



**MINI FRAC & AFTER CLOSURE
ANALYSIS REPORT**

**Company Ltd.
100/00-00-000-00W0/0 (Surface 00-00)**

**Name Field – Name Formation
February 6 – 18, 2013**

DISTRIBUTION: Client Name/Company Ltd.

DEFINITIVE PROJECT COORDINATOR:

PREPARED BY: Definitive Optimization

DATE: March 7, 2013

SUMMARY OF RESULTS (MINI-FRAC)

1. Fracture closure time (t_c) was determined to be 4853.92 min.
2. Fracture closure pressure (P_c) was determined to be 9033 psia at the toe sleeve ($D_{\text{datum}} = 11344.0$ ftKB-TVD), 4140 psia at surface.
3. The instantaneous shut-in pressure was determined to be 11444 psia at D_{datum} , 6518 psia at surface, and therefore, the net fracture pressure was calculated to be 2411 psi. Closure time was initially difficult to assess, however, was further confirmed utilizing other available techniques.
4. Fracture gradient was determined to be 1.009 psi/ft.
5. Based on the G-function time (G_c) of 106.5, the fluid efficiency for the water injection was determined to be 98.2%.

SUMMARY OF RESULTS (AFTER-CLOSURE)

6. The derivative plot used for after closure flow regime identification indicates a transition into a late-time trend of approximate $-1/2$ slope signifying linear flow. The presence of pseudo-radial flow was not observed.
7. Although pseudo-radial flow was not observed, a late-time extrapolation was conducted on the radial plot to obtain a maximum permeability and pressure estimate. In addition, a late-time extrapolation was also conducted on the linear plot to obtain a minimum pressure estimate. Estimates from the straight-line analyses were used as starting parameters for simulation. The analysis was conducted using a fracture model. Since pseudo-radial flow was not observed, confidence in the results is low. However, the estimated reservoir pressure from simulation is within the pressure range obtained.
8. The initial reservoir pressure of 8698 psia at D_{datum} was obtained from simulation.
9. The flow capacity $(kh)_o$ was also obtained from simulation and was determined to be 0.111 md-ft. The effective permeability to oil (k_o) was therefore estimated to be 0.0074 md, based on a net pay of 15.0 feet.

RESULTS

Injection Pressure at D_{datum} , P_{inj} (psia)	12990
Instantaneous Shut In Pressure at Surface, ISIP (psia)	6518
Instantaneous Shut In Pressure at D_{datum} , ISIP (psia)	11444
Fracture Closure Pressure at Surface, P_c (psia)	4140
Fracture Closure Pressure at D_{datum} , P_c (psia)	9033
Net Fracture Pressure at D_{datum} , Δp_{net} (psi)	2411
Fracture Closure Time, t_c (min)	4853.9
G-Function Time, G_c	106.5
Fracture Gradient, (psi/ft)	1.009
Fluid Efficiency, (%)	98.2
Estimated Initial Reservoir Pressure at D_{datum} , P_{Ri} (psia)	8698
Total Fluid-Loss/Leakoff Coefficient, C_{L} (ft/min ^{-1/2})	2.22e-4
Reservoir Fluid-Loss/Leakoff Coefficient, C_{R} (ft/min ^{1/2})	1.69e-4
Flow Capacity, $(kh)_o$ (md.ft)	0.1110
Permeability to Oil, k_o (md)	0.0074
Fracture Half-Length, X_f (ft)	80.0
Choked Fracture Skin, s_c	0.0
Skin equivalent to X_f , s_{xf}	-4.9
Apparent Skin, s'	-4.9

Atmospheric Pressure: 13.489 psi

RESERVOIR PARAMETERS

Net Pay, h (ft)	15.0
Effective Horizontal Well Length, L_e (ft)	9453.0
Porosity, ϕ_i (%)	6.0
Gas Saturation, S_g (%)	0.0
Oil Saturation, S_o (%)	74.0
Water Saturation, S_w (%)	26.0
Temperature, T_R (°F)	270.0

Source : Company Energy Inc.

GAS PROPERTIES

Gas Relative Density, G (air = 1)	N/A
Gas Composition, N_2 (%)	N/A
Gas Composition, CO_2 (%)	N/A
Gas Composition, H_2S (%)	N/A
Pseudo Critical Pressure, P_c (psi)	N/A
Pseudo Critical Temperature, T_c (K)	N/A

Source : N/A

OIL PROPERTIES

Oil API, ($^\circ$ API)	43.0
Oil Density, (lb/ft ³)	50.62

Source : Company Energy Inc.

WATER PROPERTIES (Treating Fluid)

Water Specific Gravity.....	1.000
Fluid Composition	Fresh Water
Surface Fluid Temperature (°F)	N/A

Source : Company Energy Inc.

INJECTION

Final Injection/Pump Rate (bbl/min).....	6.07
Final Injection/Pump Rate (bbl/d).....	8737.74
Water Injection Volume (bbl).....	167.0*
Pump Time (min).....	27.52

Source : Company Energy Inc., * Includes 42 bbl, 9.9 ppg brine, ** Final pump time 24.4 min.

DOWNHOLE CONFIGURATION

Well Type	Horizontal Oil
Well License	0000000
KB, (ft)	00.0
GL, (ft)	00.0
KB - GL, (ft)	0.0
Frac String Depth, (ftKB-MD).....	00000.00
Frac String Depth, (ftKB-TVD).....	00000.00
Frac String O.D., (in)	0.00
Frac String Density, (lb/ft)	0.00
Intermediate Casing Depth, (ftKB-MD).....	00000.00
Intermediate Casing Depth, (ftKB-TVD).....	00000.00
Casing O.D. (in)	0.00
Casing Density, (lb/ft).....	0.00
Production Casing/Liner, (ftKB-MD).....	00000.00
Production Casing/Liner, (ftKB-TVD).....	00000.00
Casing/Liner O.D. (in)	0.00
Casing/Liner Density, (lb/ft).....	0.00
PBTD, (ftKB-MD).....	00000.00
PBTD, (ftKB-TVD)	00000.00
Packer Depth, (ftKB-MD)	00000.00
Packer Depth, (ftKB-TVD).....	00000.00
Stage Top, (ftKB-MD).....	00000.00
Stage Top, (ftKB-TVD).....	00000.00
Stage Bottom, (ftKB-MD)	00000.00
Stage Bottom, (ftKB-TVD).....	00000.00
D _{datum} , (ftKB-MD)	00000.00
D _{datum} , (ftKB-TVD).....	00000.00

Source : Company Energy Inc.

www.wtaservices.com (P09284)

Definitive Optimization

AER/OGC Requirements – Oil/Gas Optimization - Technical Services
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Website: www.defopt.com

Company Energy Inc.
100/00-00-000-00W0/0 (Surface 00-00)
Name Field / Name Formation
February 6 – 18, 2013 DFIT

Total Test

Measured pressures were converted from surface to 11344.0 ftKB-TVD (Ddatum).

**End Injection
Well Shut In For Falloff**

Date 2013/02/06 13:19:23
t 2.90 h
 Δt 0.41 h
p_{data} 12990.0 psi(a)
q_w -8737.74 bbl/d

ISIP (surface) 6518.3 psi(a)
ISIP (D) 11443.9 psi(a)
D_{datum} 11344.000 ft
Frac grad 1.009 psi/ft

ISIP

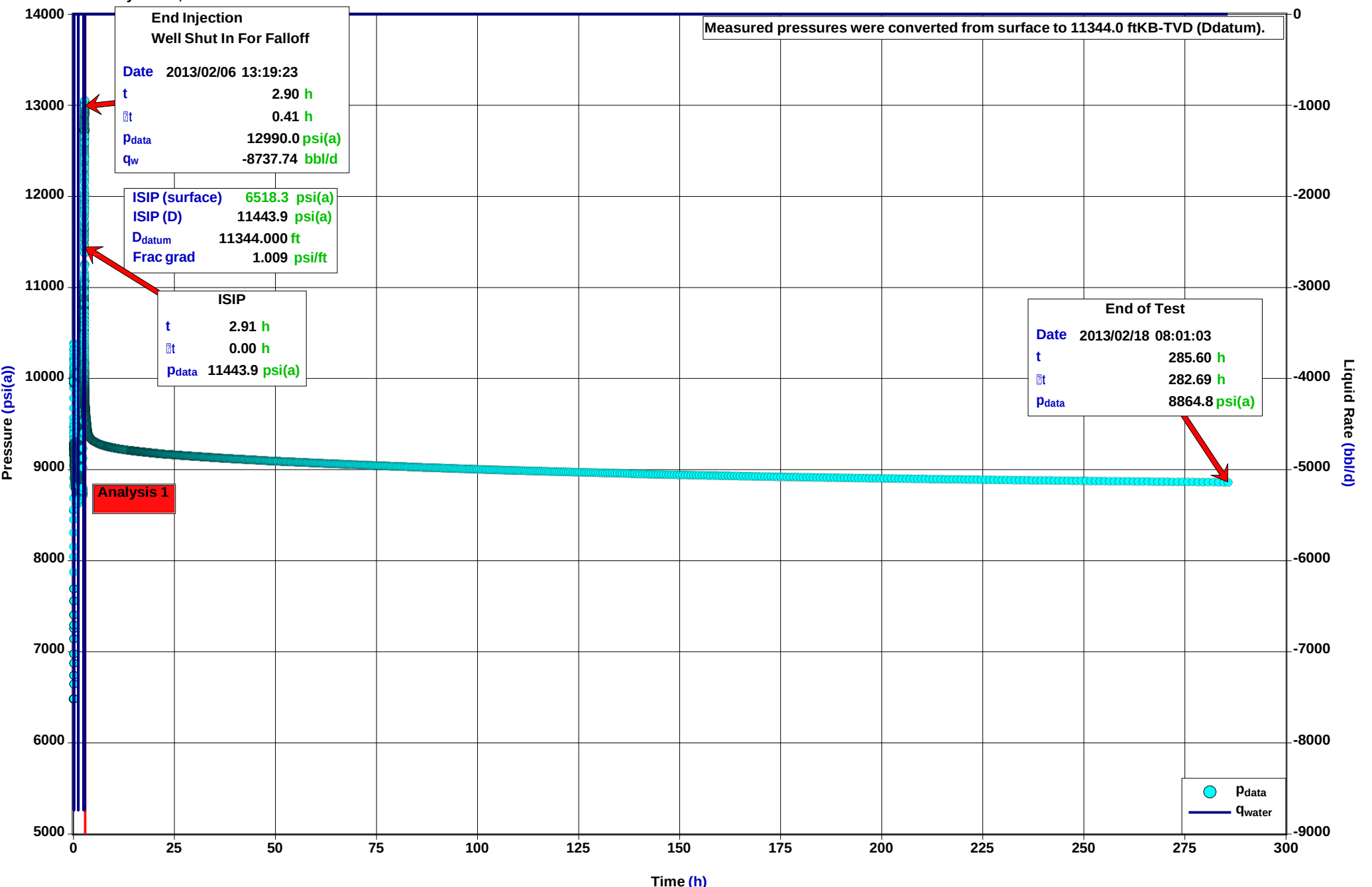
t 2.91 h
 Δt 0.00 h
p_{data} 11443.9 psi(a)

End of Test

Date 2013/02/18 08:01:03
t 285.60 h
 Δt 282.69 h
p_{data} 8864.8 psi(a)

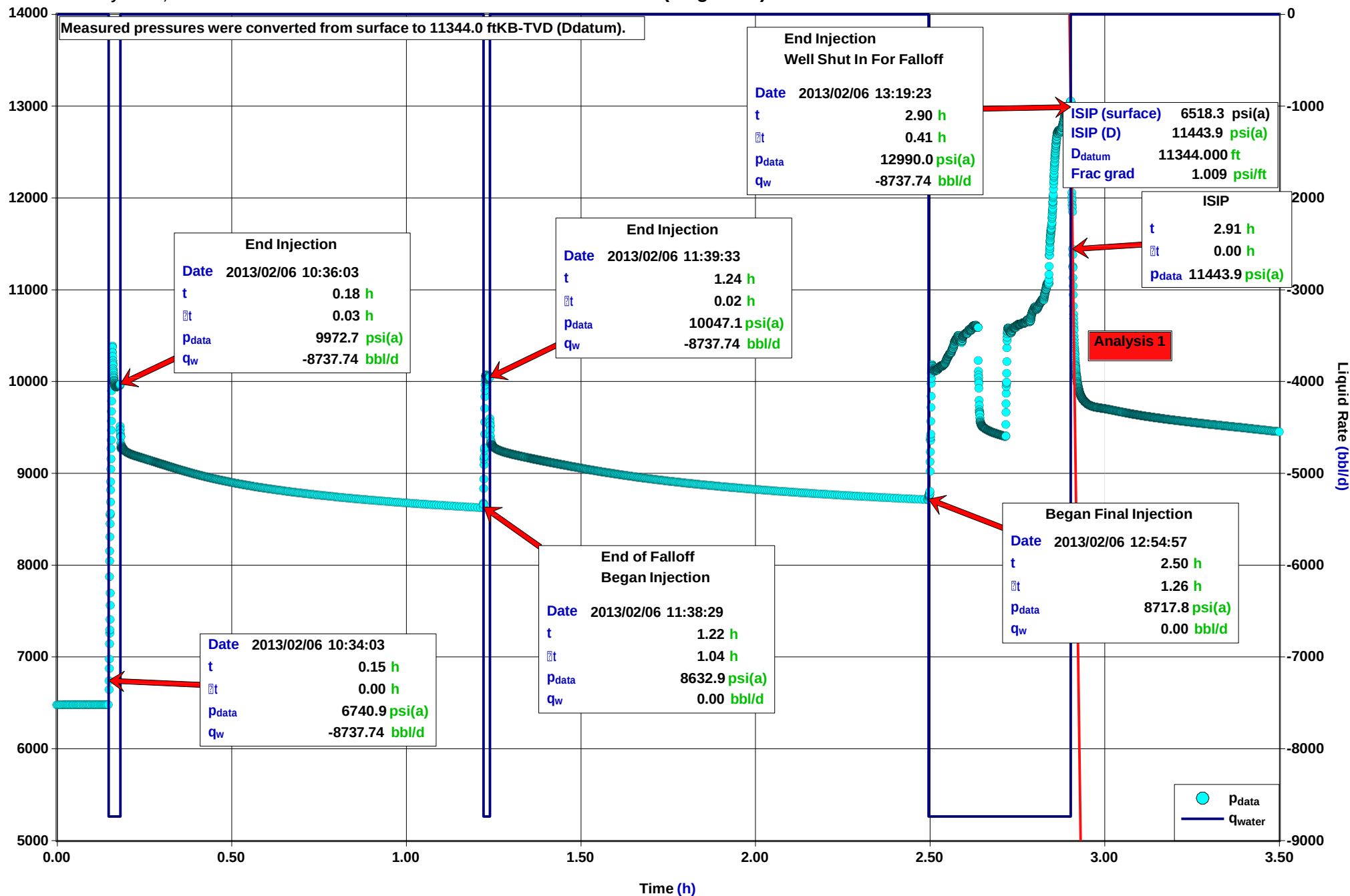
Analysis 1

● p_{data}
— q_{water}



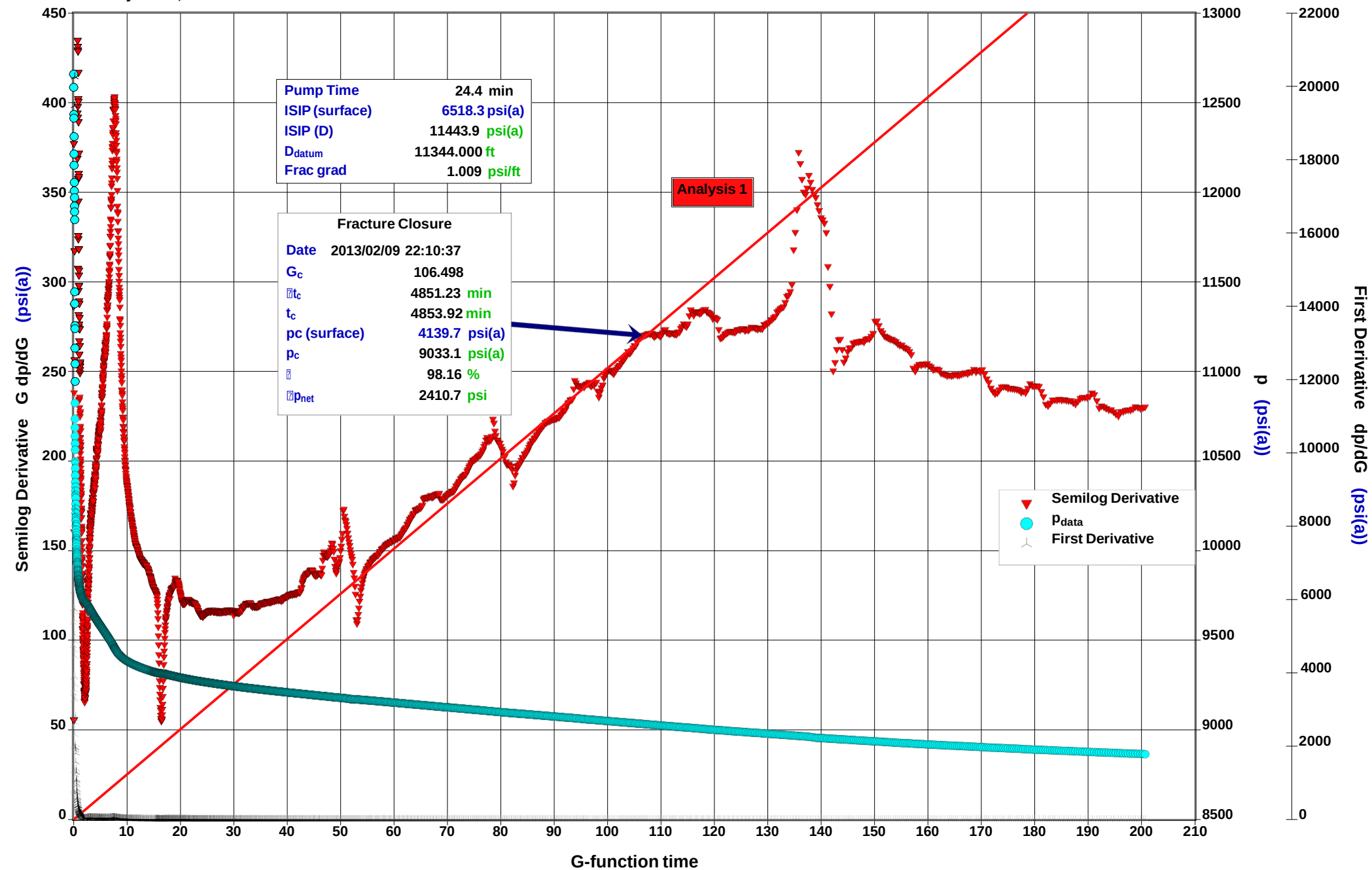
Company Energy Inc.
100/00-00-000-00W0/0 (Surfac 00-00)
Name Field / Name Formation
February 6 – 18, 2013 DFIT

Total Test (Magnified)



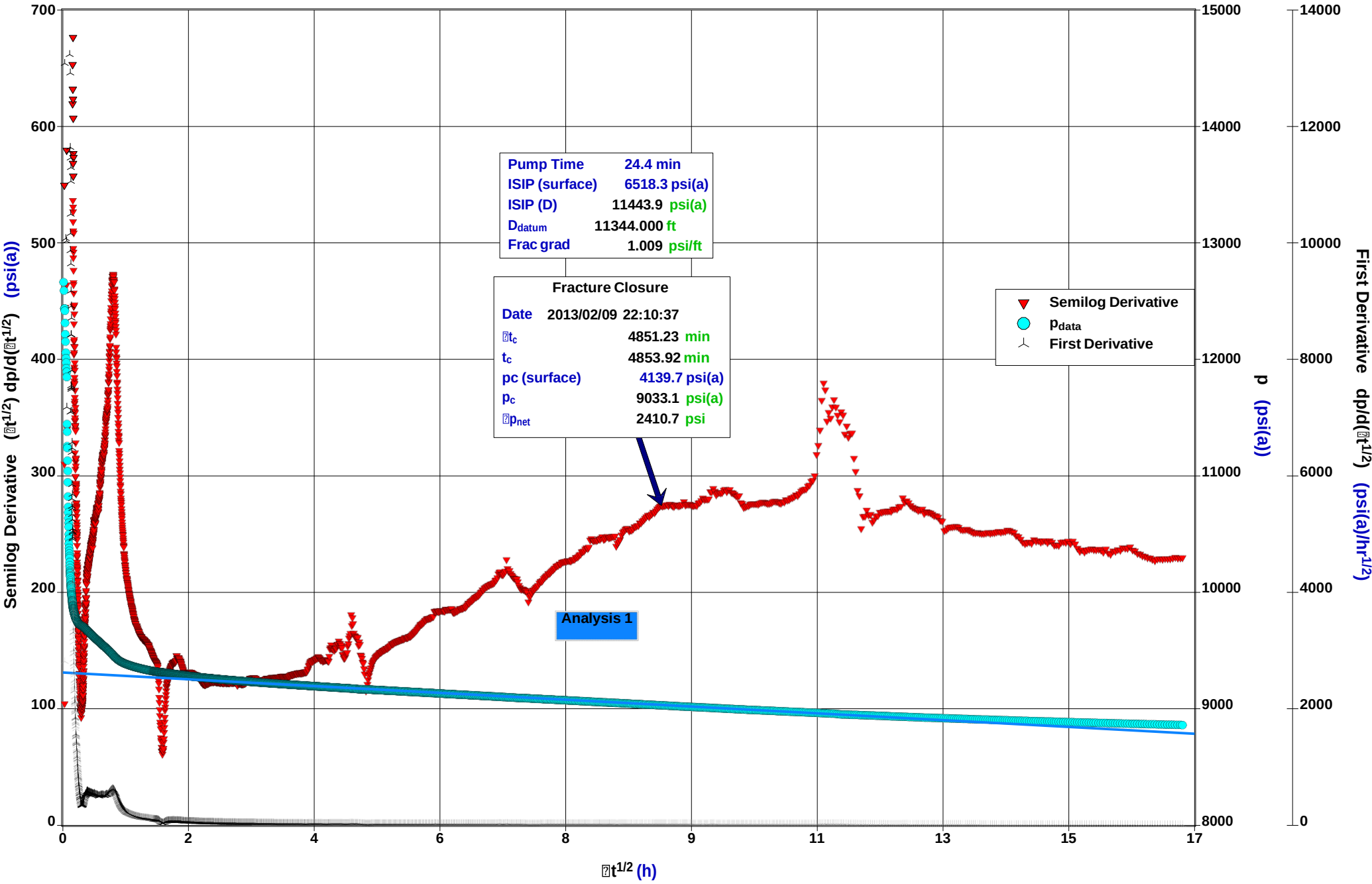
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100/00-00-000-00W0/0 (Surface 00-00)
Name Field / Name Formation
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G-Function



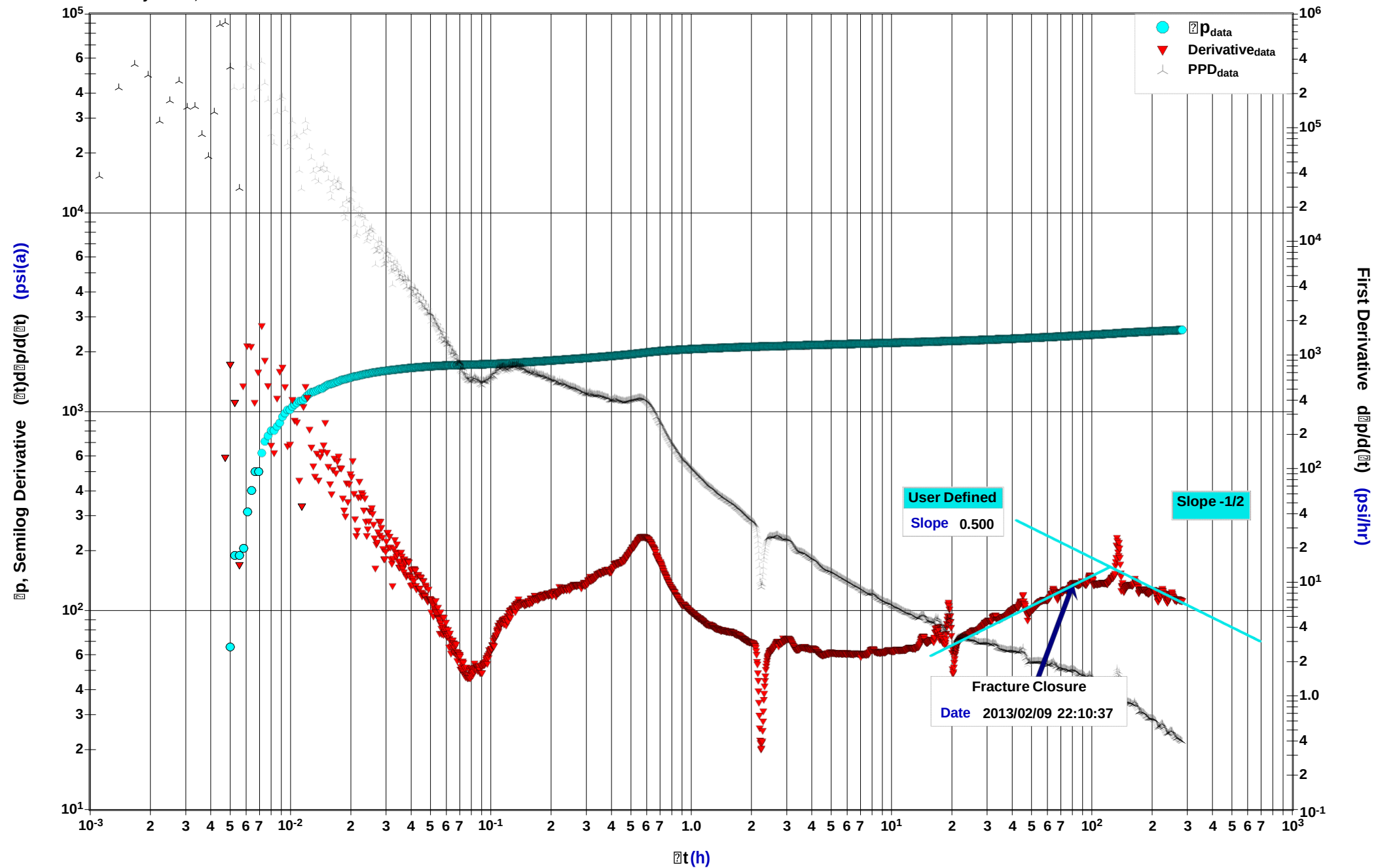
Company Energy Inc.
100/00-00-000-00W0/0 (Surface 00-00)
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MiniFrac Sqrt(t)



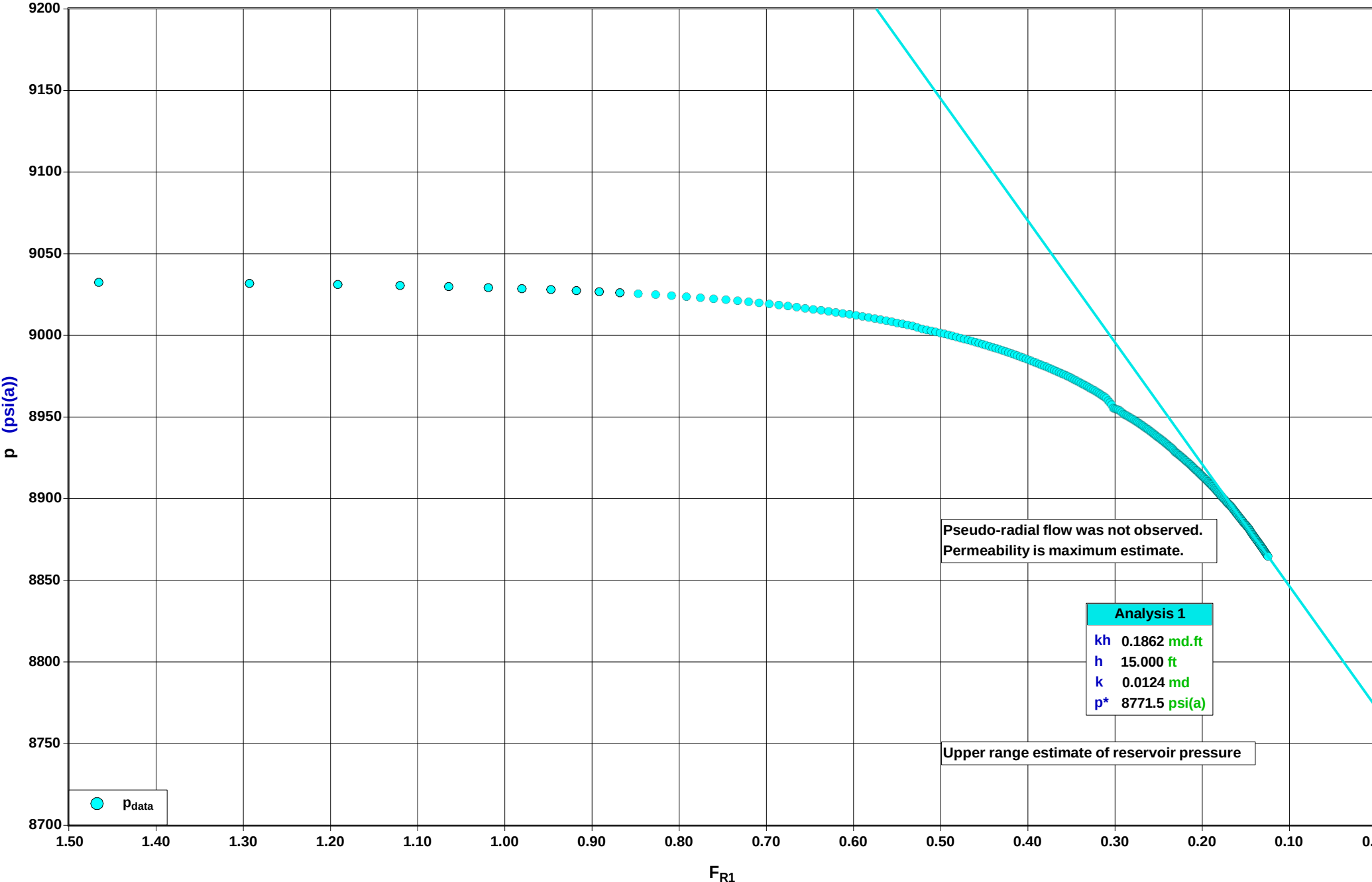
Company Energy Inc.
 100/00-00-000-00W0/0 (Surface 00-00)
 Name Field / Name Formation
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Derivative



Company Energy Inc.
100/00-00-000-00W0/0 (Surface 00-00)
Name Field / Name Formation
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Minifrac Radial (Nolte)



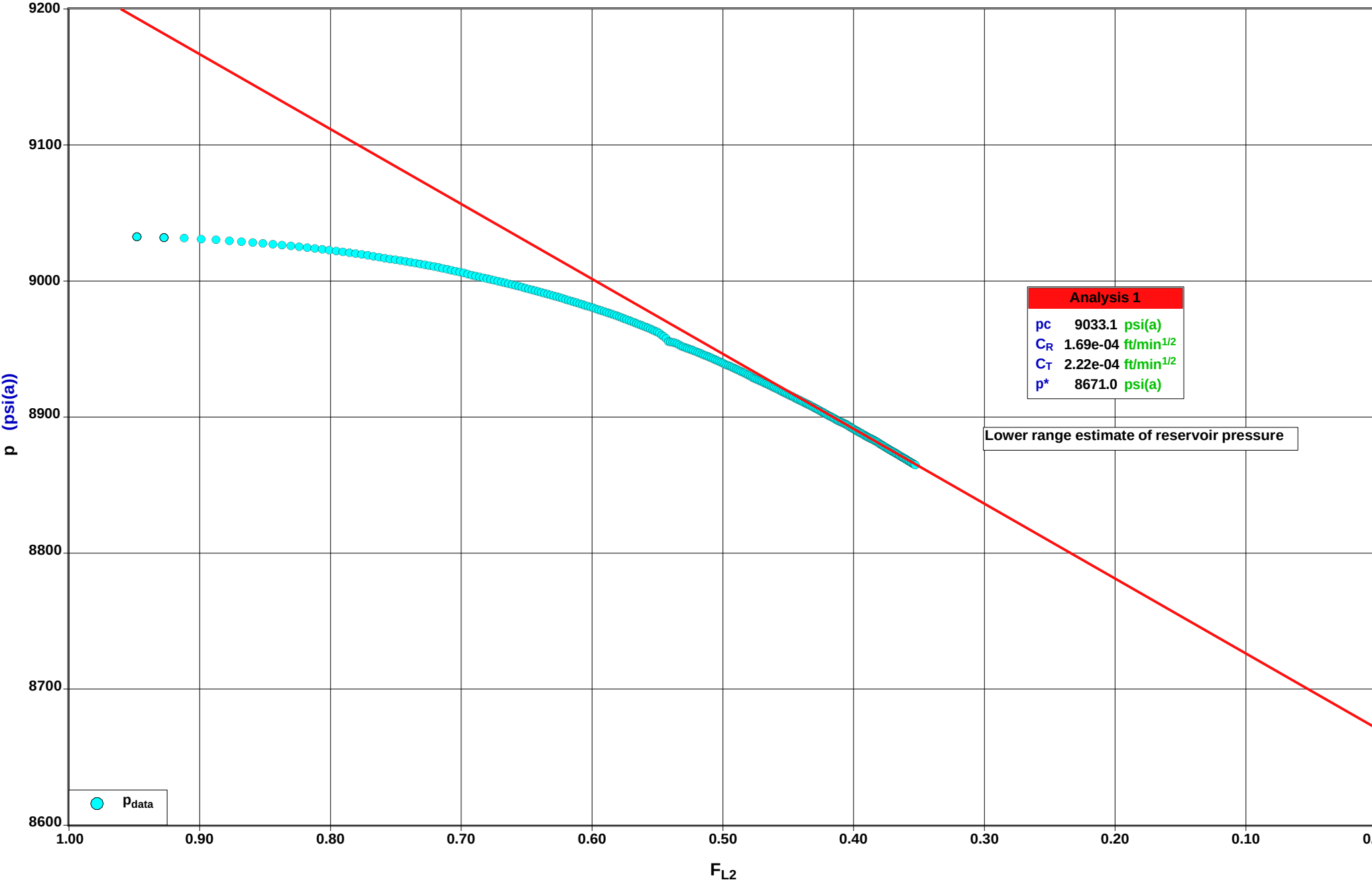
Analysis 1	
kh	0.1862 md.ft
h	15.000 ft
k	0.0124 md
p*	8771.5 psi(a)

Pseudo-radial flow was not observed.
Permeability is maximum estimate.

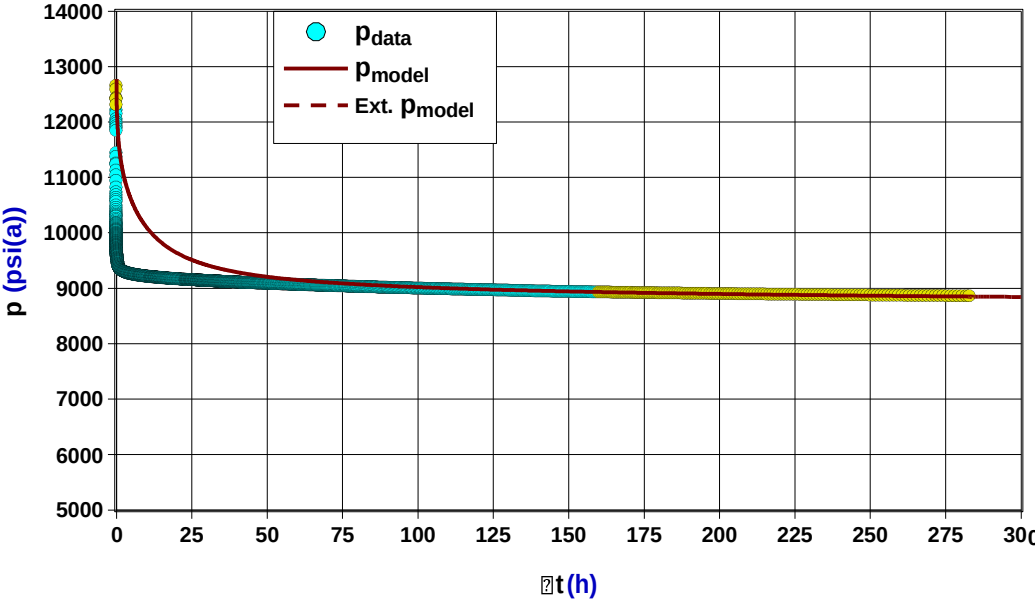
Upper range estimate of reservoir pressure

Company Energy Inc.
100/00-00-000-00W0/0 (Surface 00-00)
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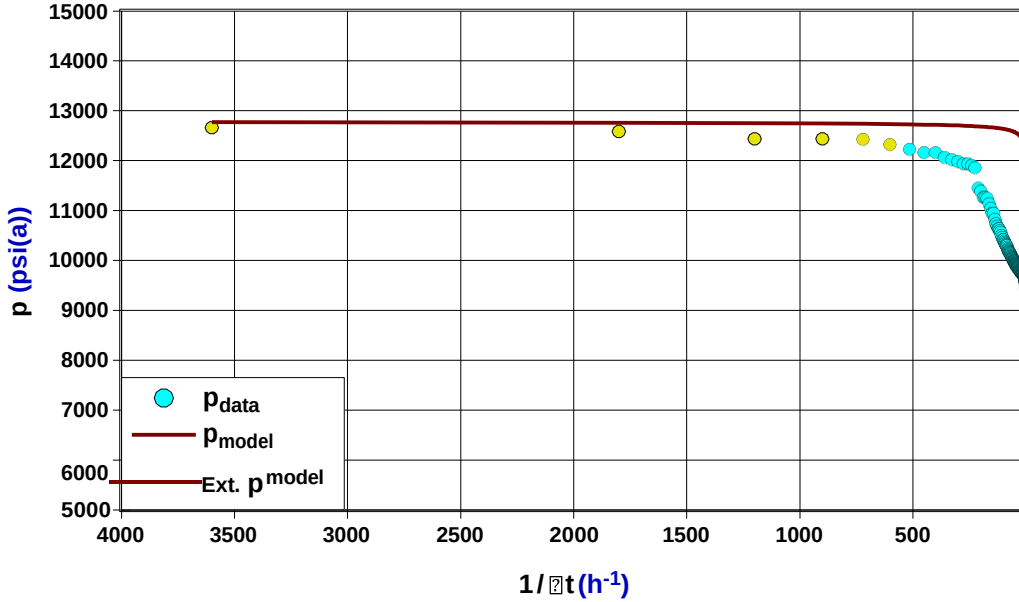
Minifrac Linear (Nolte)



Early Time

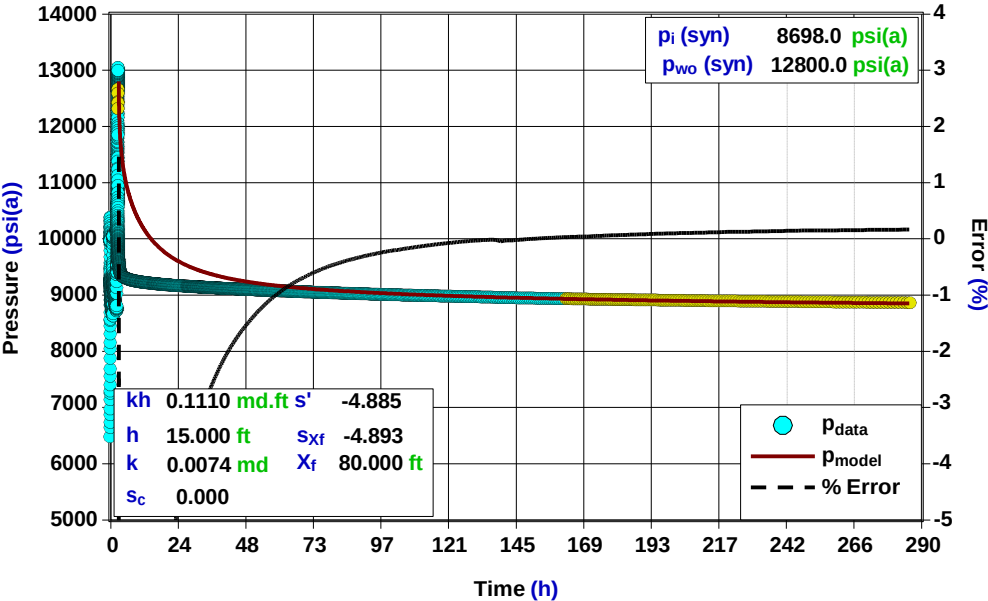


Late Time

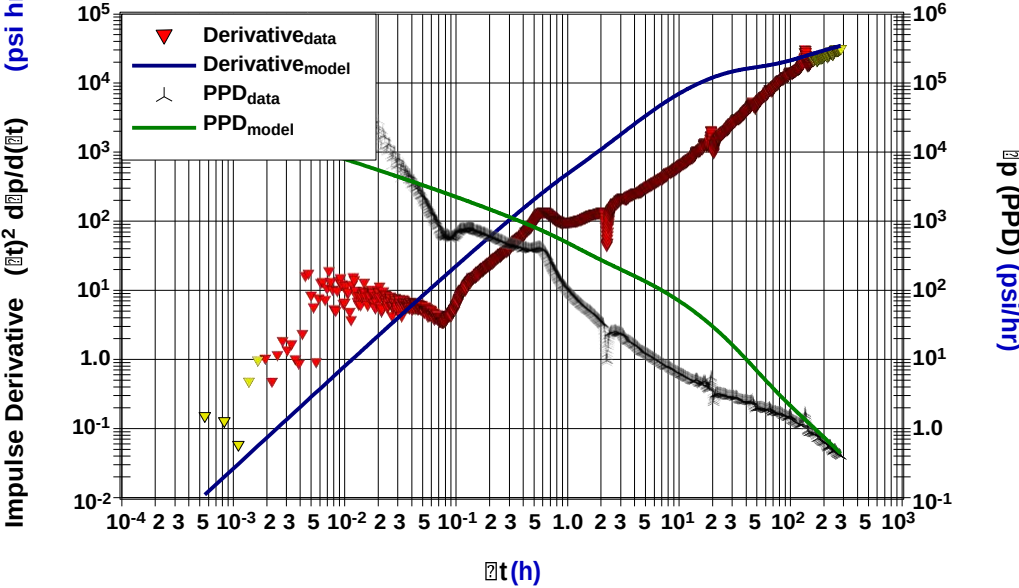


Simulation attempts were conducted with a primary focus on the late-time and early-time data to obtain estimates of pressure and permeability.

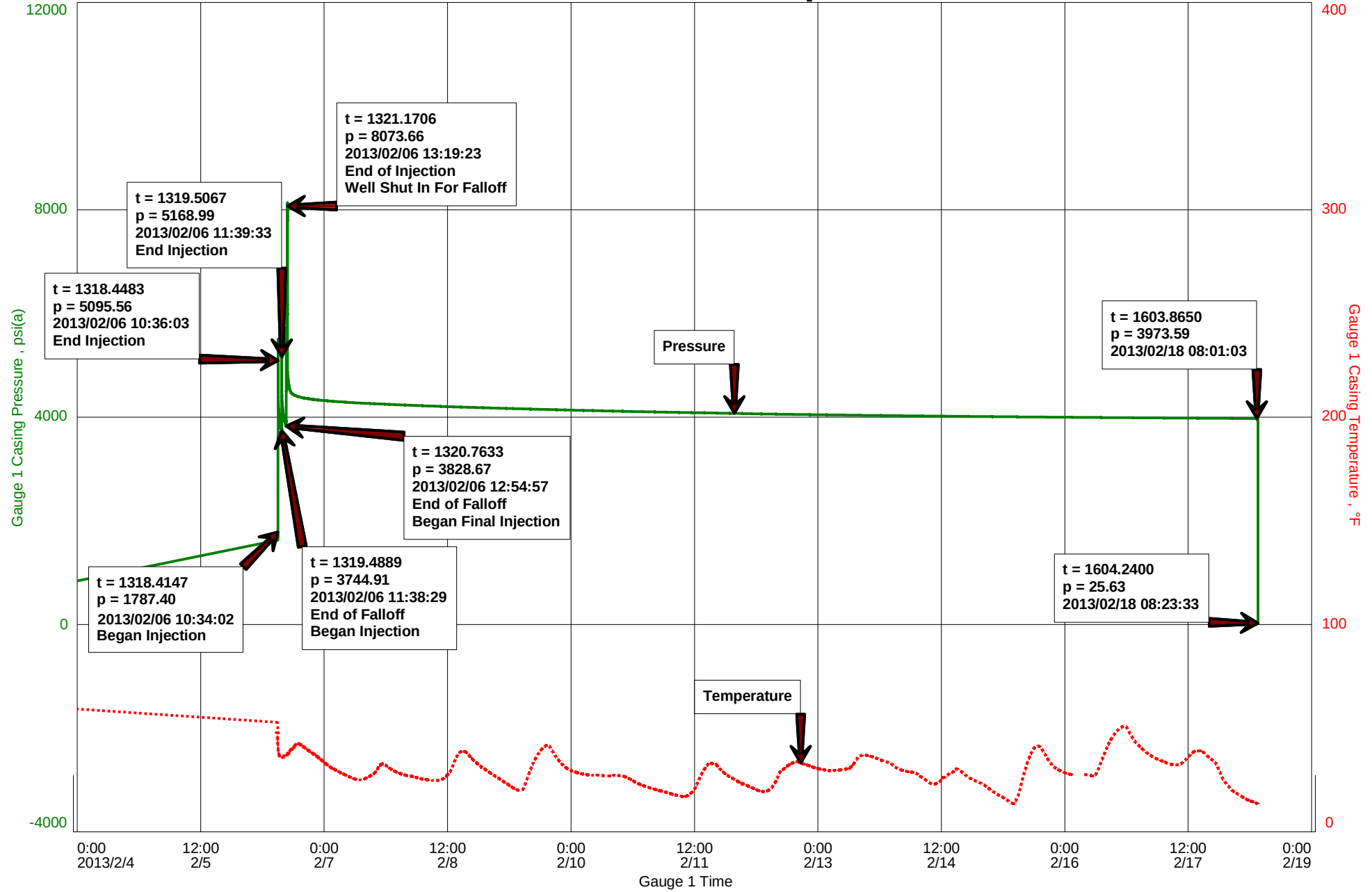
History



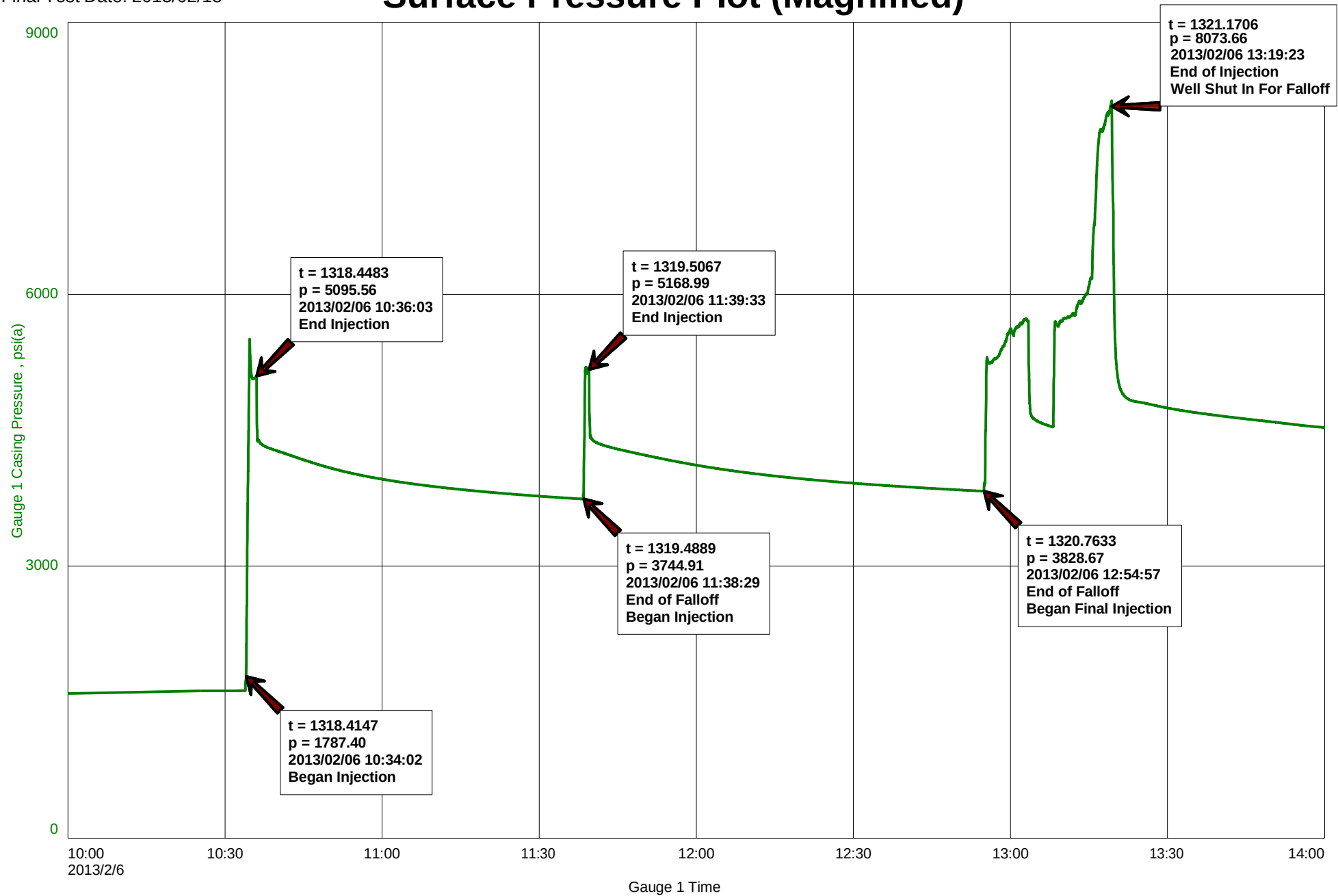
Derivative



Surface Pressure and Temperature Plot



Surface Pressure Plot (Magnified)



Company Ltd.
Well Name
100/00-00-000-00W0/0 (Surface 00-00)

Name Field – Name Formation
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* **TERMS:** The interpretations and conclusions presented in this report are the opinions based on information from geological, engineering and other available data. This report embodies the author's best, sound engineering practices and efforts and the results are not and should not be guaranteed. The author does not guarantee the accuracy of geological, engineering and other available data and interpretation provided for use in this analysis. The author does not accept any responsibility and shall not be liable in negligence or otherwise, for any loss or damage resulting from the possession or use of the report in terms of correctness or otherwise. The use and application of this report in whole or part is exclusively at the user's own risk. The release of liability shall also be binding upon the client's permitted assigns, administrators, heirs, executors and successors. The author's liability to the client shall not exceed the amount of fees it received for performing the services under this agreement under no circumstances.