10 ACRE SPACING CASE (−4 SKIN) ALL 4 WELLS

$\bar{P}_R$ = 287 psia ; P_{wf} = 100 psia ; q_i = 54 BOPD ; $q_{i\,max}$ = 83 BOPD

N_{pi} = 114,850 BBL ; $q(t) = \frac{54}{e^{1.05222t}}$; 4 WELLS = 4×54 = 216

$q_i = \frac{216}{e^{1.05222t}}$

(10+t) YEAR	t YRS.	q(t)
10	0	216
10.5	0.5	128
11	1	75
12	2	26
13	3	9
14	4	3
15	5	1
20	10	

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LAYERED EXAMPLE PROBLEM

TIME	CROSSFLOW Q Mscfd (LAYERED)		NO-CROSSFLOW Q Mscfd (LAYERED)	
YRS	HAND	7151	HAND	7151
1	8050		5063	
2	5735		2923	
3	4254		2007	
4	3258		1534	
5	2560		1256	
10	995		725	
15	502		540	
20	293		431	
25	189		357	
30	130		300	
35	94		257	
40	70		222	
45	54		194	
50	43		170	

3/10/93
mjs

LAYERED EXAMPLE PROBLEM

S.G. = 0.70 ; P_{pc} = 668 ; T_{pc} = 392

$P_r = \frac{1000 \text{ psia}}{668} = 1.50$ $\qquad Z = .859 @ 1.50 T_r$

$T_r = \frac{460+150}{392} = 1.56$ $\qquad Z = .889 @ 1.60 T_r$

Interp. Z = .859 + .018 = 0.877

FROM PROGRAM 7151

n = 1.00

C_1 = 11.12 $\qquad OGIP_1$ = 6.22 Bscf

C_2 0.92 $\qquad OGIP_2$ = 12.64 Bscf

P_i = 1000 psia ; P_i^2 = 1,000,000 $\qquad q_{i_1}$ = 11,009 Mscfd ; q_{max_1} = 11,120 Mscfd

P_{wf} = 100 psia $\qquad P_{wf}^2$ = 10,000 $\qquad q_{i_2}$ = 911 Mscfd ; q_{max_2} = 920 Mscfd

ΔP^2 = 990,000

C MUST BE IN Mscfd/(THOUSANDS)

| Need to Check Calculations With P_{wf} not equal to 0 | DID!! |

Use Arps Equation (b) w/ $\frac{P_{wf}}{P_r}$ = 0.10 ie b = 0.40

G_i = OGIP × R.F. where R.F. = $1 - \left(\frac{100}{1000}\right) = 0.90$

Rates $\left(\frac{q_i}{G_i}\right)$ should be on same basis.

Will try both ways to see which is most correct

@ end 1 year
From 7151

$q_1(t)$ = 4246.5 Mscfd
$q_2(t)$ = 868.8 Mscfd

$$D_i = \frac{1}{(1-b)}\left(\frac{q_i}{G_i}\right) \qquad q_g(t) = \frac{q_{gi}}{\left[1 + b D_i t\right]^{1/b}}$$

Where G_i = OGIP × R.F. and q_{gi} @ Pwf not 0

ALL THESE WITH b = 0.4

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LAYER 1
$$\left(\frac{q_{gi\,max}}{OGIP}\right) = \left(\frac{11.120\ M^2scfd \times 365\ d/yr}{6320\ M^2scf}\right) = 0.6422$$

$$\left(\frac{q_{gi}}{G_i}\right) = \left(\frac{11.009\ M^2scfd \times 365\ d/yr}{6320\ M^2scf \times .90}\right) = 0.7064$$

LAYER 2
$$\left(\frac{q_{gi\,max}}{OGIP}\right) = \left(\frac{.920\ M^2scfd \times 365\ d/yr}{12,640\ M^2scf}\right) = 0.02657$$

$$\left(\frac{q_{gi}}{G_i}\right) = \left(\frac{.911\ M^2scfd \times 365\ d/yr}{12,640 \times .90}\right) = 0.02923$$

$$1/b = \frac{1}{0.4} = 2.5$$ and $$\frac{b}{(1-b)} = \frac{0.4}{0.6} = 0.667$$

$$q_g(t) = \frac{q_{gi}}{[1 + bD_it]^{1/b}} = \frac{q_{gi}}{\left[1 + \frac{b}{1-b}\left(\frac{q_{gi}}{G}\right)t\right]^{1/b}}$$

$$q_g(t) = \frac{q_{gi}}{\left[1 + 0.667\left(\frac{q_{gi}}{G}\right) t\ yr\right]^{2.5}}$$

Layer 1 @ 1 yr: **7151 q_g = 4247 Mscfd**

$$q_g(t) = \frac{11.130}{[1 + 0.667(0.6422)]^{2.5}} = \frac{11.130}{2.4383} = 4560\ Mscfd$$

$$q_g(t) = \frac{11.009}{[1 + 0.667(.7064)]^{2.5}} = \frac{11.009}{\ldots} = 4194\ Mscfd$$

OGIP $_1$ = 6.32 Bscf P_i = 1000 psia ; P_{wf} = 100 psia   ① 11,009 Mscfd   3/23/93
OGIP $_2$ = 12.64 Bscf   R.F. = 0.90 ; D = 0.10   ② 911 Mscfd
TOTAL 18.96 Bscf   TOTAL 11,920 Mscfd

LAYERED EXAMPLE PROBLEM

TIME	LAYER 1, Q Mscfd (q_i = 11,009 Mscfd)			LAYER 2, Q Mscfd (q_i = 911 Mscfd)			COMMINGLED	
YRS	HAND	7151	MODEL	HAND	7151	MODEL	HAND	7151
1	4195	4247		868	869		5063	5116
2	2095	2124		828	831		2923	2955
3	1217	1237		790	796		2007	2033
4	779	794		755	762		1534	1556
5	534	544		722	731		1256	1275
10	141	137		584	597		725	734
15	59.6	49.6		480	495		540	54[illegible]
20	31.4	20.4		400	415		431	43[illegible]
25	18.9	8.8		338	352		357	36[illegible]
30	12.4	3.9		288	302		300	306
35	8.6	1.8		248	261		257	262
40	6.3	0.79		216	227		222	228
45	4.7	0.35		189	199		194	199
50	3.7	0.09		166	175		170	175

LAYER 1 YEAR 5 FROM 7151 **q_g = 544 Mscfd**

$$q_g(2) = \frac{11.120}{\left[1 + 0.667(0.6422)5\right]^{2.5}} = \frac{11.120}{17.495} = 636 \text{ Mscfd}$$

$$q_g(1) = \frac{11.009}{\left[1 + 0.667(.7064)5\right]^{2.5}} = \frac{11.009}{20.630} = \boxed{534 \text{ Mscfd}}$$

TRY $$\frac{q_{gi\,max}}{OGIR \times R.F.} = \frac{11.120 \times 365}{6320 \times .90} = 0.7136$$

$$q_g(2) = \frac{11.120}{\left[1 + 0.667(0.7136)5\right]^{2.5}} = \frac{11.120}{21.001} = 529 \text{ Mscfd}$$

)GIP 1 = 6.32 Bscf
)GIP 2 = 12.64 Bscf
TOTAL 18.96 Bscf

P_i = 1000 psia ; P_{wf} = 100 psia
R.F. = 0.90 ; b = 0.40

① 11,009 Mscfd
② 911 Mscfd
TOTAL 11,920 Mscfd

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LAYERED EXAMPLE PROBLEM

q_i = 11,009 Mscfd — q_i = 911 Mscfd

TIME	LAYER 1; Q Mscfd			LAYER 2, Q Mscfd			COMMINGLED	
YRS	HAND	7151	MODEL	HAND	7151	MODEL	HAND	7151
1	4195	4247	4436 4170	868	869	858 862	5063 (5028)	5116
2	2095	2124	2293 2185	828	831	820 823	2923 (3006)	2955
3	1217	1237	1359 1307	790	796	785 788	2007 (2092)	2033
4	779	794	881 852	755	762	753 755	1534 (1604)	1556
5	534	544	609 591	722	731	722 724	1256 (1313)	1275
10	141	137	158 155	584	597	591 593	725 (746)	734
15	59.6	49.6	63 62	480	495	490 492	540 (552)	54[illegible]
20	31.4	20.4	26 26	400	415	412 413	431 (438)	43[illegible]
25	18.9	8.8	9 11	338	352	350 340	357 (361)	361
30	12.4	3.9	5 5	288	302	300 301	300 (305)	306
35	8.6	1.8	2 2	248	261	259 260	257 (261)	262
40	6.3	0.79	1 1	216	227	226 227	222 (227)	228
45	4.7	0.35	0 0	189	199	199 199	194 (199)	199
50	3.7	0.09	0 0	166	175	175 176	170 (175)	175

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3/23/93
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LAYERED EXAMPLE PROBLEM

TIME YRS	CROSSFLOW Q Mscfd (LAYERED) HAND	CROSSFLOW Q Mscfd (LAYERED) 7151	NO-CROSSFLOW Q Mscfd (LAYERED) HAND	NO-CROSSFLOW Q Mscfd (LAYERED) 7151
1	8050		5063	
2	5735		2923	
3	4254		2007	
4	3258		1534	
5	2560		1256	
10	995		725	
15	502		540	
20	293		431	
25	189		357	
30	130		300	
35	94		257	
40	70		222	
45	54		194	
50	43		170	

semilog

3/23/93
DMJ

LAYERED EXAMPLE PROBLEM

	Crossflow		No-Crossflow	
TIME	Q Mscfd (LAYERED)		Q Mscfd (LAYERED)	
YRS	HAND	7151	HAND	7151
1	8050		5063	
2	5735		2923	
3	4254		2007	
4	3258		1534	
5	2560		1256	
10	995		725	
15	502		540	
20	293		431	
25	189		357	
30	130		300	
35	94		257	
40	70		222	
45	54		194	
50	43		170	

$P_i = 1000$ psia
$T_R = 100°F = 560°R$

$p_r = \frac{1000}{666} = 1.5$

$T_r = \frac{560}{390} = 1.44$

$z_i = .835$

$B_{gi} = 35.35 \frac{P}{ZT}$ scF/res CF @ 14.7 PSIA P_{sc}, 60°F T_{sc}

$= 35.35 \frac{(1000)}{(.835)(560)} = 75.59$ scF/res CF

Vol 1 well / 640 Acres
Layer 1 $h_1 = 50$ ft

$G_1 = 43560\, A\, h\, \phi \cdot (1 - S_w) \times B_{gi}$

$= 43560 \frac{ft^2}{Acres} (640 \text{ Acres})(50 \text{ ft})(.1)(1-.4)\ 75.59 \frac{scF}{resF}$

$= 6.32$ BCF

layer 2

$h_2 = 100$

$G_2 = 12.64$ BCF

$G = G_1 + G_2 = 18.96$ BCF

ssflow

$G = 18.96$

$C = \frac{0.703(10 \cdot 50 + 1 \cdot 100)}{(560)(0.0012)(0.835)\left[\ln\left(\frac{2978.92}{.25}\right) - 0.75 - 3\right.}$

$= 13.34$ or 12.04 if $C_1 + C_2$

FIRST WELL

$$C = \frac{0.703\,kh}{T\mu_g Z\left[\ln(r_e/r_w) - 0.75 + s\right]}$$ for N=1.0 B&W eq 2.67

layer 1

$$C_1 = \frac{0.703\,(10)\,(50)}{(560)(0.012)(0.835)\left[\ln\left(2978.92/0.25\right) - 0.75 - 3\right]}$$

$= 11.12$ n = 1.0

$$C_2 = \frac{(0.703)(1)(100)}{(560)(0.012)(0.835)\left[\ln\left(\frac{2978.92}{0.25}\right) - 0.75 + 5\right]}$$

$=$ ~~0.97~~ 0.919

2 wells after 5 years

OlD WELL

$$C_1 = \frac{0.703\,(10)(50)}{(560)(0.012)(0.835)\left[\ln\frac{2106.42}{.25} - 0.75 - 3 + .973\right]}$$

$C_1 = 10.00$

$$C_2 = \frac{0.703\,(1)(100)}{(560)(0.012)(0.835)\left[\ln\frac{2106.42}{.25} - 0.75 + 5 + .973\right]}$$

$=$ ~~0.87~~ $.878$

NEW WELL

$C_1 = 10.00$

$$C_2 = \frac{0.703\,(1)(100)}{(560)(0.012)(0.835)\left[\ln\frac{2106.42}{.25} - 0.75 - 3 + .973\right]}$$

$C_2 = 2.001$

over

4 wells

old well

$$c_1 = \frac{(.703)(10)(50)}{(560)(.012)(.835)\left[\ln\frac{1489.46}{.25} - .75 - 3\right]}$$

$= 12.674$

$$c_2 = \frac{(.703)(1)(100)}{(560)(.012)(.835)\left[\ln\frac{1489.46}{.25} - .75 + 5\right]}$$

$= 0.968$

new wells

$$c_1 = \frac{(.708)(10)(50)}{(560)(.012)(.835)\left[\ln\frac{1489.46}{.25} - .75 - 3\right]}$$

$= 12.674$

$$c_2 = \frac{(.708)(1)(100)}{(560)(.012)(.835)\left[\ln\frac{1489.46}{.25} - .75 - 3\right]}$$

$= 2.553$

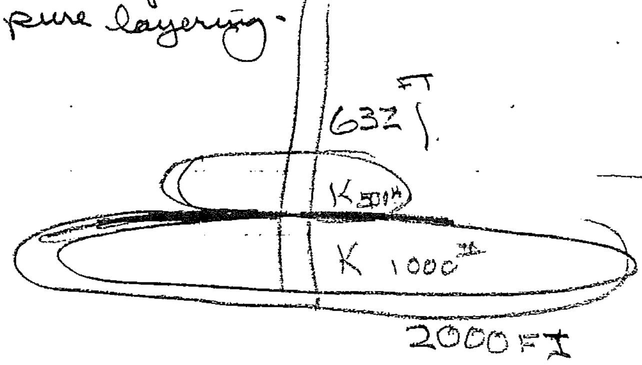
☒

☐ Odessa 2 day seminar

☐ Geology

Although it looks like areal heterogeneity its the no-crossflow that will give the response that would looks like pure layering.

5/19/92 5:10 PM @ 221 GB



$$\frac{\left(\frac{q_{max}}{G_i}\right)_1}{\left(\frac{q_{max}}{G_i}\right)_2}$$

$\frac{G_2}{G_1} = 10$

all else equal

$\frac{G_2}{G_1} = \frac{r_{e2}^2}{r_{e1}^2} = 10$

$r_{e1}^2 = \frac{r_{e2}^2}{10}$

$V = hA\phi(1-S_w)B_g$ $\quad r_{e1} = \sqrt{\frac{2000^2}{10}}$

$= \pi r^2 h \phi (1-S_w) B_g$

$$\frac{\left(\frac{q_{max}}{G_i}\right)_1}{\left(\frac{q_{max}}{G_i}\right)_2} = 10$$; Let $q_{max\,1} = q_{max\,2} = 1000$ Mscfd

$B_{gi} = 32$ SCF/RCF

w/ $P_i = 463$ psia

$h = 40$ FT

$\phi = 15\%$

$S_w = 30\%$

use $r_{e2} = 2000$ FT

$$\frac{q_{max1}}{G_{i1}} = 10\,\frac{q_{max2}}{G_{i2}}$$

$G_{i2} \times q_{max1} = 10\, q_{max2}\, G_{i1}$ then $r_{e1} = 632$ FT for 10/1 ratio

1000 Mscfd $G_{i2} = 10 \times 1000$ Mscfd G_{i1}

$G_{i2} = 10\, G_{i1}$ Let $G_{i1} = 1000$ MMscf

$G_{i2} = 10{,}000$ MMscf

Use of Ratio $\left(\frac{q_{max}}{G_1}\right)_1 / \left(\frac{q_{max}}{G_1}\right)_2 = 10$ where K and S are equal after both layers.

$$\frac{G_2}{G_1} = 10$$

$$\frac{G_2}{G_1} = \frac{h_2 \, r_{e_2}^2}{h_1 \, r_{e_1}^2} = 10 \quad \text{with } \boxed{h_1 = h_2} \quad r_{e_1}^2 = \frac{r_{e_2}^2}{10}$$

if $\boxed{r_{e_2} = 2000 \text{ FT}}$ then $r_{e_1} = \sqrt{\frac{2000^2}{10}} = \boxed{632 \text{ FT}}$

Don't think Ks would be equal here! Kh's would be equal though & Ks would vary slightly.

if $\boxed{h_2 = 2h_1}$ then $\frac{2h_1 \, r_{e_2}^2}{h_1 \, r_{e_1}^2} = 10$ or $r_{e_1} = \sqrt{\frac{2(2000)^2}{10}} = \boxed{894 \text{ FT}}$

or

if $\boxed{h_2 = \frac{1}{2} h_1}$ then $\frac{h_2}{2h_2} \frac{r_{e_2}^2}{r_{e_1}^2} = 10$ or $r_{e_1} = \sqrt{\frac{2000^2}{2 \times 10}} = \boxed{447 \text{ FT}}$

where subscript (2) is low permeability layer.

We do reference permeability after all!!!

Use of Ratio $\left(\frac{q_{max}}{G_i}\right)_1 \Big/ \left(\frac{q_{max}}{G_i}\right)_2 = 10$ when K and G_i are equal for each layer. (r's equal) [Vary only skin (S)]

$$\left[\frac{q_{max}}{G_i}\right]_{RATIO} = \frac{K_1/\phi_1 \left[\ln\left(\frac{.472\, r_{e2}}{r_w}\right) + S_2\right] r_{e2}^2}{K_2/\phi_2 \left[\ln\left(\frac{.472\, r_{e1}}{r_w}\right) + S_1\right] r_{e1}^2} = 10$$

[WITH K's equal $K_1 = K_2$]

$$\left[\frac{q_{max}}{G_i}\right]_R = \frac{\left[\ln\left(\frac{.472 \times 2000}{.333}\right) + S_2\right]}{\left[\ln\left(\frac{.472 \times 2000}{.333}\right) + S_1\right]} = 10$$

$$\frac{(7.95 + S_2)}{(7.95 + S_1)} = 10$$

[If $S_2 = 0$]

$$\frac{7.95}{10} = 7.95 + S_1$$

$$.80 = 7.95 + S_1 \quad \text{or} \quad S_1 = -7.95 + .80 = -7.2$$

[$S_1 = -7.2$] like horizontal well.

[If $S_1 = 0$]

$$\frac{7.95 + S_2}{7.95} = 10 \quad \text{or} \quad 79.5 = 7.95 + S_2$$

$$S_2 = 79.5 - 8.0 = +71.5$$

[$S_2 = +72$]

[If $S_2 = -4$]

$$\frac{7.95 - 4}{7.95 + S_1} = 10 \quad \text{or} \quad \frac{3.95}{10} = 7.95 + S_1$$

$$.4 - 7.95 = \boxed{S_1 = -7.6}$$

[If $S_2 = +50$]

Layered No-Crossflow

Reservoir Performance Indicators

- Precipitous decline in Rate.
- High Decline Exponents, b from 0.5 to 1.0.
- Long Producing Life
- Rapid Drop in Shut-In Pressure with Cumulative Production
- Positive Cumulative Production Plot Curvature
- Thick Gross Pay Sections
- Carbonate Reservoirs.
- Large Discrepancy between Volumetric and Material Balance Oil or Gas-In-Place.
- Low Recovery Factors
- Differential Depletion
  - a) different layer pressures - RFT or packer tests.
  - b) wellbore backflow during shut-ins and/or production curtailment (thief zones).
  - c) good response from profile modification.

Production and Reserve Improvement Potential Indicators

A) OPEN HOLE COMPLETIONS

B) ACID STIMULATION COMMINGLED, OR NO INITIAL STIMULATIONS (SHOT HO

C) DEEPENING POTENTIAL BECAUSE OF NO-CROSSFLOW (COMPLETED WELLS WITH STAND OFF FROM BOTTOM WATER CONTACT)

In a layered no-crossflow reservoir "All" low permeability layers must be stimulated, preferably mechanically and individually. Attempts at stimulation through various diversion techniques have been generally shown to be unsuccessful. In some instances it is better to isolate and stimulate the low permeability layers first.

Layered No-Crossflow Reservoir Concepts:
and Its Impact on Field Development, Primary Production, Infill Drill
and Enhanced Recovery.

Layered No-Crossflow Reservoir Performance Indications

1) High Decline Exponents D = 0.5 TO 1.0 [Unique to Phillips]
 a) Thick Gross Pays
2) Long Producing Lifes [people erroneously think its gravity drainage.]
3) Carbonate Reservoirs [continuous layers, both productive and vertical seal layers]
 a) open hole completions
 b) commingled or no initial stimulations [BIG POT'L HERE]
 [Run liners and separately stimulate all layers in old wells]
4) Differential depletion i.e. layer pressures different (RFT or packer tests)
5) Wells with indication of wellbore backflow [thief zone] during shut-ins and/or production curtailment.
 [Depending where more permeable layers are i.e. top or bottom of wellbore backflow can be damaging to high perm layers if water ends up being injected.] Keep Pwf near to 0 as possible to prevent backflow.
6) Pressure Curve Curvature i.e. precipitous drop in pressure even looks like undersaturated effect for oil systems.
7) Steep backpressure curve ?? when it should not be for a given average permeability.
 a) Large discrepancy between Volumetric oil in-place and Material Balance calculated from early performance data [Abnormally low recovery factors.]
8) For oil fields GOR behaviour increases then goes flat.
9) Additional oil or gas "appears" to be recovered because of poor initial completions i.e. didn't perf everything or did not effectively stimulate "all" layers. [Also deepening potl because of no-crossflo]

Hole completed with commingled stimulation in carbonate reservoirs.

Layered No-Crossflow Reservoir Concepts:
Its Impact on Field Development, Primary Production, Infill Drilling and Enhanced Recovery.

Introduction -

Basic Equations -

a) gas - Drive n = 1 and explain why

b) oil (From Appendix of other layered paper

Show example calculations where [Gmax/Gi] ratio is equal to 1 and how sum of two will result in b = 0.5. Make sure K values are not equal though!

Gas Equation Application to Develope Concepts

1) Illustrate points on handling more than just two layers, (Set up 4 layer example) to develope P/Z curve and order of each layer pressure curve position etc. Gmax/Gi with highest value will be on the bottom.) Show failure to perf 1 or 2 layers and its effect on P/Z composite curve.

2) Clearly show K ratio concept only is not valid, can show Vol Ratio and skin effect to get 10 Ratio.

3) Turn problem sideways to show same effect, here number of wells can enter in also

4) show Hugoton 3 layer problem, how the Kr & Wn are combined to get distance between P/Z curves.

a) Illustrate long producing times with this example

b) why infill drilling gets no more reserves.

c) example of open hole completion with negative skin on only one layer. Drill infill well with negative skin on all layers. [Becomes key point of how we can make money.

Will deplete equally even with 10/1 ratio of K and 10/1 ratio of volume.

10/5		10/1	1/10	1,000 MscF / 10 BcF
1/.5		1/.1	.1/1	or 100 MscF / 1 BscF

Volume or permeability contrast is not enough!

[Topic – The [q_{max}/G_i] RATIO.

Pressure transient tests can not distinguish during the infinite acting period between a layered no crossflow reservoir, a layered reservoir with crossflow or a single layer homogeneous system. Only when one of the layers in a layered no-crossflow reservoir is undergoing "depletion" is there a chance of identifying that a no-crossflow condition exists. Earlougher and Kersch point out that the classical no-crossflow pressure build-up characteristic will not be seen in the field unless all offset wells are simultaneously shut-in. The characteristic second rise in the build-up pressure is a result of wellbore backflow and repressuring from the high pressure layer into the more depleted low pressure high permeability layer. Continuous production in offset wells permits all the backflowed gas to be produced from the offset wells until

Some Depletion Performance Characteristics and Reservoir Properties Indications OF Layered No-Crossflow Reservoirs.

- High Rate-Time Decline Exponents — b = 0.5 to 1.0. (See Tables X and Y) (Underestimates recoverable reserves if early data extrapolated with exponential decline i.e. b=0.)
- Long Producing Life. (This is a direct result of high values of Decline exponent b.)

- Pressure Cumulative Production Graph Curvature (Early precipitous drop in pressure that underestimates GIP at early times) (P/Z GIP does not correspond with volumetric calculations). Curvature could be misinterpreted as lack of shut-in pressure build-up in a low permeability reservoir or strong water drive in a high permeability reservoir. The level of permeability will usually indicate which of the three possibilities is most likely. For a layered system the high curvature usually reflects most of the reservoir volume is in the low permeability layer.

- Straight Line Pressure Cumulative Production Graph that indicates a large discrepancy, when compared with volumetric estimates — substantially less. [q_{max}/G_i] ratio $\geq$ 100.
-

- Differential depletion between layers. Normally determined from RFT tests or layer packer testing in a replacement or newly drilled well in an already developed or producing field.

(2)

- Wellbore backflow during shut-ins or production curtailment i.e. wellbore flow into "thief zones" is an indication of differential depletion of layered no-crossflow reservoirs.

2/19/93

mjd

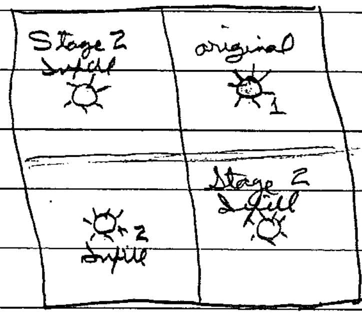
LAYERED NO CROSSFLOW GAS WELL EXAMPLE

- 640 ACRES TO 320 TO 160 ACRES
- $\bar{P}_{Ri}$ = 1000 psia ; P_{wf} = 100 psia
- S.G. = 0.700 ; TEMP = ~~150°F~~ 100°F
- ϕ = ~~20%~~ 10% ; S_w = ~~30%~~ 40%
- K_1 = 10 MD ; K_2 = 1 MD
- h_1 = 50 FT ; h_2 = 100 FT ; ALSO $h_1 = h_2$ = 75 FT EACH.
- S RANGES +5, 0, −3.

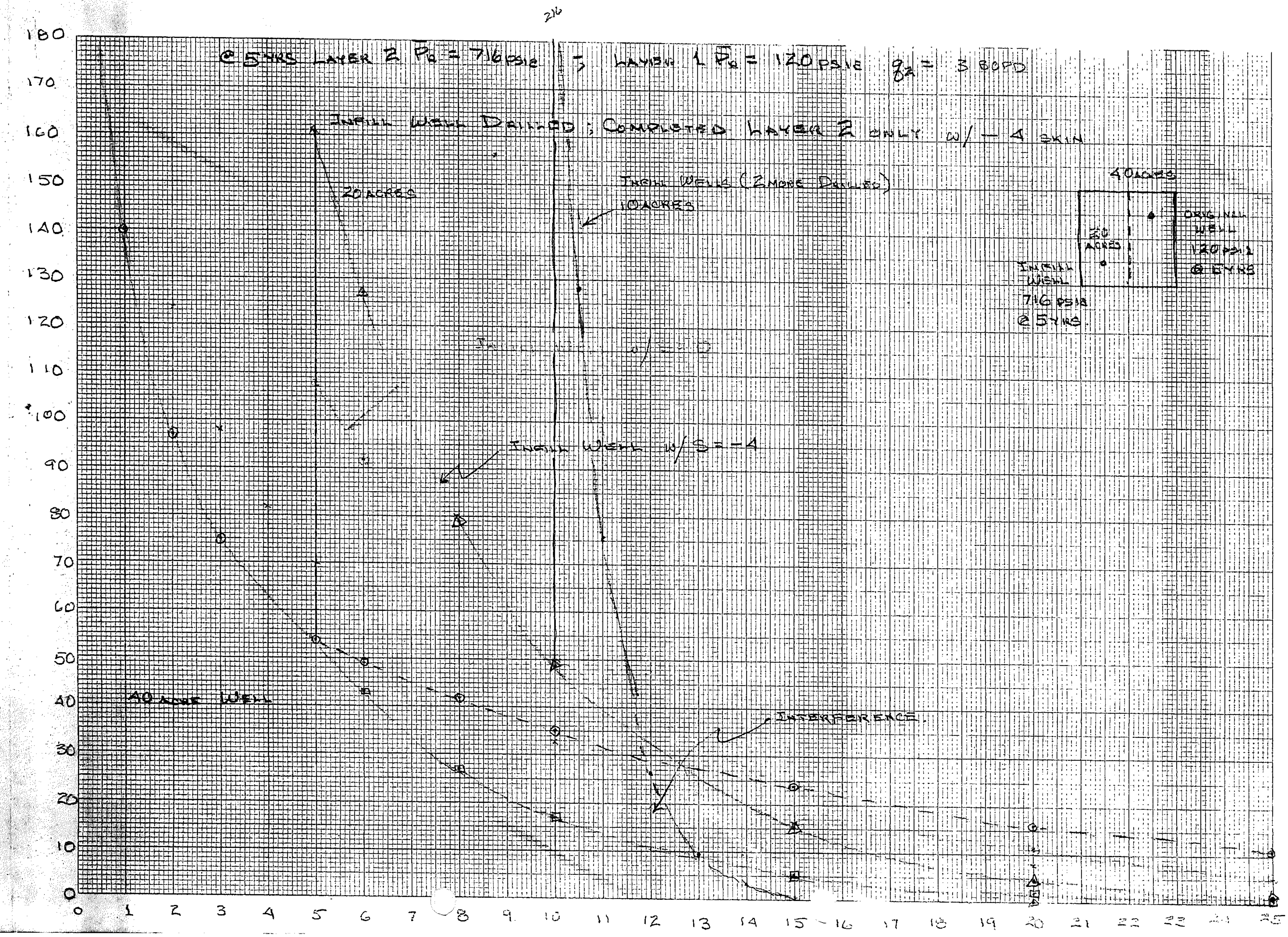
Have original well w/ −3 on more permeable layer and 0 or +5 skin on less permeable layer.

FORECASTS AS FOLLOWS:

1) HAND CALCULATION WITH b = 0.40.
2) USE PROGRAM 7151
3) USE 3-D MODEL. ONE WELL MODEL USED BY S. VOELKER ON OUR OKLA. HUGOTON STUDY.



—mjd



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@ 5 YRS LAYER 2 $\bar{P}_R$ = 716 psig ; LAYER 1 $\bar{P}_R$ = 120 psig q_2 = 3 BOPD
INFILL WELL DRILLED ; COMPLETED LAYER 2 ONLY w/ −4 SKIN
20 ACRES
INFILL WELL (2 MORE DRILLED)
10 ACRES
40 ACRES
20 ACRES
ORIG. WELL 120 psig @ 5 YRS
INFILL WELL 716 psig @ 5 YRS
INFILL WELL w/ S = −4
40 ACRE WELL
INTERFERENCE