



HALLIBURTON

M.A.R. H HKT  
VP Well File LO16-14.  
HALLIBURTON DEL PERU S.A.

Avenida E. Canaval y Moreyra 425 - Of. 31 - San Isidro TELEFONO: (051) 14-442-0699 FAX: (051) 14-442-3371 Lima, Jan. 03 TH., 1996

**MRS. PETROTECH PERUANA  
UNIDAD PLANEAMIENTO- EXPLORACION-PRODUCCION**

**Attn Ing. Julio Mego**

**WELL LO16-14 DRAWDOWN ANALYSIS  
BASAL SALINA RESERVOIR  
INTERVAL: 9460'-9664' MD**

The Drawdown Test was analized with the pressure, temperature, time, oil production, GOR and cumulative production information provide by Petrotech.  
The following is the conclusion we get from the test:

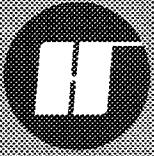
- 1.- 1/2" and 5/8" bean Oil and Gas production rates are not estabilized. We used 3/8" bean rate because it was the better. The main reason seems to be the gas production.
- 2.- Initial reservoir pressure has been calculated in 4216.22 psia. at 9500' MD (7547' VD). The current average reservoir pressure has been calculated in 3464.18 psia. at the same depth.
- 3.- The well shows an effect skin dependent on the rate. However we estimate  $s=-7.5$ . It means the well is not damage and it is negative because the well is slant.
- 4.- The effective oil permeability is calculated in  $k_o= 4.39$  md if we consider all the productive interval ( $h=123'$ ).
- 5.- The test evidence that the current reservoir pressure is above Bubble pressure. However at and/or near the well the flowing pressure is below that pressure point and generates free gas in the reservoir (damage) producing with 1/2" and 5/8". Technically 1/2" could be no the best bean and it could contribute to a faster pressure decline in the reservoir pressure.

We hope you will find this information useful and for any doubt or additional information just contact us.

Respectfully

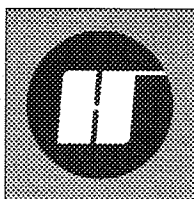
Eduardo Sarango  
Sales and Technology Engineer.  
HALLIBURTON DEL PERU.

|                   |           |         |          |            |    |
|-------------------|-----------|---------|----------|------------|----|
| Post-it® Fax Note | 7671      | Date    | 8/8      | # of pages | 14 |
| To                | A. Agurto | From    | H. Chang |            |    |
| Co./Dept.         |           | Co.     |          |            |    |
| Phone #           |           | Phone # |          |            |    |
| Fax #             |           | Fax #   |          |            |    |

| Main Results                                                                      |         |                 |                     | PTP1614        |
|-----------------------------------------------------------------------------------|---------|-----------------|---------------------|----------------|
|  | Company | Petrotech       | Formation interval  | Basal Salina   |
|                                                                                   | Field   | Lobitos         | Perforated interval | 9460'-9664' MD |
|                                                                                   | Well    | LO16-14         |                     |                |
|                                                                                   | Test    | Drawdown        |                     |                |
|                                                                                   | Date    | 04/12/95        |                     |                |
|                                                                                   | Gauge   | SPC             |                     |                |
|                                                                                   | Depth   | 9500' Wire Line |                     |                |

|                  |          |                 |                  |
|------------------|----------|-----------------|------------------|
| TEST TYPE        | Standard | FLUID TYPE      | Oil              |
| Porosity Phi (%) | 12       | Volume Factor B | 1.37848          |
| Well Radius rw   | 0.35 ft  | Total Compr. ct | 2.52807E-5 psi-1 |
| Pay Zone h       | 123 ft   | Viscosity       | 0.870433 cp      |

|                |                  |               |                |
|----------------|------------------|---------------|----------------|
| Flow Period #  | 4                | RESERVOIR     | Homogeneous    |
| Rate           | 456 STB/day      | BOUNDARY      | Infinite       |
| Rate Change    | 262 STB/day      | WELL          | Storage & Skin |
| P at dt=0      | 1601.08 psia     | Storage C     | 0.37 STB/psi   |
| Pi             | 4216.22 psia     | Ci/Cf         | 0.240259       |
|                |                  | Alpha         | 9090           |
| Time Match     | 0.5 (hr)-1       | Skin factor   | 3.18           |
| Pressure Match | 0.00699 (psia)-1 |               |                |
|                |                  | kh            | 540 md.ft      |
|                |                  | k             | 4.39 md        |
|                |                  | Mobility k/mu | 5.04           |

**Main Results****PTP1614A**

Company Petrotech  
Field Lobitos  
Well LO16-14  
Test Drawdown  
Date 04/12/95  
Gauge SPC  
Depth 9500' Wire Line

Formation interval Basal Salina  
Perforated interval 9460'-9664' MD

TEST TYPE Standard

FLUID TYPE Oil

Porosity Phi (%) 12  
Well Radius rw 0.35 ft  
Pay Zone h 123 ft

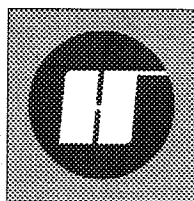
Volume Factor B 1.37848  
Total Compr. ct 2.52807E-5 psi-1  
Viscosity 0.870433 cp

Flow Period # 5  
Rate 792 STB/day  
Rate Change 336 STB/day  
P at dt=0 2165.74 psia  
Pi 4216.19 psia

Time Match 8.65 (hr)-1  
Pressure Match 0.0068 (psia)-1

RESERVOIR Homogeneous  
BOUNDARY Infinite  
WELL Storage & Skin  
Storage C 0.0358 STB/psi  
Ci/Cf 0.0933818  
Alpha 320  
Skin factor 11.6

kh 913 md.ft  
k 7.42 md  
Mobility k/mu 8.53

**Main Results****PTP1614B**

Company Petrotech  
Field Lobitos  
Well LO16-14  
Test Drawdown  
Date 04/12/95  
Gauge SPC  
Depth 9500' Wire Line

Formation interval Basal Salina  
Perforated interval 9460'-9664' MD

TEST TYPE Standard

FLUID TYPE Oil

Porosity Phi (%) 12  
Well Radius rw 0.35 ft  
Pay Zone h 123 ft

Volume Factor B 1.37848  
Total Compr. ct 2.52807E-5 psi-1  
Viscosity 0.870433 cp

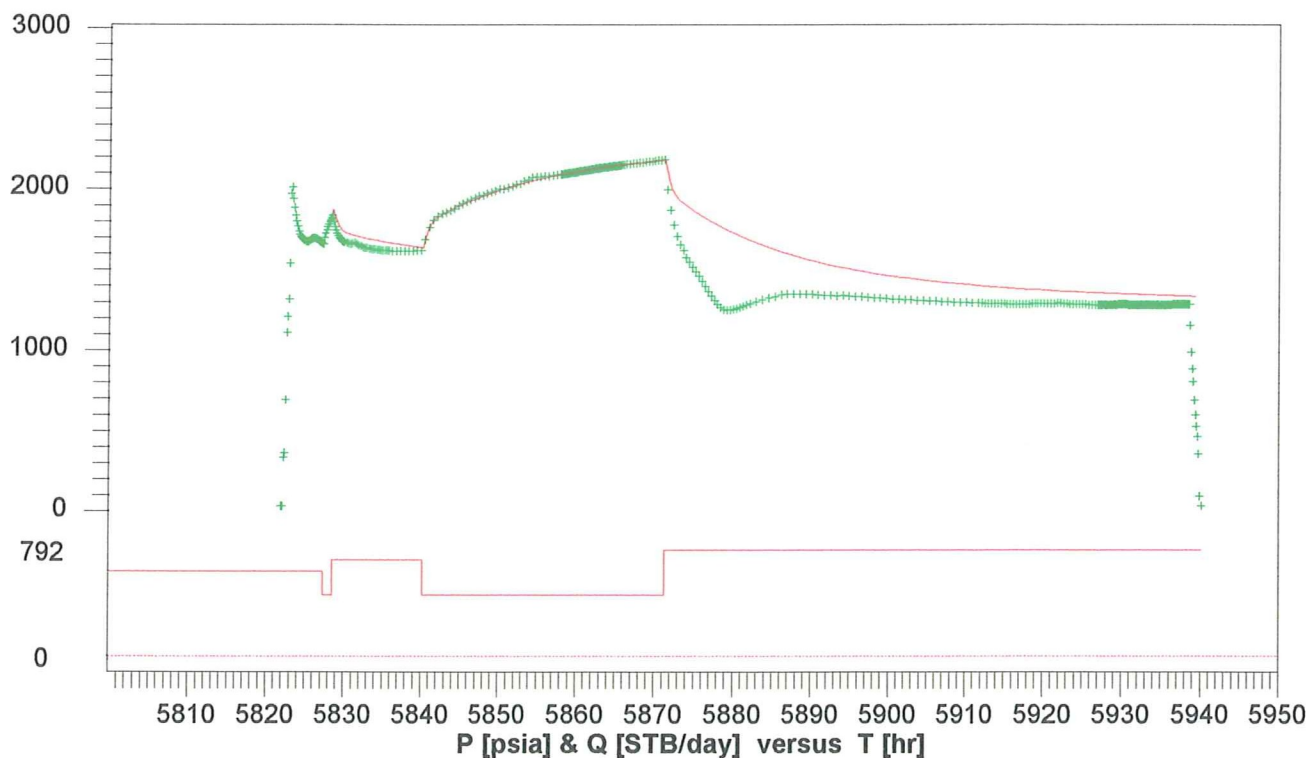
Flow Period # 3  
Rate 718 STB/day  
Rate Change 262 STB/day  
P at dt=0 1814.38 psia  
Pi 4216.22 psia

Time Match 0.43 (hr)-1  
Pressure Match 0.00215 (psia)-1

RESERVOIR Homogeneous  
BOUNDARY Infinite  
WELL Storage & Skin  
Storage C 0.21 STB/psi  
Ci/Cf 0.281319  
Alpha 2870  
Skin factor -2.73

kh 262 md.ft  
k 2.13 md  
Mobility k/mu 2.44

|                                                                                   |                   |           |                |          |
|-----------------------------------------------------------------------------------|-------------------|-----------|----------------|----------|
|  | <b>Simulation</b> |           | <b>PTP1614</b> |          |
|                                                                                   | Company           | Petrotech | Test           | Drawdown |
|                                                                                   | Field             | Lobitos   | Date           | 04/12/95 |
|                                                                                   | Well              | LO16-14   | Gauge          | SPC      |



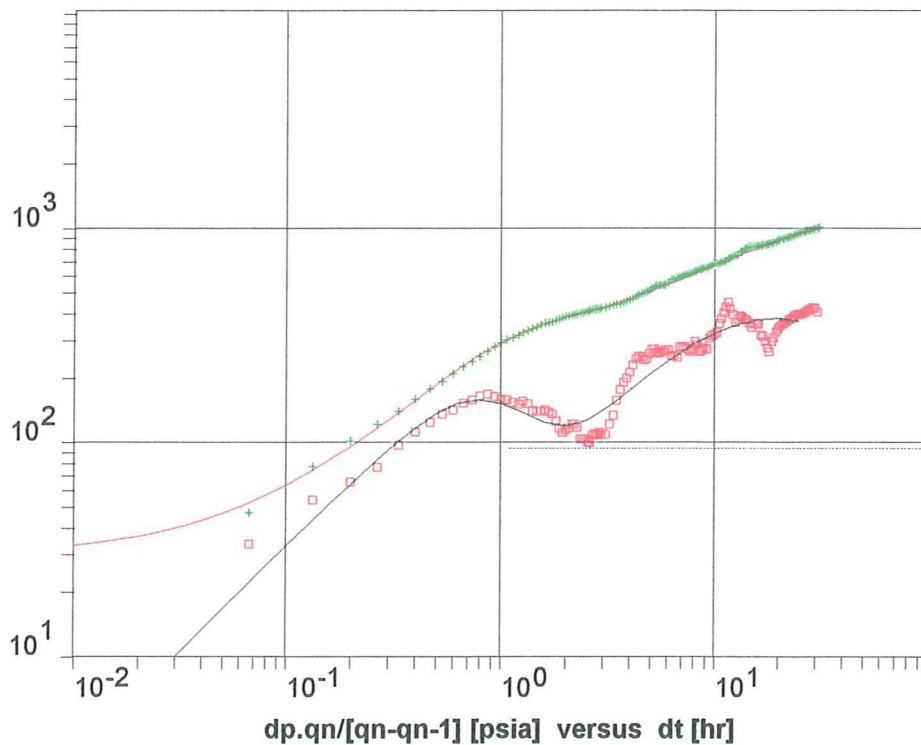
Flow Period # 4  
Rate 456 STB/day  
Rate Change 262 STB/day  
P at dt=0 1601.08 psia  
Pi 4216.22 psia  
Time Match 0.46 (hr)<sup>-1</sup>  
Pressure Match 0.00542 (psia)<sup>-1</sup>

RESERVOIR Homogeneous  
BOUNDARY Infinite  
WELL Storage & Skin  
Storage C 0.31 STB/psi  
Ci/Cf 0.272781  
Alpha 6520  
Skin factor 0.51  
kh 418 md.ft  
k 3.4 md  
Mobility k/mu 3.91

**Log-Log****PTP1614**

Company Petrotech  
Field Lobitos  
Well LO16-14

Test Drawdown  
Date 04/12/95  
Gauge SPC



Flow Period # 4  
Rate 456 STB/day  
Rate Change 262 STB/day  
P at dt=0 1601.08 psia  
Smoothing 0.1  
Pi 4216.22 psia  
  
Time Match 0.46 (hr)<sup>-1</sup>  
Pressure Match 0.00542 (psia)<sup>-1</sup>

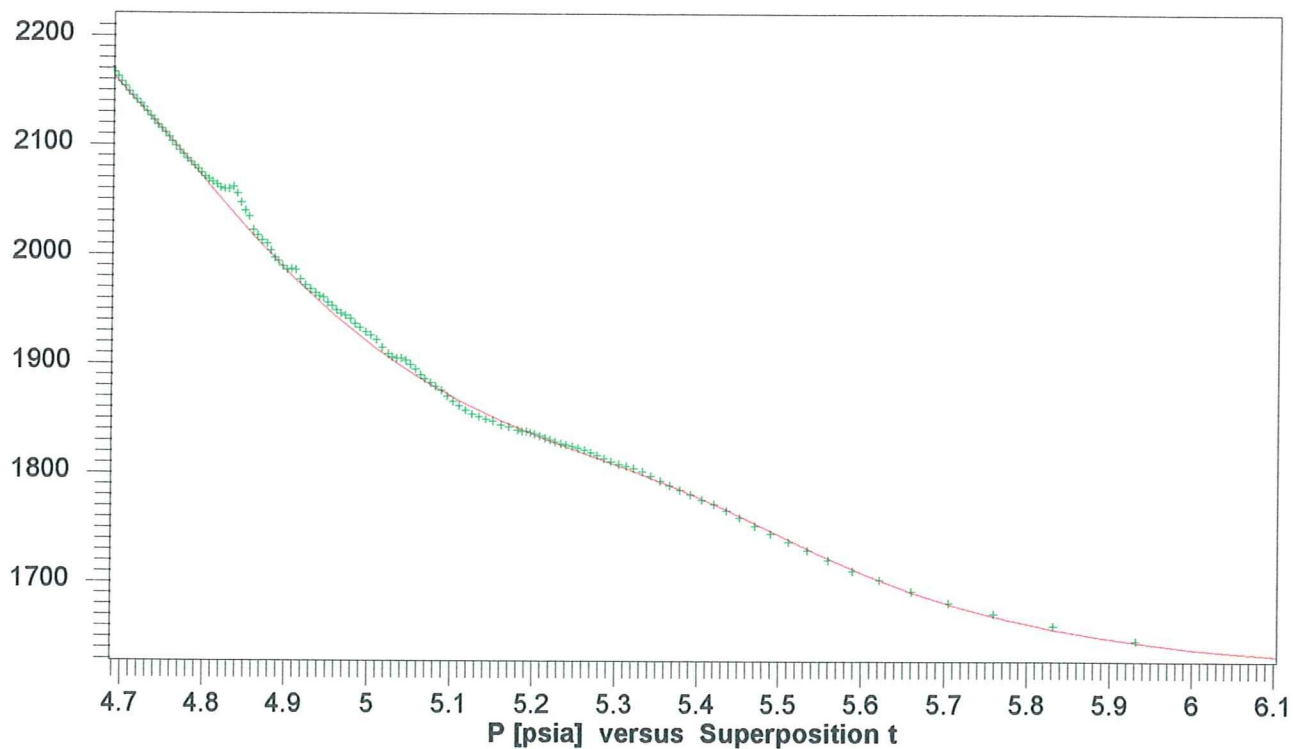
RESERVOIR Homogeneous  
BOUNDARY Infinite  
WELL Storage & Skin  
Storage C 0.31 STB/psi  
Ci/Cf 0.272781  
Alpha 6520  
Skin factor 0.51

kh 418 md.ft  
k 3.4 md  
Mobility k/mu 3.91  
Investig. R 183 ft

**Semi-Log****PTP1614**

Company Petrotech  
Field Lobitos  
Well LO16-14

Test Drawdown  
Date 04/12/95  
Gauge SPC



Flow Period # 4  
Rate 456 STB/day  
Rate Change 262 STB/day  
P at dt=0 1601.08 psia  
Pi 4216.22 psia  
Time Match 0.46 (hr)<sup>-1</sup>  
Pressure Match 0.00542 (psia)<sup>-1</sup>

RESERVOIR Homogeneous  
BOUNDARY Infinite  
WELL Storage & Skin  
Storage C 0.31 STB/psi  
Ci/Cf 0.272781  
Alpha 6520  
Skin factor 0.51

kh 418 md.ft  
k 3.4 md  
Mobility k/mu 3.91



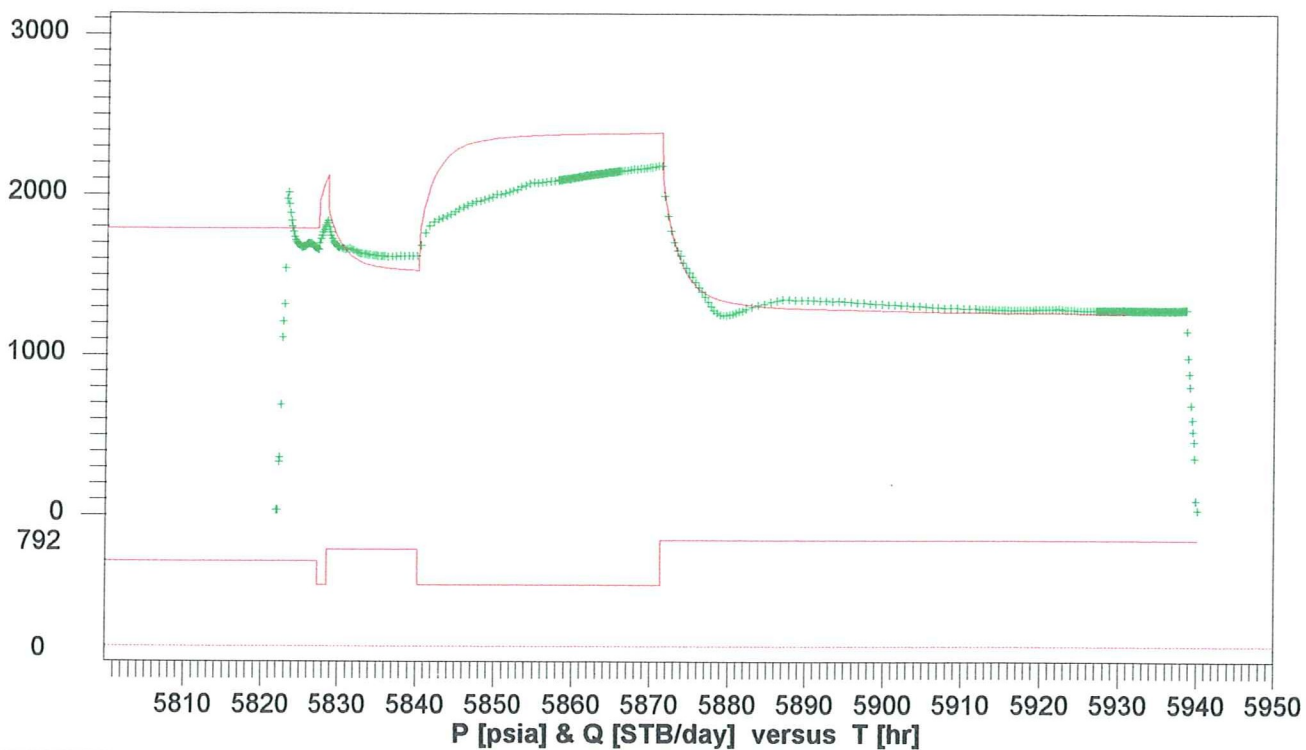


# Simulation

PTP1614A

Company Petrotech  
Field Lobitos  
Well LO16-14

Test Drawdown  
Date 04/12/95  
Gauge SPC



Flow Period # 5  
Rate 792 STB/day  
Rate Change 336 STB/day  
P at dt=0 2165.74 psia  
Pi 4216.19 psia  
Time Match 8.65 (hr)<sup>-1</sup>  
Pressure Match 0.0068 (psia)<sup>-1</sup>

RESERVOIR Homogeneous  
BOUNDARY Infinite  
WELL Storage & Skin  
Storage C 0.0358 STB/psi  
Ci/Cf 0.0933818  
Alpha 320  
Skin factor 11.6

kh 913 md.ft  
k 7.42 md  
Mobility k/mu 8.53



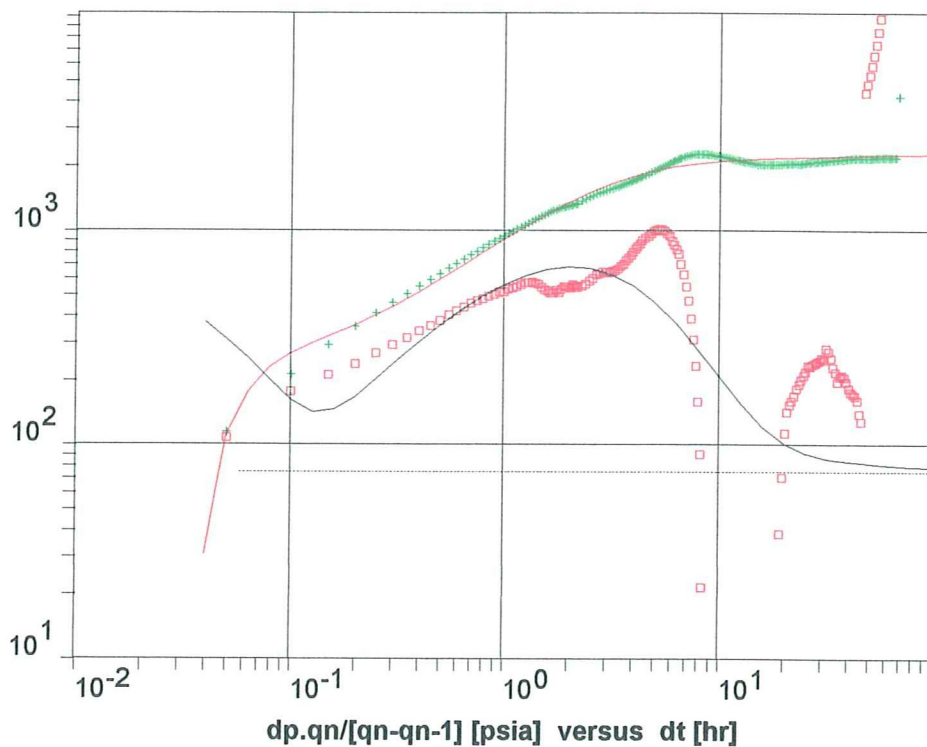


# Log-Log

PTP1614A

Company Petrotech  
Field Lobitos  
Well LO16-14

Test Drawdown  
Date 04/12/95  
Gauge SPC



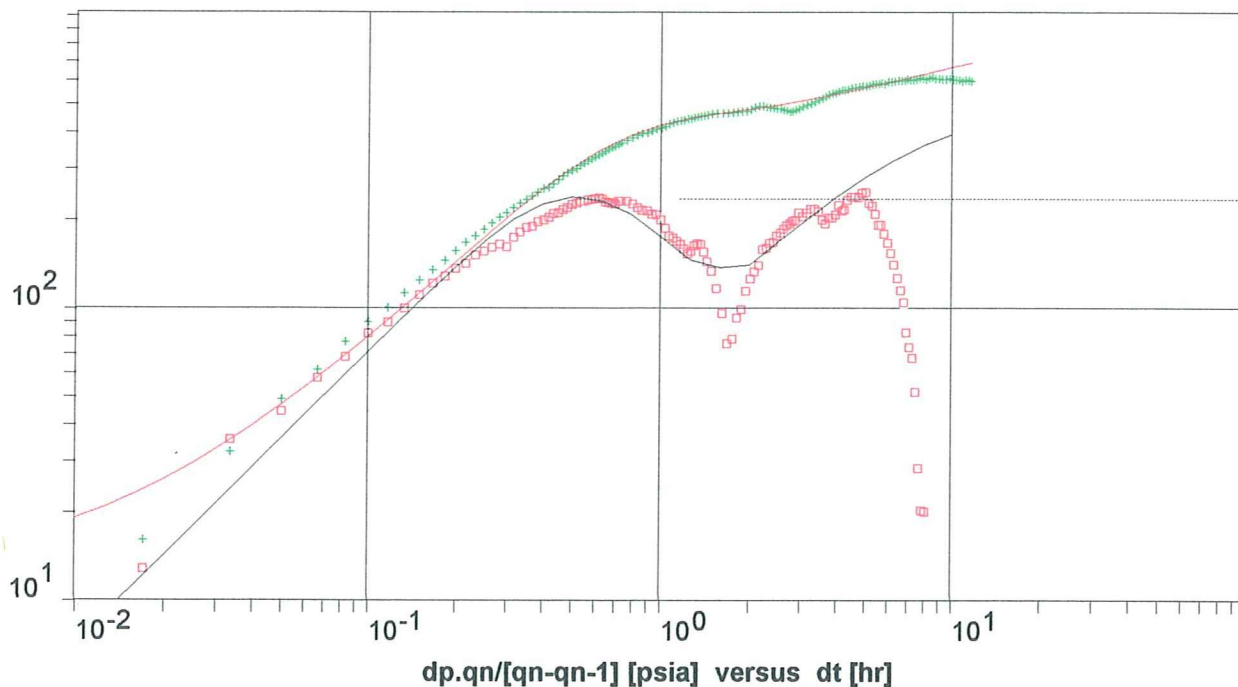
Flow Period # 5  
Rate 792 STB/day  
Rate Change 336 STB/day  
P at dt=0 2165.74 psia  
Smoothing 0.1  
Pi 4216.19 psia

Time Match 8.65 (hr)<sup>-1</sup>  
Pressure Match 0.0068 (psia)<sup>-1</sup>

RESERVOIR Homogeneous  
BOUNDARY Infinite  
WELL Storage & Skin  
Storage C 0.0358 STB/psi  
Ci/Cf 0.0933818  
Alpha 320  
Skin factor 11.6

kh 913 md.ft  
k 7.42 md  
Mobility k/mu 8.53  
Investig. R 402 ft

|                                                                                   |                |           |                 |          |
|-----------------------------------------------------------------------------------|----------------|-----------|-----------------|----------|
|  | <b>Log-Log</b> |           | <b>PTP1614B</b> |          |
|                                                                                   | Company        | Petrotech | Test            | Drawdown |
|                                                                                   | Field          | Lobitos   | Date            | 04/12/95 |
|                                                                                   | Well           | LO16-14   | Gauge           | SPC      |



Flow Period # 3  
 Rate 718 STB/day  
 Rate Change 262 STB/day  
 P at  $dt=0$  1814.38 psia  
 Smoothing 0.1  
 Pi 4216.22 psia  
  
 Time Match 0.43 (hr)<sup>-1</sup>  
 Pressure Match 0.00215 (psia)<sup>-1</sup>

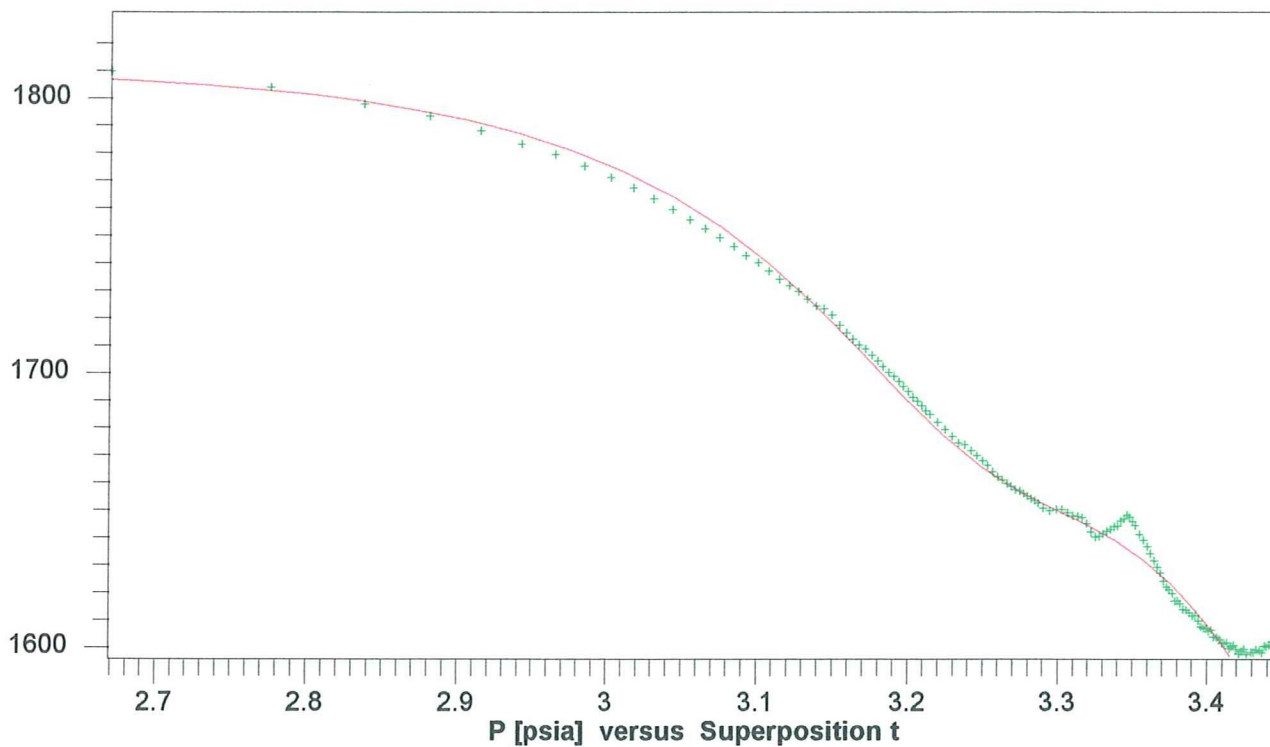
RESERVOIR Homogeneous  
 BOUNDARY Infinite  
 WELL Storage & Skin  
 Storage C 0.21 STB/psi  
 Ci/Cf 0.281319  
 Alpha 2870  
 Skin factor -2.73

kh 262 md.ft  
 k 2.13 md  
 Mobility  $k/\mu$  2.44  
 Investig. R 88.8 ft

**Semi-Log****PTP1614B**

Company Petrotech  
Field Lobitos  
Well LO16-14

Test Drawdown  
Date 04/12/95  
Gauge SPC



Flow Period # 3  
Rate 718 STB/day  
Rate Change 262 STB/day  
P at dt=0 1814.38 psia  
Pi 4216.22 psia  
  
Time Match 0.43 (hr)<sup>-1</sup>  
Pressure Match 0.00215 (psia)<sup>-1</sup>

RESERVOIR Homogeneous  
BOUNDARY Infinite  
WELL Storage & Skin  
Storage C 0.21 STB/psi  
Ci/Cf 0.281319  
Alpha 2870  
Skin factor -2.73  
  
kh 262 md.ft  
k 2.13 md  
Mobility k/mu 2.44

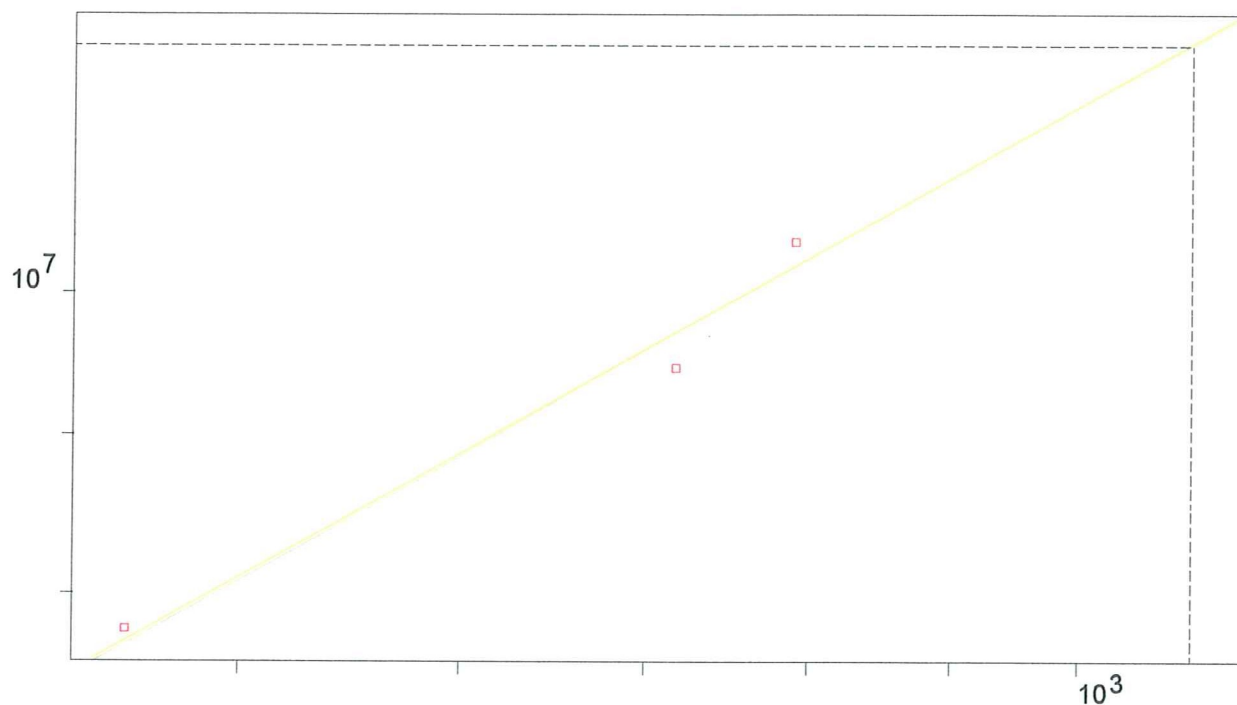


IPR

PTP1614

Company Petrotech  
Field Lobitos  
Well LO16-14

Test Drawdown  
Date 04/12/95  
Gauge SPC

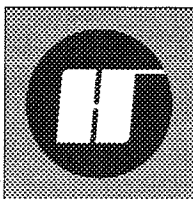


( $P_{avg}^2 - P_{wf}^2$ ) [psia<sup>2</sup>] versus  $Q_o$  [STB/day]

Fetkovitch I.P.R.  
Test type Flow after flow

Reservoir Pressure 3464.18 psia  
AOFP 1100 STB/day  
C 1.04347E-11, STB/day/psia\*\*2n  
n 1.98073

Test points 3



## History Listings

PTP1614

Company Petrotech  
Field Lobitos  
Well LO16-14  
Test Drawdown  
Date 04/12/95  
Gauge SPC  
Depth 9500' Wire Line

Formation interval Basal Salina  
Perforated interval 9460'-9664' MD

| Date     | Time     | FP # | Rate<br>STB/day | Duration<br>hr |
|----------|----------|------|-----------------|----------------|
| 04/12/95 | 11:18:00 | 1    | 636.000         | 5827.35        |
| 03/08/96 | 06:39:09 | 2    | 456.000         | 1.19727        |
|          | 07:50:59 | 3    | 718.000         | 11.7168        |
|          | 19:33:59 | 4    | 456.000         | 31.1333        |
| 05/08/96 | 02:41:59 | 5    | 792.000         | 68.8003        |

### Damage Determination Plot

