch}{144} = \beta \gamma b$$

$$\frac{\beta}{C_t} = \frac{\phi h}{144 h} C_b = \frac{\phi}{144}$$

$$\frac{\beta \gamma h}{\phi ch} = \frac{\gamma}{144}$$

$$\beta = \frac{\phi ch}{h\ 144}$$

$$\frac{\beta}{C_t} = \frac{\phi}{144} \qquad \beta = 144 \phi C_t \qquad C_t = \frac{\beta}{144\phi}$$

$$\frac{\phi}{E_w} + \frac{1}{E_s} = 144 \phi C_t$$

$$C_t = \frac{1}{144\phi}\left(\frac{\phi}{E_w} + \frac{1}{E_s}\right) = \frac{1}{144 E_w} + \frac{1}{144 \phi E_s}$$

$\phi ch = .0415$

$$c = \frac{.0415}{\phi h} = \frac{.0415}{(.05)(1364)} = 6.085 \times 10^{-4}/psi$$

$\beta = 1643$ psi

$$\beta = \frac{S}{\gamma b} = \frac{.0167}{59 \times 1364} = 2.075 \times 10^{-7}$$

$$S = \frac{.05 \times 59 \times 1364}{307000 \times .75} = .01788$$ observed .0167 pump test

$$\beta = \frac{\alpha}{E_w} + \frac{1}{E_s}$$

$$2.075 \times 10^{-7} = \frac{.05}{307000} + \frac{1}{E_s}$$

$$\frac{1}{E_s} = 4.08 \times 10^{-8} \qquad E_s = 2.45 \times 10^6 \text{ psi}$$

$$BE = \frac{\alpha E_s}{\alpha E_s + E_w} = \frac{\frac{.05 \times}{4.08 \times 10^{-8}}}{\frac{.05}{4.08 \times 10^{-8}} + 300000} = 0.803$$

$S = 0.01676$ if $BE = .803$

$$C_t = S_w C_w + C_f = \frac{1}{.05} \times 300,000 + \frac{4.08}{2.45} \times 10^{-8}$$

$$= 1.667 \times 10^{-7} +$$

$$= 2.075 \times 10^{-7} \quad 3.374 \times 10^{-6}$$

β = aq. comp. = $\frac{S}{\gamma b}$ $\frac{ft^3}{lb\ ft}$ × $\frac{144\ in^2}{ft^2}$

$c_t = \frac{\phi c_t h}{\phi b} = \frac{ft\ in^2}{lb\ ft}$

$\frac{S}{\gamma b} = \frac{\phi c h}{\phi b}$ $\qquad \frac{S \times 144}{\phi c h} = \frac{\gamma}{\phi}$

$\phi = \frac{\gamma\ \phi c h}{S (144)} = 1.018$

$\phi c h = \frac{2.245 \times 4.396 \times 10^{-6} \times 14517 \times .0362}{.18 \times .83^2}$ $\qquad \frac{59}{.05}$

$= .0418$

$S = \frac{T t_0}{4790 r^2} = \frac{1537 \times .0362}{4790 \times .83^2} = .01686$

$\frac{S \times 144\ T \mu}{\gamma b .04730035\ kh\ S} = \frac{(144) 3.28849 \times 10^{-4}\ kh\ \gamma\ \mu}{\gamma b \mu \times .04730035\ kh} = \frac{1.0011}{\phi} = \frac{\phi c h\ b}{\phi b}$

$\frac{S \times 144}{\phi c h} = \frac{S \times 144 \times T \mu}{.0473..\ kh\ S} = \frac{144 \times 3.28849 \times 10^{-4}\ kh\ \gamma\ \mu}{.04730035\ kh\ \mu} = \gamma = \frac{\gamma}{\phi}$

$\frac{1}{\phi} = 1 \qquad \phi = 1.$

$\phi c h$ = porosity × compressibility total × thick. (psi^{-1})

$$\boxed{\frac{S \times 144}{\gamma} = \phi c h}$$

$\frac{S}{\gamma} = \frac{\beta \gamma b}{\gamma}$ = compressibility aq × spec wt H_2O × thick

$\frac{ft\ in^2}{lb} \times \frac{lb}{ft^3}\ \frac{144\ in^2}{ft^2}$

RRGI #6 Injection 10-21-81

Time	Annulus Pressure	Temp °F	Flow	Comments
Start Up	Pre-Start 21 psi			
[illegible]				
:30	69.5			
[illegible]	183.0			
	189.0			
[illegible]	[illegible]			
	219.0			
	214.0			
	222.5			
	224.0	153	995	
	223.0			
	[illegible]			
	[illegible]		1000	
	230.0			
	[illegible]			
	243.0	158	[illegible]	
	240.0			
	[illegible]			
	247.0			
	248.0			
	249.0			
	[illegible]	169	990	
	[illegible]			
	[illegible]			
	255.0			
0631:00	259.5	170	1000	
0632:00	261.5			
0633:00	262.5	170	995	
0635:00	263.0			
0636:00	263.0	171	995	
0637:00	263.5			

263.5		
264.0		
264.0		
264.5		
[illegible]	[illegible]	[illegible]
266.5		
266.5		
267.0		
267.5		
268.0		
268.5		
269.0	[illegible]	[illegible]
[illegible]		[illegible]
[illegible]		
[illegible]	[illegible]	[illegible]
283.5		
284.0		
286.5	191.5	102.5
287.5	[illegible]	[illegible]
289.0		
290.5	191.5	[illegible]
291.5	191.5	[illegible]
292.5	191.5	101.0
[illegible]		
294.5	191.5	[illegible]

WELL 3.1 ~~1165~~ 1355:00 Wednesday ??

-81 7132 WELL #1 DOWN

-81 BLM 0920 3.5

lin regr. fig. 7 - PAGE 1 Q 900-1100

$\Delta s = -64.00202 + .1065920\ Q$

$y = -64.00202$
$m = 0.1065922$

900	10.61
800	21.27
900	31.93
1000	42.59
1100	53.25
1200	63.90

$r = .988512$
$r^2 = .97715$

$dd = .0068573\ Q^{1.579632} + (-64.00202 + 0.1065920\ Q)(\log t \cdot 3)$

t	Q 1100	E
1000	437	106
1500	446	96.8
2000	453	89.8
3000	462	80.4
4000	469	73.8
5000	474	68.6
6000	478	64.4
7000	482	60.8

$Q/\Delta s = 0.0156245Q^{9.381549}$

900	23.44
1000	25.04
1100	26.56
1200	28.13

1/1 = 1

BP = 55

WH 162.2 PSIG
WQ 174.7 PSIA
BQ 559.8 PSIA
BH 547.3 PSIG
} shut in bot corrected to 280°F

DRAWDOWN/RECOVERY

Q GPM	10 MIN	100 MIN	1000 MIN	10,000 MIN	
2/3/82 300 WH	46.7	55.2	63.2	(71.2) estimates	
BH	47.3	56.8	63.8	(71.1)	DD
WQ	45.7	54.7	63.2	(71.2)	
AV	46.6	55.6	63.4	71.2	dd low heat up
10/20/81 Q 1080 WH BH	266	~~344~~	—	—	Rec.
1000 BH	—	372.1	(425.4)	~~479.6~~	DD
10/28/81 Q 1000 REC	235	278	—	—	Rec DD
422.9 1100 BH	—	373	(433)	(486)	DD
AV		372.6	429.1	481.5	
2/3/82 300 WH	43.4+1	50.5+1	(57.2)	—	
BH	41.5+1	~~49.5~~+1	—	—	REC
WQ	49+1	50.2+1	(58.0)	—	
BQ	42.2+1	49.8+1	(57.5)	—	
AV.	43.5	51.0	57.6	—	dd low cool down
Δ DD/REC	3.1	4.6	5.8		

too high

$$kh = \frac{Q\mu B}{8.298\times10^{-5}\,\Delta P} = \frac{300 \times 0.18 \times 1}{8.298\times10^{-5} \times 7 \times \frac{144}{57.94}}$$

$$= 37406 \text{ md-ft.}$$

$$T = \frac{37406}{1000} \times \frac{.3284147 \times 57.94}{.18} = 3954 \text{ gpd/ft.}$$

$$T = \frac{114.6 \times 300 \times 1}{7 \times \frac{144}{57.94}} = 1976$$

$$kh = \frac{7 \times 300 \times .18}{1.72} = 18{,}080$$

$$T = \frac{114.6 \times 300 \times 1}{18080 \times} = 1911 \text{ gpd/ft.}$$

$$kh = \frac{\overset{3{,}045}{1000} \overset{1976}{T} \times .18}{3284147 \times 57.94} = 18692 = 18{,}700 \text{ md-ft}$$

$\frac{57.31\ lb}{ft^3} \times \frac{ft^2}{144\ in^2} \times \frac{bbl}{d} \times 42\ \frac{gal}{bbl} \times \frac{d}{1440\ min}$

$150\ gpm = \frac{150}{42} \times 1440 = 5,142\ bbl/d$

$kh = \frac{162.6\ q\ \mu\ b}{m} =$

$162.6 \times \frac{42}{1440} \times$ [illegible] $= 4.7425$

$\frac{162.6 \times 5142 \times .18 \times 1}{90.5}$

$162.6 \times \frac{1440}{42}$

5574.85

$162.6 \times \frac{1440}{42}$

5574

$\frac{1.151}{8.298 \times 10^{-6}} \times \frac{144}{57.31} = 5520$

$(2.245)(4.396\times10^{-6})$ intercept when $\frac{1}{m}=0$

$$\phi ch = \frac{w\, kh\, t_o}{\mu\, t_d\, r_w^2} = \frac{9.869\times10^{-6}\, kh\, t_o}{\mu (r_w)^2}$$

min.

log log $$\phi ch = \frac{4.396\times10^{-6}\, kh\, t_o}{\mu\, t_D (r_w)^2}$$

matched pts.

$$\phi ch = \frac{kh}{\mu r_w^2} \frac{1}{\log^{-1}\left[\frac{P_{1hr} - P_i}{m} - 3.2275\right]}$$

$$kh = 141.2\, q \frac{B\mu}{q} \frac{(P_D)_m}{(\Delta P)_m}$$

log log $$\phi ch = \frac{.0002637\, kh\, (\Delta t)_m}{\mu\, r_w^2\, (t_D)_m}$$

$$\phi ch = 2.245$$

$$T = Kh = \frac{k\gamma h}{\mu}$$

$$T = \frac{2.3\,Q}{2\pi\,\Delta s} = \frac{k h \gamma}{\mu}$$

$$kh = \frac{2.3\,Q\,\mu}{2\pi\,\Delta s\,\gamma}$$

$kh =$

$$c = \frac{1}{\beta} = E_w$$

$$S = \frac{2.25\,T t_0}{r_w^2} = \gamma \frac{\beta h}{c}\left(1 + \frac{\alpha}{\phi\beta}\right)$$

$$S = \frac{\gamma \phi h}{c}\left(1 + \frac{\alpha c}{\phi}\right) = \frac{\gamma\phi h}{c} + \frac{\gamma \alpha c \phi h}{c\phi}$$

$$= \frac{\gamma\phi h}{c} + \frac{\gamma \alpha h}{1}$$

$$= \frac{\gamma\phi h + c\gamma\alpha h}{c} = \frac{\gamma h}{c}(\phi + c\alpha)$$

$$c\left(\frac{S_c - c\gamma\alpha h}{\gamma}\right) = \phi h c$$

$$\phi c h = \frac{S_c^2}{\gamma} - c^2 \alpha h = \frac{w\,k h\,t}{\mu\, t_0\, r_w^2}$$

$$S = \frac{\gamma\phi h}{c}\left(1 + \frac{\alpha c}{\phi}\right) \qquad S = \gamma\phi c h\left(1 + \frac{\alpha}{\phi c}\right)$$

$$S = \phi c h \frac{\gamma}{c}\left(1 + \frac{\alpha c}{\phi}\right) \qquad \phi c h = \frac{S}{\gamma + \frac{\gamma\alpha}{\phi c}}$$

$$\phi c h = \frac{S c}{\gamma}\left(1 + \frac{\phi}{\alpha c}\right)$$

$$\phi ch = \frac{4.396 \times 10^{-6} \times 18,700 \times 0.59}{0.18 \times .01 \times 1}$$

$$= 26.95$$

$$s = \frac{Tut}{1.87r^2} = \frac{1976 \times .01 \times 0.59}{1.87 \times 1^2 \times 1440} = \cancel{0.4329} .0043$$

$$\phi ch = \frac{.0043}{57.94 + \frac{57.94 \times}{\frac{0.1 \times 1}{300,000}}}$$

$\frac{\Delta V}{\Delta P} = V_c \quad \frac{1}{E_w} = \frac{\Delta V}{\Delta P} = \frac{1}{300{,}000}$ 9788

porosity

$S = \gamma \Theta \beta_m \left(1 + \frac{\alpha}{\Theta \beta}\right)$

$S = \gamma \phi c h \left(1 + \frac{\alpha}{\phi c}\right)$

$\phi ch = \frac{S}{\gamma + \frac{\gamma \alpha}{\phi c}}$

por.

$S \approx \frac{\alpha \gamma h}{E_w B} \approx \frac{\phi h \gamma}{}$

$\Delta V_s = - \Delta s c \alpha$ $\quad c = \frac{1}{E_w}$

$S = \gamma \phi c h ($ $\quad c = \beta = \frac{1}{E_w}$

$\alpha = \frac{1}{E_s}$

$\phi ch = \frac{S}{\gamma + \frac{\gamma E_w}{\phi E_s}}$

$B =$

$\beta = \frac{\phi}{E_w} + \frac{1}{E_s}$

$S = \gamma \phi h \left(\frac{1}{E_w} + \frac{1}{\phi E_s}\right)$

$S = \gamma \phi h c + \frac{\gamma h}{E_s}$

$S = \gamma h \left(\frac{\phi}{E_w} + \frac{\phi}{\phi E_s}\right) = \gamma h \beta$

$\phi c S = \gamma \phi ch \beta \quad \phi ch = \frac{\phi c S}{\gamma \beta} = \frac{\phi \frac{1}{300{,}000} S E_w B}{\gamma \phi}$

$= \frac{S}{\gamma} B$

① $T = \frac{23208}{1000} \cdot \frac{.3284147 \times 57.94}{.18} = 2453$

$S = \frac{0.3 \times 2453 \times \frac{0.0033}{1440}}{\left(\frac{10}{12}\right)^2} = .0024$

fig 2 $WHP = 174.7 = 143.8 - 17.2 \log t$

$-\frac{30.9}{17.2} = \log t$

$t_o =$ ~~[illegible]~~ 0.016 min

$kh = \frac{(5759)(300)(.18)}{17.2} = 18081$

ϕch

$T = \frac{18081}{1000} \times \frac{0.3284147 \times 57.94}{.18} = \begin{matrix} 1911 \\ 1894 \end{matrix}$

$S = \frac{0.3 \times 1911 \times .016}{\left(\frac{10}{12}\right)^2 \times 1440} = .0092$

③ $kh = \frac{5759 \times 300 \cdot .18}{19.6} = 15867$

~~ϕ~~ $T = \frac{15867}{1000} \times \frac{.3284147}{.18} \times 57.94 = 1677$

1699

.01 .1 1 10 100 1000 KEGE - 1 2/3/83

900 gpm rec DD

WHP at shut in = 104.7 psig. 900 gpm

t	s'		
.167	6.54	46.67	48.1
.33	21.3	54.67	48.8
.5	23.7	59.67	48.8
.67	26.3	69.67	49.4
.83	28.3	79.67	49.8
1	30.0	89.67	50.2
1.167	31.2	109.67	50.8
1.33	32.3	129.	51.1
1.5	33.2	149	51.7
1.67	34.0	169	52.0
1.83	34.6	189	52.3
2	35.2	209	52.6
2.5	36.8	229 234	53.8 52.6
3	37.9	269	52.8
3.5	38.8	329	54.4
4	39.5	389	54.8
4.5	40.1	449	55.2
5	40.6	509	55.6
5.5	41.0	629	56.3
6	41.3	749	56.8
7	42.0	869	57.6
8	42.5	989	57.9
9	42.9		
10	43.2		
11.67	43.8		
12.67	44.1		
14.67	44.6		
16.67	45.0		
18.67	45.2		
20.67	45.6		
24.67	46.2		
29.67	46.8		
34.67	47.1		
40.67	47.7		

$T = \frac{150}{1000} \times \frac{0.3284147 \times 57.94}{.18}$

$= 1596$

$S = \frac{0.3 \times 1596 \times 0.0362}{\left(\frac{10}{12}\right)^2 \times 1440}$

$= .0173$

+.2

+.4

need rg. low pres 150 60

$0 = 29.7 + 20.6 \log t'$

$t'_0 = \frac{+29.7}{20.6}$ $= .0362$

$36.17 + 7.03 \log t' = 29.7 + 20.6 \log t'$

$6.47 = 13.57 \log t'$

$t' = 3.00$

$$kh = \frac{5759\ Q\mu}{\Delta a} = \frac{5759 \times 300 \times 0.18}{13.4} = 23208\ md\text{-}ft.$$

$$\phi ch = \frac{(2.24\pi)(4.396 \times 10^{-6})(23208)(0.0033)}{.18 \times (\text{[illegible]})^2} = 0.016 \frac{ft}{psi}$$

$$= 1.6 \times 10^{-2} \qquad r_w = \frac{12.25}{24}$$

$$= 4.2 \times 10^{-3} \qquad r_w = 1'$$

$$WHP = 128.9 - 13.4 \log t$$

$$162.2 =$$

$$-\frac{33.3}{13.4} = \log t \qquad t_0 = 0.0033\ min.$$

$$S = 0.3 \times$$

Power.

$y = bx^m$

$\ln y = \ln b + m \ln Q$

exp.

$\Delta_o = b e^{mQ}$

$\ln \Delta_o = \ln b + mQ$

$\ln \Delta_o = \ln 1.45590 + 0.0017957 \ln Q.$

$\ln \Delta_o - m \ln Q = \ln 1.45590$

$=$

$\frac{\ln \Delta_o}{m \ln Q} = \frac{\ln 1.45590}{m \ln Q} + 1$

$\frac{\Delta_e}{Q^m} = b \qquad \frac{\Delta_e}{Q^{0.0017957}} = 1.4559$

$\frac{Q^m}{\Delta_o} = \frac{1}{b} \qquad \frac{m \ln Q}{\ln \Delta_e} = \frac{1}{\ln b}$

$\frac{\Delta_e}{Q} = \frac{b Q^m}{Q} = b Q^{(m-1)}$

$\frac{Q}{\Delta_o} = \frac{1}{b Q^{m-1}} = \frac{1}{1.455905584} Q^{-0.9982042}$

$Q = 100 = Q/\Delta_o = 68.12$

$\Delta_e = b Q^m$

$\frac{Q}{\Delta_o} = \frac{Q}{b Q^m} = \frac{Q^{1-m}}{b} = Q^{0.99}$

$\frac{Q}{\Delta_o} = \frac{Q}{1.455905584}$

$\Delta_o = .0017957411 Q$

$\frac{Q}{\Delta_o} = \frac{1}{0.0017957411} Q^{-0.455905584}$

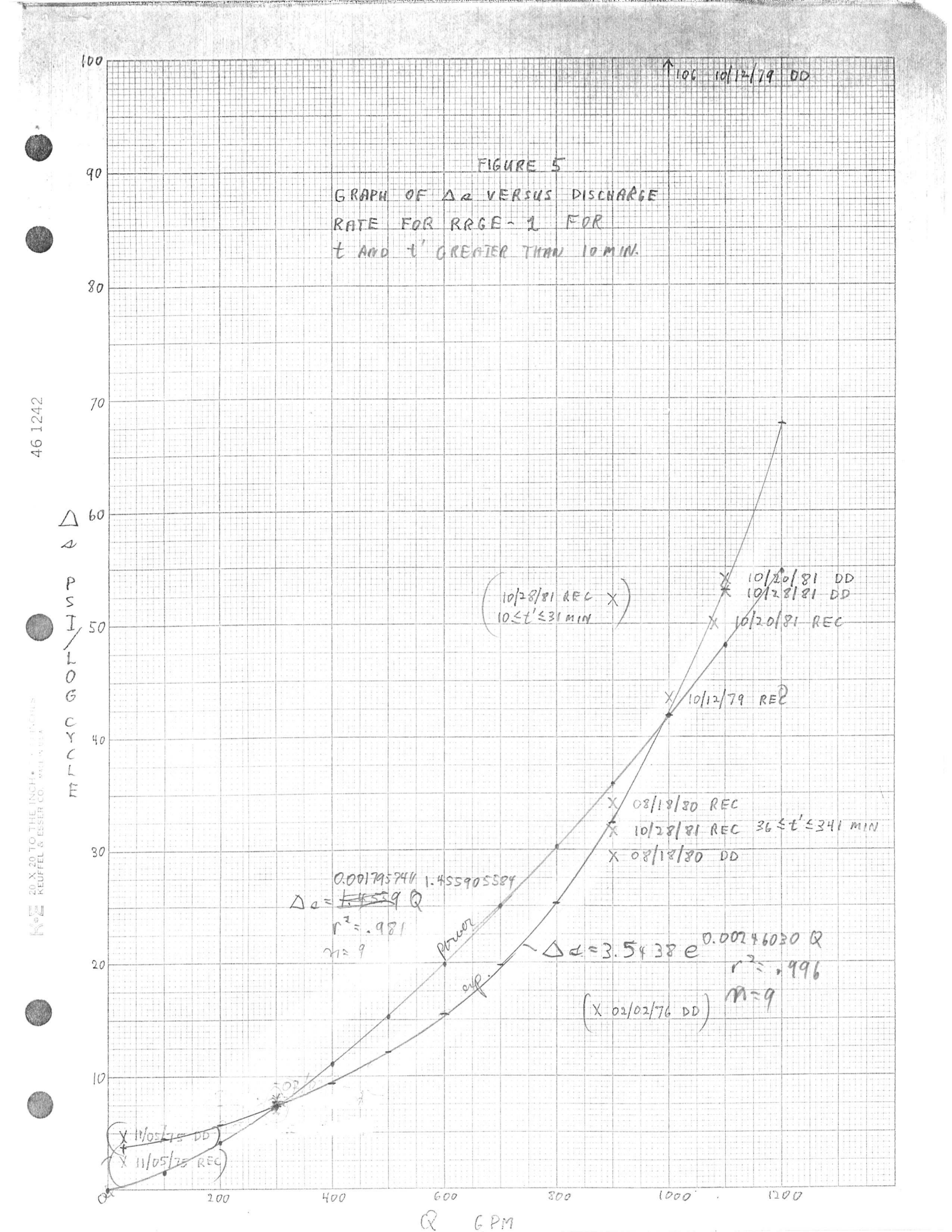
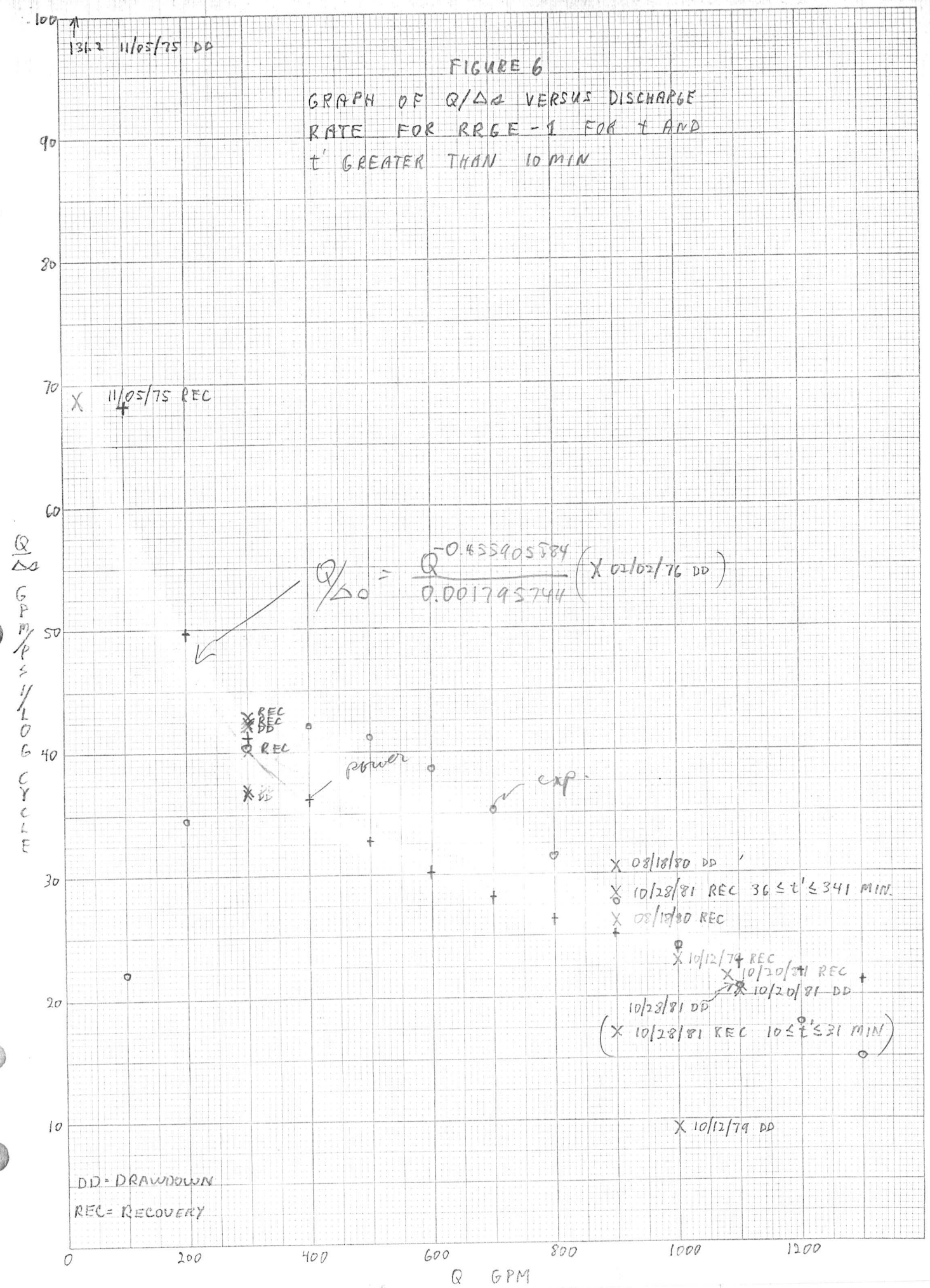


FIGURE 5
GRAPH OF Δd VERSUS DISCHARGE RATE FOR RRGE-1 FOR t AND t' GREATER THAN 10 MIN.
Δd PSI/LOG CYCLE
Q GPM
100
90
80
70
60
50
40
30
20
10
0
200
400
600
800
1000
1200
↑ 106 10/12/79 DD
10/28/81 REC X
10≤t'≤31 MIN
10/20/81 DD
10/28/81 DD
10/20/81 REC
10/12/79 REC
08/18/80 REC
10/28/81 REC 36≤t'≤341 MIN
08/18/80 DD
0.00179574Q 1.455905584
Δd = 9 Q
r² = .981
n = 9
power
exp.
Δd = 3.5438 e^0.0024603Q
r² = .996
n = 9
X 02/02/76 DD
11/05/75 DD
11/05/75 REC
46 1242
20 X 20 TO THE INCH
KEUFFEL & ESSER CO.

FIGURE 6

GRAPH OF $Q/\Delta s$ VERSUS DISCHARGE RATE FOR RRGE-1 FOR t AND t' GREATER THAN 10 MIN



Q = 298

(1) 156.7 WH

Q 11000

t	dd.		w Q	dd	
1000	55.5 (58)	101.2	113.9	800	
1500	56.79	99.9		1000	437 106
				1500	97.4
2000	57.69	99.0		2000	91.4
				3000	460 82.9
~~2500~~				100	388.8 153.4
				200	403.3 139.5
3000	58.95	97.7		400	417.8 125.0
				~~500~~	
4000	59.85	96.85		700	429.5 113.3
					Q 1080
5000	60.54	96.15			10 330.78 212.0
6000	61.11	95.58			100 377.6 165.1
7000	61.59	95.11	109.8		
100	48.34	108.35	412.7 = 121.05		
200	50.50	106.2	118.9		
400	52.67	104.0	116.7		
700	54.41	102.2	114.9		
10	41.1	115.5	128.2		
20	42.3	113.4	126.1		
40	45.5	111.2	123.9		
70	47.2	109.5	122.2		

$$1.78 = \frac{kh\,t_0}{948.2\, r_w^2\, (\phi ch)\mu}$$

$$\phi ch = \frac{kh\,t_0}{948.2\, r_w^2\, \mu \times 60 \times 1.78}$$

9.869×10^{-6}

1.062×10^{-8} ft² × ft × hr × 60 sec × 60 in²

948.2 ft² × 1.45×10^{-2} lb sec ft

ft

psi

2.7807×10^{-6}

1.062×10^{-8} ft² ft × hr min

948.2 ft² × 60 = 56892 md 1.45×10^{-8} psi sec

$= 1.287 \times 10^{-5}$

$= \frac{2305 \times 0.0033}{948.2 \quad 60 \times .18} = .0074$

Bulk modulus of compression of water

.01726

.01716

.0001

$$t_0 = \frac{4790\, S}{T} = \frac{\phi ch \times 56892\, r_w^2\, \mu}{kh}$$

$$\phi ch = \frac{4790\, S\, kh}{T \quad 56892\, \mu} = \frac{0.08419\, 5\, kh}{T\, \mu}$$

$$\frac{ft}{cycle} \cdot \frac{lb}{ft^3} \cdot \frac{ft^2}{in^2}$$

$$m = \frac{162.6\, q\, \mu\, B}{kh} = \frac{264\, Q\, \gamma}{T\ 144} = \frac{5759\, Q\mu}{kh}$$

$$T = \frac{264\, Q\, \gamma}{(144)\,5759\, Q\mu}\ \frac{kh}{} = \qquad 3045$$

$$kh = \frac{A}{\frac{5759\, \mu T}{264\, Q\, \gamma}} = \frac{1000 \times 264}{.3284147}$$

$$kh = \frac{5759 \times 144}{264}\ \frac{T\mu}{\gamma} \qquad A = \frac{264}{(144)(.3284147)}$$

1600 psi

$$A = 5582.37 \qquad B = 1.0058 \quad \frac{1500}{300000}$$

$$kh = \frac{5603 \times Q\mu}{m}$$

$$\Delta V_w = + \frac{1600}{300000}$$

$$P_i - P = 162.5\, \frac{QB\mu}{kh} \left[\log t - \log \left(1.68 \times 10^3\, \frac{r^2 \phi \mu c}{k} \right) \right]$$

$$0 = 162.5\, \frac{QB\mu}{kh} \log t$$

$$\frac{gal}{ft} \cdot \frac{ft}{ft^2} \cdot \frac{ft^3}{7.48\, gal}$$

$$.5772 = \ln \frac{1}{u} = \ln \frac{kh\, t_0}{948.2\, r^2 \phi ch \mu}$$

$$1.78 = \frac{4\, T t_0}{r^2 S} \qquad S = \frac{4\, T t_0}{r^2\, 1.78 \times 7.48} = 0.3\, \frac{T t_0}{r^2}$$

$$.2506 = \log \frac{4\, T t_0}{r^2 S}$$

$t = 1.$ $\quad t_0 = .00842184$

fig 1

$\phi ch = 7.99556) \times 10^{-5}\ kh\ t_0$

$= .014836$ fig 1

$s = .0059668$

$\phi ch = .01481$

$m = \dfrac{5575\ \Omega\mu}{kh} = \dfrac{264\Omega\ \gamma}{T\ 144}$

$T = \dfrac{(264)\ \Omega\ \gamma}{5575\ \Omega\mu\ 144} = \dfrac{0.328849\ kh\gamma}{\mu\ 1000} = \dfrac{3.28849 \times 10^{-4}\ kh\gamma}{\mu}$

$kh = \dfrac{T\mu}{3.28849 \times 10^{-4}\ \gamma}$

948.2x60

$$\phi ch = \frac{.084195 \times 22317 \times .0043}{2362 \times 0.18} = 0.019$$

$$\phi ch = \frac{22317 \times .0033}{948.2 \quad 60 \times .18 \left(\frac{10}{12}\right)^2} = .0104$$

1.78

.005814

$$\phi ch = \frac{22317 \times .0033}{948.2 \times 1.78 \times 60 \times .18 \times \left(\frac{10}{12}\right)^2} = .005818$$

$$\phi ch = \frac{kh\, t_o}{101267.8\, \mu\, r^2}$$

Wtherm = .0058086

$$4790 \frac{S}{T} = \frac{\phi ch\, 101267.8 \mu}{kh}$$

$$\phi ch = 4790 S \frac{kh}{T} \frac{}{101267.8 \mu} = \frac{.04730035\, kh}{T \mu}$$

$$= \frac{.04730035 \times 22317 \times .0043}{2362 \times .18} = .0167619$$

$$t_o = \frac{4790\, S\, r_w^2}{T} = \frac{kh\, t_o\, 101267.8 \mu\, r_w^2}{101267.8 \mu\, kh}\, \phi ch$$

$$\phi ch = \frac{4790 S}{T} \frac{kh}{101267.8 \mu} = \frac{.04730035\, kh\, S}{T \mu}$$

Salt Lk. Tomorrow - recovery on material bc.
- lawyer Salt Lk. - Omega
- bring note - if any defaults - prior interest.
20+30 K - due - Anderson - loans
- 15 on gold/d
- no expenses for me - fees by Anderson

$$s = 1.151 \left[\frac{p_{2\,min} - p_{wf}}{m} - \log \frac{kh}{\phi c h \mu r_w^2} + 3.23 \right]$$

1.7524 for 2 min

for 1 hr

$$3.23 - \log \frac{2}{60} =$$

35.2

14964

$$= 1.151 \left[\frac{140 - 104.8}{20.6} - \log \frac{15000}{(.0428)(.18)\left(\frac{10}{12}\right)^2} + 4.7071 \right]$$

$$= -0.4828$$

$$\Delta p_{skin} = 20.6 \times .87 \times -0.4828 = 8.65 \text{ psi}$$

$$r_w' = r_w e^{-s} = \frac{10}{12} e^{+0.4828} = 1.35'$$

$$A = \frac{114.6 \times 298}{1615} \times 4.06$$

$$= 85.85 \text{ ft}.$$

$$= 85.85 \times \frac{57.94}{144} = 34.54 \text{ psi recovery.}$$

$$u = \frac{1.87 r^2 S}{Tt} = \frac{1.87 \times \left(\frac{10}{12}\right)^2 (.0167)}{1615 \times \frac{2}{1440}}$$

$$= .0097$$

$W(u) = 4.06$

$s = .02$ $\quad \Delta p_{skin} = 0.36$ psi

$$t_{after} = 2 \times 10^5 \; .18 \; \frac{1}{300{,}000} \times \frac{24}{14887} \times 60 = .01 \text{ min}$$

$$r_{iv} = \sqrt{.00105 \; \frac{14887 \; 5 \times 24}{.0415 \quad .18}} = 501 \text{ ft}$$

used for table 2 02/03/82 [illegible]

RKGE 1

t=1000 min

BH		(543.1)	483.5
BQ	553.4 + 1 + 1.3 = 555.7		(496.3)
WH	155.4 + 1 + 1.3 = 157.7		99.0
WQ	168.0 + 1 + 1.3 = 170.3		111.8

12.6, 12.8, 397.3, 12.6, 12.8, 384.5

$t' = 1000$

WH	WQ	BQ	BH
158.6	171.4	555.9	543.1
158.4	171.2	555.7	542.9
157.7	170.5	555.0	542.2
157.5	170.3	554.8	542.0
158.1	170.9	555.4	542.6

12.8, 384.5, 12.8

384.5

BH	543.1	534.1
BQ	555.7	546.7
WH	157.7	149.0
WQ	170.3	161.6

385.1, 12.6, 397.7, 12.6

WH	WQ	BQ	BH
158.0	170.6	555.7	543.1
158.0	170.6	555.7	543.1
157.7	170.3	555.4	542.8
157.7	170.3	555.4	542.8
157.9	170.5	555.6	543.0

12.6, 385.1, 12.6

385.1

158.0	170.7	555.5	542.8

~~Radford [illegible] Bing~~

~~Dillon~~

~~Sears~~

K mart 5243271 -

[illegible] - 445.25

30.00

SKIN Feb 03, '82 test

$$s = \frac{140 - 104.8}{19.6} - \log \frac{15257}{.0415\,(18)\,(.83)^2} + 4.7071$$

$= .03447$

$\Delta p_{skin} = 19.6 \times .87 \times .03447 = .59$ psi

$$\Delta = \frac{14.6 \times 298 \times 4.04}{1576} = 87.54 \times \frac{57.94}{144} = 35.22 \text{ psi}$$

obser 35.2

.0.

$$u = \frac{1.87 r^2 s}{Tt} = \frac{1.87 \times .83^2 \times .0167}{1576 \times \frac{2}{1440}} = 9.9 \times 10^{-3}$$

$w(n) = 4.04$