KAPPA

Main Results	Analysis 12
Company Cimarex Energy Co. Well Pennzoil B 36 State 1	Field Apache Ridge (Bone Spring) Test Name / # PBU1

Test date / time	11-3-06
Formation interval	Bone Spring
Perforated interval	9441'-9520'
Gauge type / #	PPS-1258
Gauge depth	9388'
TEST TYPE	Standard
Porosity Phi (%)	7
Well Radius rw	0.328 ft
Pay Zone h	33 ft
Water Salt (ppm)	90000
Form. compr.	3E-6 psi-1
So	0.65
Sg	0.1
Sw	0.25
Reservoir T	140 °F
Reservoir P	3800 psia
Fluid type	Oil
Volume Factor B	1.57216 B/STB
Viscosity	0.412144 cp
Total Compr. ct	3.23931E-5 psi-1

Selected Model

Model Option	Standard Model
Well	Vertical, Changing Storage (Hegeman)
Reservoir	Two porosity PSS
Boundary	One fault

Main Model Parameters

TMatch	51.6 1/hr
PMatch	0.0304 1/psia
C	0.0129 bbl/psi
Total Skin	1.78
k.h, total	928 md.ft
k, average	28.1 md
Pi	2109.96 psia

Model Parameters

Well & Wellbore parameters (Pennzoil B 36 State 1)

C	0.0129 bbl/psi
Ci/Cf	1.43
delta_t	0.452 hr
Skin	1.78

Reservoir & Boundary parameters

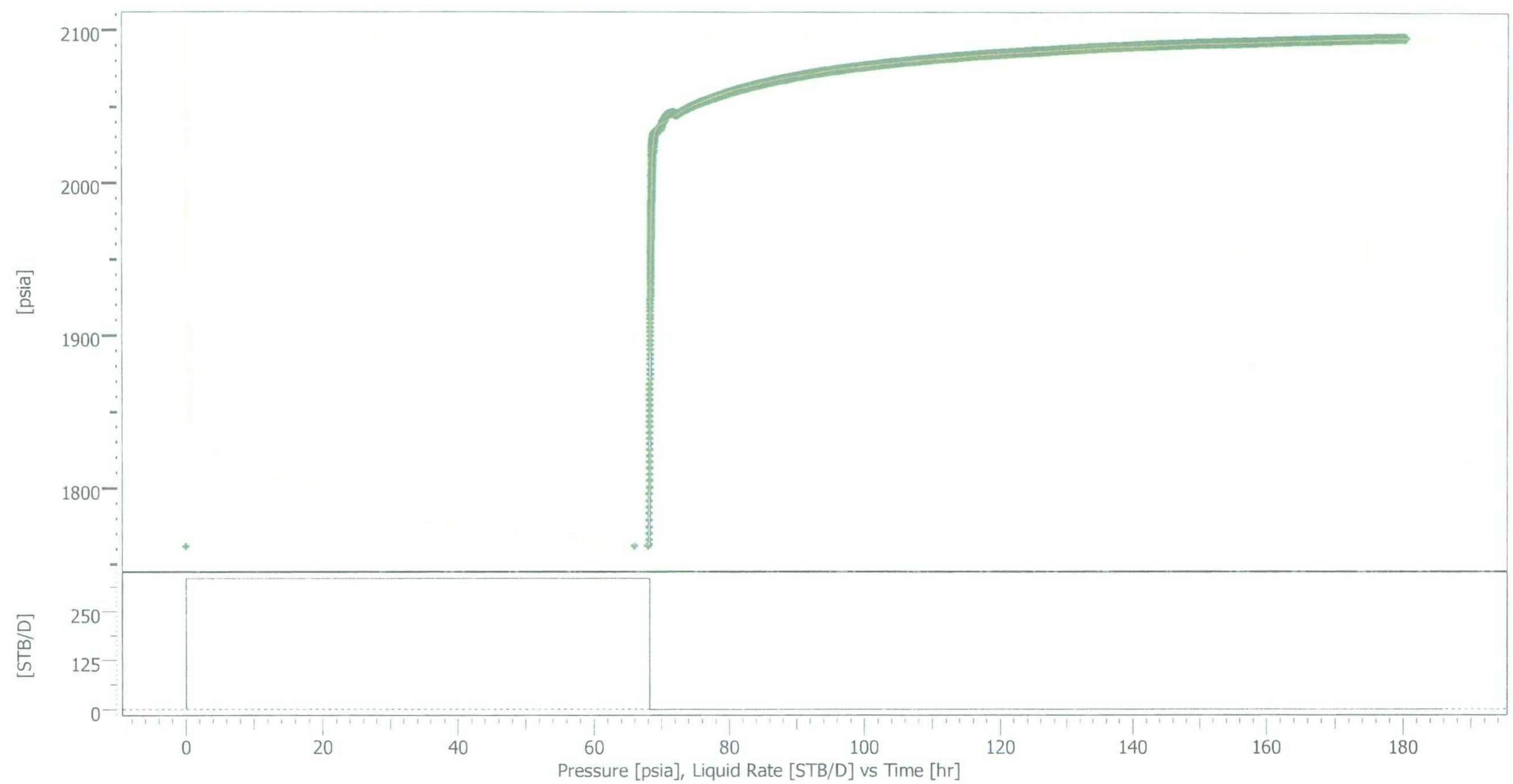
Pi	2109.96 psia
k.h	928 md.ft
k	28.1 md
Omega	0.0012
Lambda	3.29E-6
L - No flow	316 ft

Derived & Secondary Parameters

Rinv	1680 ft
Test. Vol.	0.0205366 bcf
Delta P (Total Skin)	58.572 psi
Delta P Ratio (Total Skin)	0.176076 Fraction

BEFORE THE OIL CONSERVATION DIVISION
Santa Fe, New Mexico
Case No's. 14145,14124.....Exhibit No. 21
Submitted by:
FASKEN OIL AND RANCH, LTD.
Hearing Date: June 26, 2008

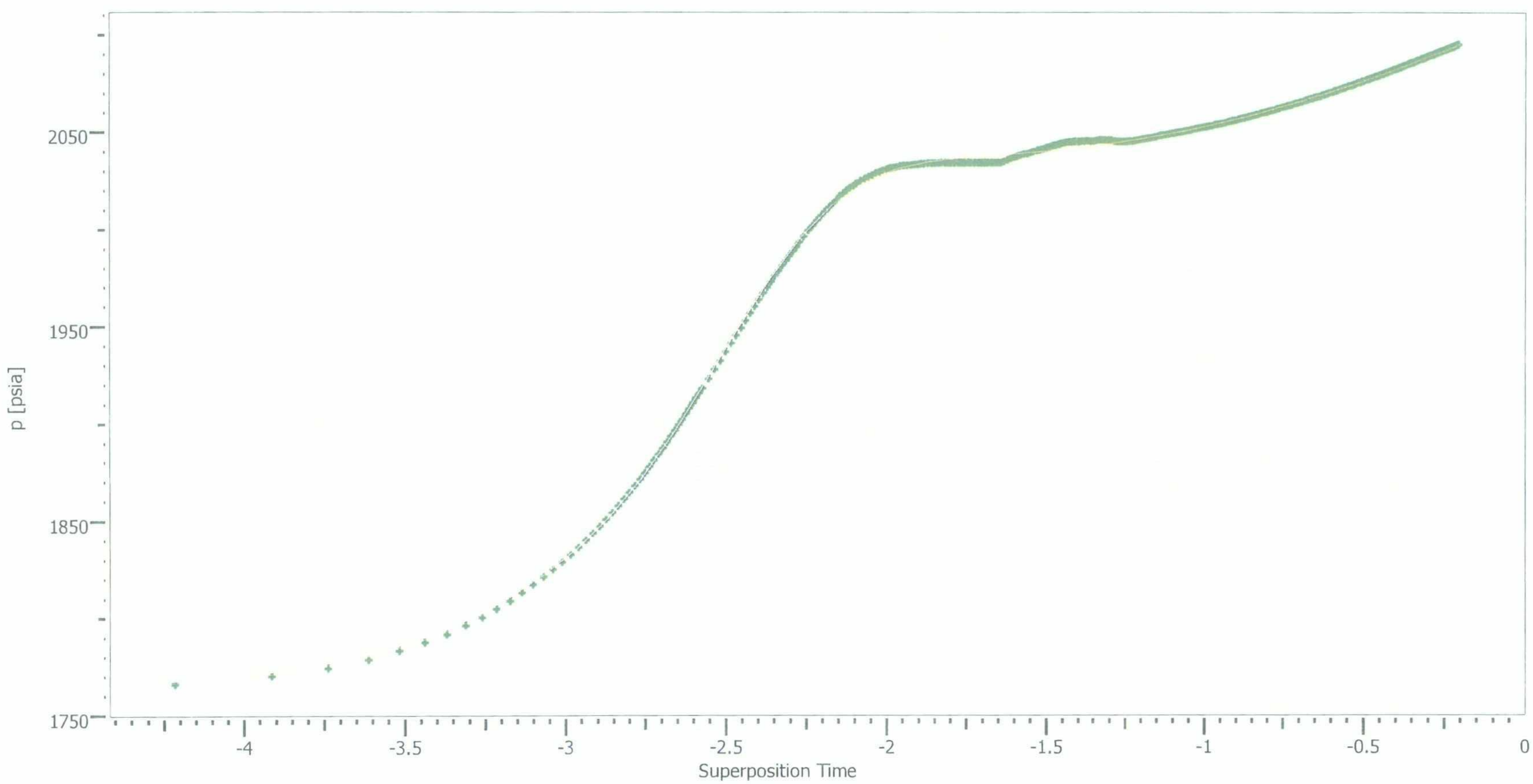
History plot	Analysis 12
Company Cimarex Energy Co. Well Pennzoil B 36 State 1	Field Apache Ridge (Bone Spring) Test Name / # PBU1



Ecrin v4.10.01 PennzoilB36St1 PBU 11_3_06 robert.ks3

5/19/2008

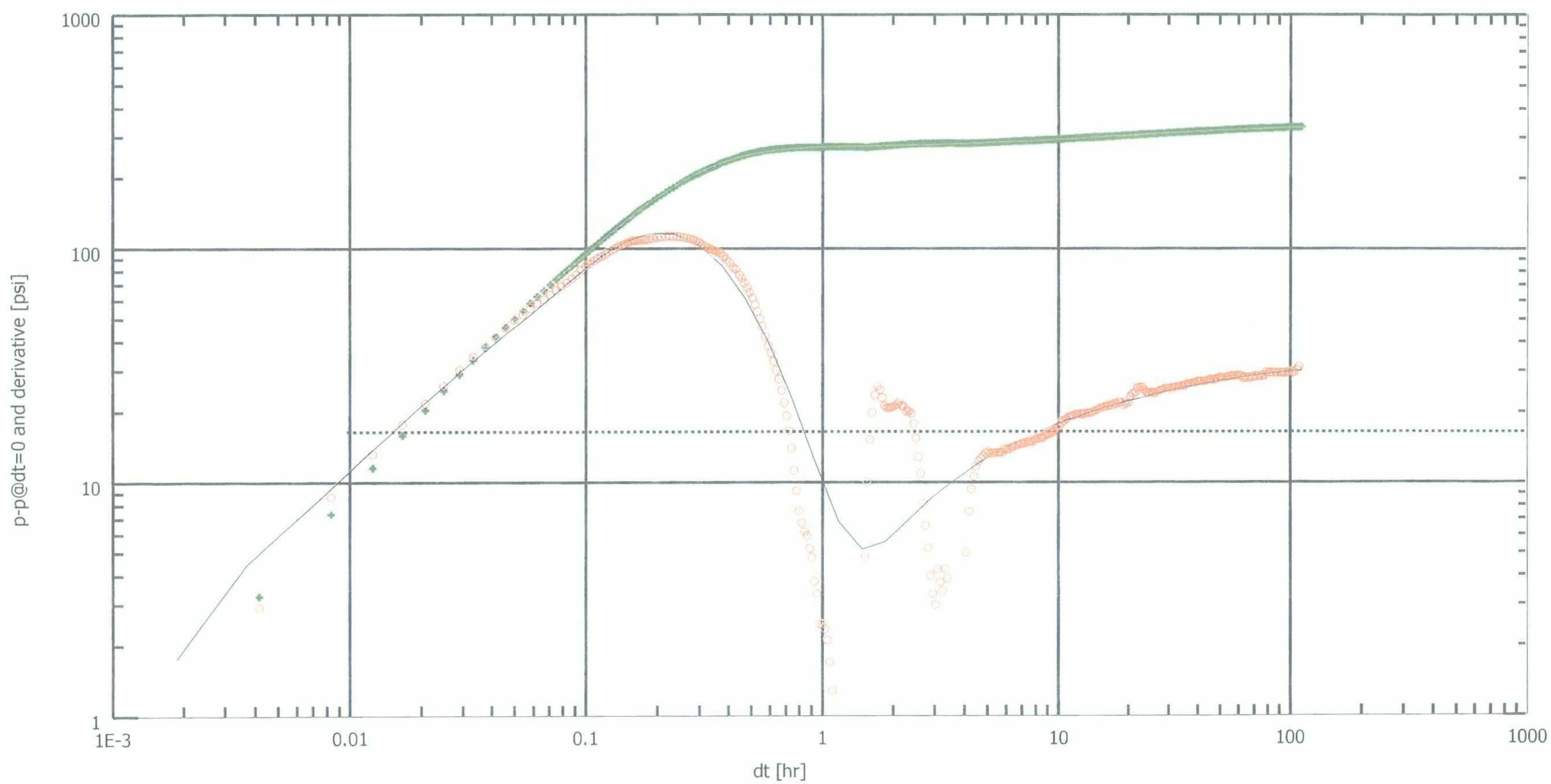
Semi-Log plot	Analysis 12
Company Cimarex Energy Co.	Field Apache Ridge (Bone Spring)
Well Pennzoil B 36 State 1	Test Name / # PBU1



Ecrin v4.10.01 PennzoilB36St1 PBU 11_3_06 robert.ks3

5/19/2008

Log-Log plot	Analysis 12
Company Cimarex Energy Co. Well Pennzoil B 36 State 1	Field Apache Ridge (Bone Spring) Test Name / # PBU1



Ecrin v4.10.01 PennzoilB36St1 PBU 11_3_06 robert.ks3

5/19/2008

pressure mercury-injection capillary pressures with SEM analysis of pore casts to further quantify the distribution of pore throat sizes. Final rock types were identified from their pore aspect ratios and coordination numbers.

Seven hydraulic rock types, listed in Table 2, were identified based on lithology, pore geometry, and porosity-permeability relationship. For each rock type, we observed a more unique relationship between porosity and permeability at the plug level than seen for the aggregate Clear Fork interval. Permeability-porosity relationships for the best reservoir rocks (*i.e.*, rock types 1, 2 and 6) are shown in Figures 4-6, respectively. Although not shown, similar permeability-porosity relationships were observed for the poorer quality reservoir rocks in the Clear Fork, *i.e.*, rock types 3-5, 7.

Table 2—Description of Rock Types Defined for Clear Fork Carbonates in the TXL South Unit Field

Rock Type	Lithologic Description
Rock Type 1	Medium to coarsely crystalline dolo-grainstones (best reservoir quality)
Rock Type 2	Medium crystalline dolo-grainstone (moderate reservoir quality)
Rock Type 3	Finely crystalline dolo-wackestone (poor reservoir quality)
Rock Type 4	Very fine crystalline dolo-wackestone (poor reservoir quality)
Rock Type 5	Siltstone (poor reservoir quality)
Rock Type 6	Limestone (moderate reservoir quality)
Rock Type 7	Anhydritic dolo-stone (poor reservoir quality)

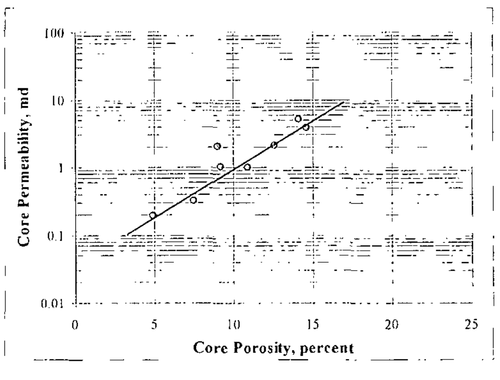


Fig. 4—Core-derived porosity-permeability relationship for rock type 1 (medium to coarsely crystalline dolo-grainstones).

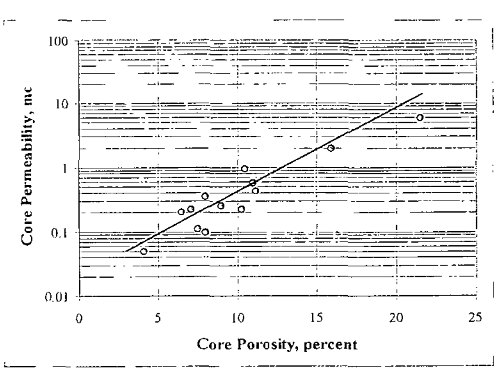


Fig. 5—Core-derived porosity-permeability relationship for rock type 2 (medium crystalline dolo-grainstones).

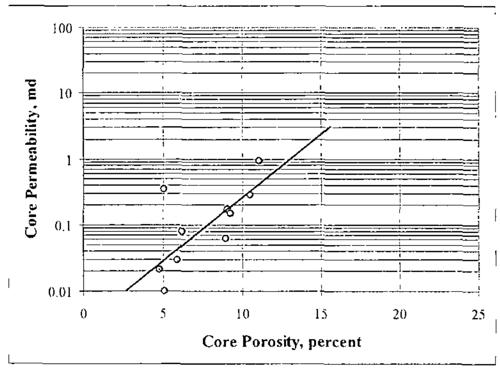


Fig. 6—Core-derived porosity-permeability relationship for rock type 6 (moderate reservoir quality limestone).

The next step was to develop an algorithm relating rock types and average rock properties to log responses. The objective of this step was to develop a model to estimate properties at each well. We attempted to use all available log data, including older gamma ray and electric logs taken from wells drilled in the 1940s and 1950s as well as more modern porosity and induction log suites from wells drilled in the 1980s and 1990s. One of the primary considerations in constructing the model was to insure that it could be applied uniformly and consistently throughout the field. Consequently, a significant part of the study effort was focused on normalizing the log data in order to correct observed inconsistencies between log responses. These inconsistencies were observed not only between logs of different vintages, but also log suites obtained from different service companies.

Following the log normalization process, first order or petrophysical rock types were identified using conventional means. For example, silts were identified with gamma ray response, while limestone and dolomite were characterized using the photoelectric response. The hydraulic rock types used a resistivity ratio technique for identification from the log response. The final product was a calculation algorithm that allowed us to identify the vertical distribution of hydraulic rock types as well as to quantify net pay, effective porosity, and absolute permeability from the log response.

Reservoir Performance Study

The third phase of our field study was the analysis of long-term production histories using the material balance decline type curve (MBDTC) methodology.[7,14] The theory and methodology of the MBDTC analysis technique have been discussed by others[7,14] and will not be repeated in detail in this paper. In general, the type curve method is applicable to variable rate, variable bottomhole flowing pressure, or combinations of these flowing conditions. Application of three different type curve plotting functions—normalized rate, rate integral, and rate derivative—allows us to obtain more unique type curve matches, even from typical field data with significant scatter. The type curves used in our study were developed specifically for pressure depletion production from solution-gas-drive reservoirs such as the TXL South Unit Field.

A major objective of the reservoir performance study was to quantify reservoir properties for both the 5600 and Tubb reservoirs. Consequently, we limited this phase of our study to the analysis of production that was not commingled. From the analysis of transient data, we estimated the effective permeability to oil and the near-wellbore flowing efficiency presented in terms of a skin factor. Furthermore, analysis of the pseudosteady-state or boundary-dominated data provided estimates of contacted oil-in-place and drainage area. We illustrate the performance analysis with several examples.

Example Analysis: Well TXLSU 1004 (5600 Reservoir). Figure 7 shows the production and development history of Well TXLSU 1004 that was completed openhole in the Upper Clear Fork in August of 1950. Following a small acid treatment, the well initially produced at a rate of almost 40 STB/day. Artificial lift was installed in December of 1950. In an attempt to increase production, the well was hydraulically fractured in December 1954 with 20,000 lbs. of 20/40 sand. Note the well responded with a post-fracture rate of more than 60 STB/day.

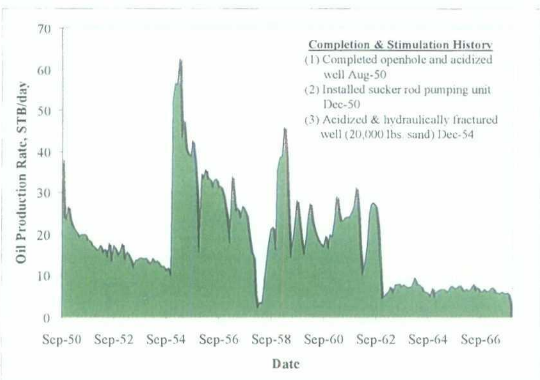


Fig. 7—Well development and completion history, Well TXLSU 1004 (5600 Reservoir).

Since there was no bottomhole pressure data available, we estimated the primary moveable oil volume or ultimate oil recovery (EUR) from a plot of daily oil rate against cumulative oil production (Fig. 8). Theoretical aspects for this technique are discussed in References 7 and 15.

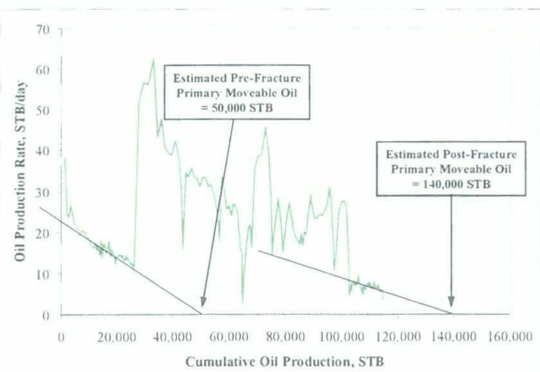


Fig. 8—Estimated ultimate primary moveable oil recovery for Well TXLSU 1004 (5600 Reservoir).

The primary moveable oil volume represents the total oil volume the well could produce under a given set of operating conditions. In some cases, the EUR can be increased by improving operating conditions. We estimate the primary moveable oil volume from the best-fit line drawn through the late-time rate data and extrapolated to the cumulative oil production axis. Note the post-fracture EUR exceeds the pre-fracture volume by 90,000 STB. This difference suggests the hydraulic fracture treatment possibly improved the well's flowing efficiency and/or contacted more reservoir pore volume.

Figures 9 and 10 show the material balance decline type curve (MBDTC) analysis of the pre- and post-fracture production history, respectively. Consistent with the EUR evaluation, we also observed an improvement in the well performance following the hydraulic fracture treatment. The computed skin factor decreased from a –1.5 to –3.1, while the drainage area increased from 30.6 to 56.5 acres. In addition, the computed effective oil permeability increased from 0.11 md to 0.19 md, suggesting the fracture treatment not only contacted more reservoir pore volume but also contacted more permeable portions of the reservoir. Note also that, even following the hydraulic fracture treatment, this well recovered less than 8 percent of the contacted oil-in-place.

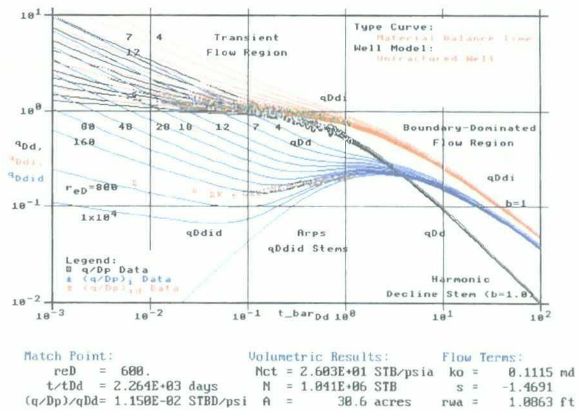


Fig. 9—MBDTC analysis of pre-fracture production history, Well TXLSU 1004 (5600 Reservoir).

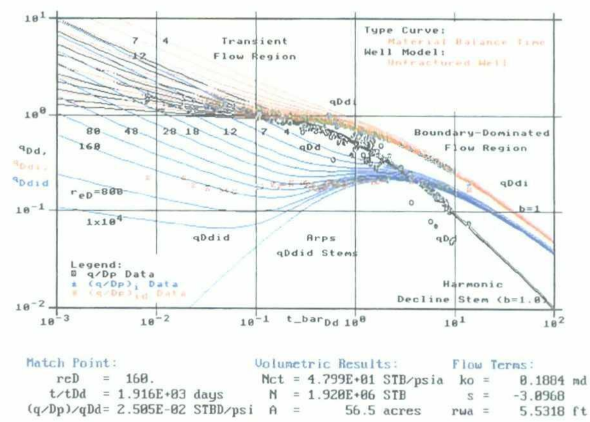
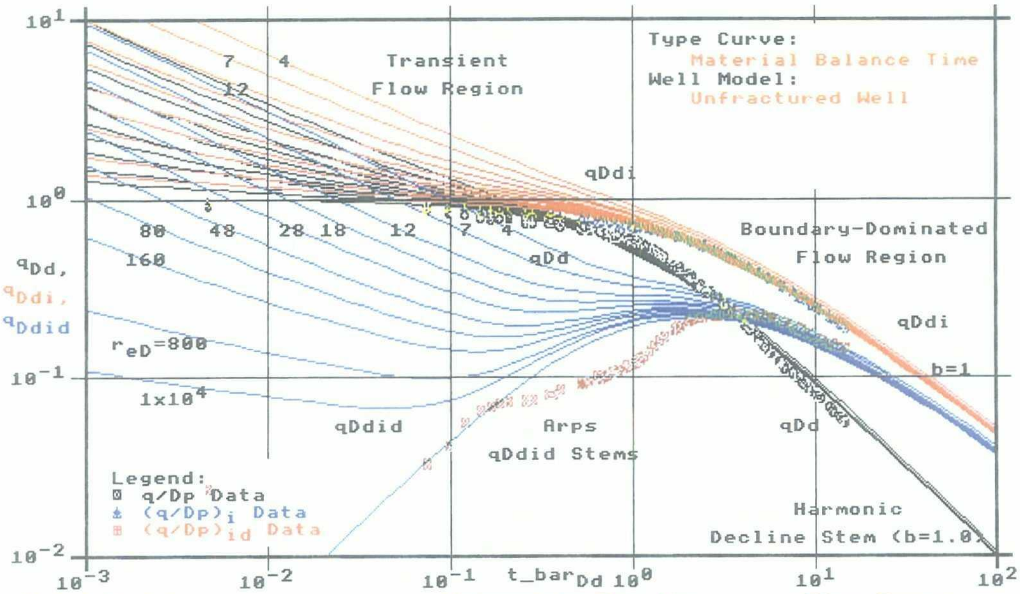


Fig. 10—MBDTC analysis of post-fracture production history, Well TXLSU 1004 (5600 Reservoir).

Well Id: Pennzoil 36 State #1 Date: Jun 18,2008 Time: 16:09
Analyst: Carl W. Brown

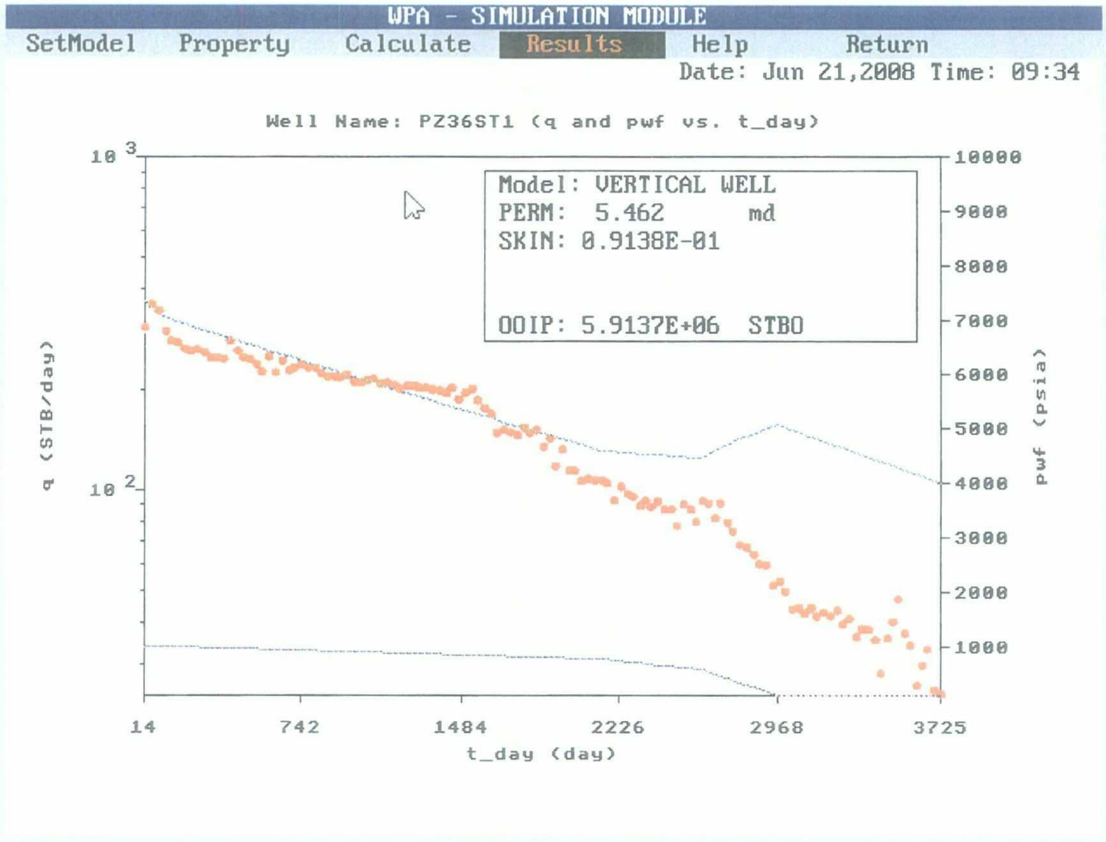


Match Point:
reD = 1.000E+04
t/tDd = 1.509E+03 days
(q/Dp)/qDd= 1.175E-01 STBD/psi

Volumetric Results:
Nct = 1.774E+02 STB/psia
N = 5.912E+06 STB
A = 662.0 acres

Flow Terms:
ko = 5.3389 md
s = 0.0915
rwa = 0.3030 ft

¦ reD (?): 10000.0 ¦ Deriv (*): 0.10 ¦ Cursor Step (PgUp/PgDn): 1.100(Mult)¦
¦ ¦ Help (F1) ¦ Edit (F3) ¦ TC (F5) ¦ CNTRL (Tab)¦



WPA - SIMULATION MODULE
SetModel
Property
Calculate
Results
Help
Return
Date: Jun 21,2008 Time: 09:34
Well Name: PZ36ST1 (q and pwf vs. t_day)
Model: VERTICAL WELL
PERM: 5.462 md
SKIN: 0.9138E-01
OOIP: 5.9137E+06 STBO
q (STB/day)
pwf (psia)
t_day (day)
10 3
10 2
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
14
742
1484
2226
2968
3725