SWD-918



FRACPRO 8.0
Hydraulic Fracture Analysis - Frac #1

WellName: Dugan Production Company : Slick Water Frac
Location: Mesa SWD #4 : Prepared For: John Alexander
Format'n: Point Lookout : Prepared By: Mike McNeese
Job Date: October 21th, 2004 :
Filename: Mesa SWD #4-Slick Water-10-13 :

## Fracture Simulation Options

FRACPRO 3D Model
Run From Database Data
Proppant Convection
Lithology Based Reservoir
Vertical Fracture
Model Wellbore and Perforations

## Results Summary

| | | | |
|---|---|---|---|
| Model has run until (min) | 49.40 | Fracture efficiency | 0.15 |
| Fracture length (ft) | 359.49 | Propped length (ft) | 346.51 |
| Fracture upper height (ft) | 175.85 | Propped upper height (ft) | 162.23 |
| Fracture lower height (ft) | 207.57 | Propped lower height (ft) | 207.34 |
| Max width at well (in) | 0.43 | Avg. prop. conc. (lb/ft²) | 0.50 |
| Dimensionless Cond. Ratio | 13.49 | | |
| Total fluid (bbls) | 1752.25 | Total sand (klbs) | 100.91 |
| Min Surface Pressure (psi) | 1643.34 | Max Surface Pressure (psi) | 2774.27 |
| Max Hydraulic Power (hp) | 4279.58 | Avg Hydraulic Power (hp) | 2775.22 |

| Dist from Wbore (ft) | 0 | 45 | 90 | 135 | 180 | 225 | 270 | 315 | 359 |
|---|---|---|---|---|---|---|---|---|---|
| Width @ Center (in) | 0.43 | 0.43 | 0.42 | 0.40 | 0.37 | 0.34 | 0.29 | 0.21 | 0.00 |

## Data Channels Used

Database file: \\fnp1-far-nm-555\home\MMcNeese\Dugan-Real Time

| Channel ID | Channel Name |
|---|---|
| EM06 | Pressure |
| UD50 | Clean Rate |
| UE53 | Sand Conc. |

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Concentration of Proppant in Fracture (lb/ft²)

| Stage # | Length (ft) | UpperHt (ft) | LowerHt (ft) | Upper Conc (lb/ft²) | Lower Conc (lb/ft²) |
|---|---|---|---|---|---|
| 0 | Has Leaked Off | | | | |
| 1 | 356.6 | 188.9 | 191.5 | 0.00 | 0.00 |
| 2 | 346.5 | 178.1 | 191.5 | 1.09 | 0.27 |
| 3 | 314.9 | 178.1 | 157.8 | 1.26 | 0.36 |
| 4 | 251.1 | 178.1 | 89.7 | 0.49 | 0.49 |

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Fracture Conductivity (mD·ft)

| Stage # | Length (ft) | UpperHt (ft) | LowerHt (ft) | Upper Cond (mD·ft) | Lower Cond (mD·ft) |
|---|---|---|---|---|---|
| 0 | Has Leaked Off | | | | |
| 1 | 356.6 | 188.9 | 191.5 | 0 | 0 |
| 2 | 346.5 | 178.1 | 191.5 | 1131 | 278 |
| 3 | 314.9 | 178.1 | 157.8 | 1310 | 371 |
| 4 | 251.1 | 178.1 | 89.7 | 509 | 509 |

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Treatment Schedule

| Stg # | Elapsed Time min:sec | Fluid Type | Clean Volume (kgal) | Prop Conc. (ppg) | Stage Prop. (klbs) | Slurry Rate (bpm) | Proppant Type |
|---|---|---|---|---|---|---|---|
| W'bore Fluid | | 2% KCL Water | 4.4 | | | | |
| 1 | 9:07 | SLICKWATER | 23.0 | 0.00 | 0.0 | 60.00 | |
| 2 | 15:12 | SLICKWATER | 15.0 | 0.50 | 7.5 | 60.00 | Brady2040-Fm |
| 3 | 23:30 | SLICKWATER | 20.0 | 1.00 | 20.0 | 60.00 | Brady2040-Fm |
| 4 | 38:20 | SLICKWATER | 35.0 | 1.50 | 52.5 | 60.00 | Brady2040-Fm |
| 5 | 46:59 | SLICKWATER | 20.0 | 2.00 | 40.0 | 60.00 | Brady2040-Fm |
| 6 | 48:34 | SLICKWATER | 4.0 | 0.00 | 0.0 | 60.00 | |
| 7 | 49:23 | SHUT-IN | 0.0 | 0.00 | 0.0 | 0.00 | |

Scheduled clean vol (kgal) 117.00 Scheduled sand total (klbs) 120.00
Scheduled slurry vol (kgal) 122.43

Treatment Schedule totals may not correspond to actual job totals.

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## Fluid Parameters

All Fluid info is at a reservoir temperature of 107.0 (°F)
All Viscosities at Shear Rate of 511 (1/sec)

| Fluid Name | 2% KCL Water | SLICKWATER |
|---|---|---|
| Init. Rheology | | |
| Viscosity | 1.01 | 3.51 |
| n' | 1.000 | 0.950 |
| K' | 2.100e-05 | 1.000e-04 |
| Rheology @ 4.0 hours | | |
| Viscosity | 1.01 | 3.51 |
| n' | 1.000 | 0.950 |
| K' | 2.100e-05 | 1.000e-04 |
| Gel Density | 1.01 | 1.01 |
| Spurt Loss | 0.0 | 0.0 |
| Wall Building | 0.0 | 0.0 |
| Flowrate #1 | 10.00 | 10.00 |
| Fric Press #1 | 14.95 | 12.68 |
| Flowrate #2 | 20.00 | 20.00 |
| Fric Press #2 | 52.20 | 29.02 |
| Flowrate #3 | 40.00 | 40.00 |
| Fric Press #3 | 182.2 | 66.41 |
| WB Fric Mult | 1.000 | 1.000 |

Wellbore Friction pressures shown are the interpolated values multiplied by the Wellbore Friction Multiplier.

Viscosity is displayed in (cp)
K' is displayed in (lbf·s^n/ft²)
Gel Density is displayed as (sg)
Spurt Loss is displayed in (gal/ft²)
Wall Building is displayed in (ft/min½)
Friction pressure is displayed in (psi/1000 ft)
Friction is displayed for longest wellbore segment

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## Leakoff Parameters

| | |
|---|---|
| Reservoir type | Gas |
| Filtrate to reservoir fluid perm. ratio, Kp/Kl | 10 |
| Reservoir pore pressure (psi) | 1887 |
| Initial fracturing pressure (psi) | 3470 |
| Reservoir fluid compressibility (1/psi) | 5.30e-004 |
| Cold filtrate viscosity (cp) | 1.00 |
| Hot filtrate viscosity (cp) | 1.00 |
| Cold reservoir viscosity (cp) | 0.03 |
| Hot reservoir viscosity (cp) | 0.03 |
| Porosity | 0.10 |
| Gas Leakoff Percentage | 100.00 |

## Reservoir Parameters

Reservoir temperature (°F) 107.00

Perforated Interval and Initial Frac Depth are for Frac #1

| | |
|---|---|
| Depth to center of Perfs (ft) | 4339 |
| Perforated interval (ft) | 102 |
| Initial frac depth (ft) | 4339 |

## Layer Parameters

| Lay # | Top of zone (ft) | Stress (psi) | Top of zone (ft) | Young's modulus (psi) | Poisson's ratio | Top of zone (ft) | Total Ct (ft/min½) | PoreFluid perm. (md) |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 3645 | 0.0 | 6.0e+06 | 0.25 | 0.0 | 1.270e-03 | 5.00e-02 |
| 2 | 4288.0 | 2907 | 4288.0 | 5.0e+06 | 0.20 | 4288.0 | 1.796e-03 | 1.00e-01 |
| 3 | 4390.0 | 2990 | 4390.0 | 4.0e+06 | 0.20 | 4390.0 | 5.680e-04 | 1.00e-02 |
| 4 | 4405.0 | 2953 | 4405.0 | 5.0e+06 | 0.20 | 4405.0 | 1.796e-03 | 1.00e-01 |
| 5 | 4410.0 | 3005 | 4410.0 | 4.0e+06 | 0.20 | 4410.0 | 5.680e-04 | 1.00e-02 |
| 6 | 4427.0 | 2970 | 4427.0 | 5.0e+06 | 0.20 | 4427.0 | 1.796e-03 | 1.00e-01 |
| 7 | 4438.0 | 3772 | 4438.0 | 6.0e+06 | 0.25 | 4438.0 | 1.270e-03 | 5.00e-02 |

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Lithology Parameters

| Layer # | Top of zone (ft) | Lithology | Top of zone (ft) | Fracture Toughness (psi) | Top of zone (ft) | Dilatancy Factor |
|---|---|---|---|---|---|---|
| 1 | 0.0 | Shale | 0.0 | 2000 | 0.0 | 1.00 |
| 2 | 4288.0 | Point Lookou | 4288.0 | 1000 | 4288.0 | 1.00 |
| 3 | 4390.0 | Sandy Shale | 4390.0 | 1000 | 4390.0 | 1.00 |
| 4 | 4405.0 | Point Lookou | 4405.0 | 1000 | 4405.0 | 1.00 |
| 5 | 4410.0 | Sandy Shale | 4410.0 | 1000 | 4410.0 | 1.00 |
| 6 | 4427.0 | Point Lookou | 4427.0 | 1000 | 4427.0 | 1.00 |
| 7 | 4438.0 | Shale | 4438.0 | 2000 | 4438.0 | 1.00 |

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Wellbore Configuration

| Segment Length (ft) | Segment Type | Tubing ID (in) | Tubing OD (in) | Casing ID (in) |
|---|---|---|---|---|
| 4427 | Casing | 0.000 | 0.000 | 4.950 |

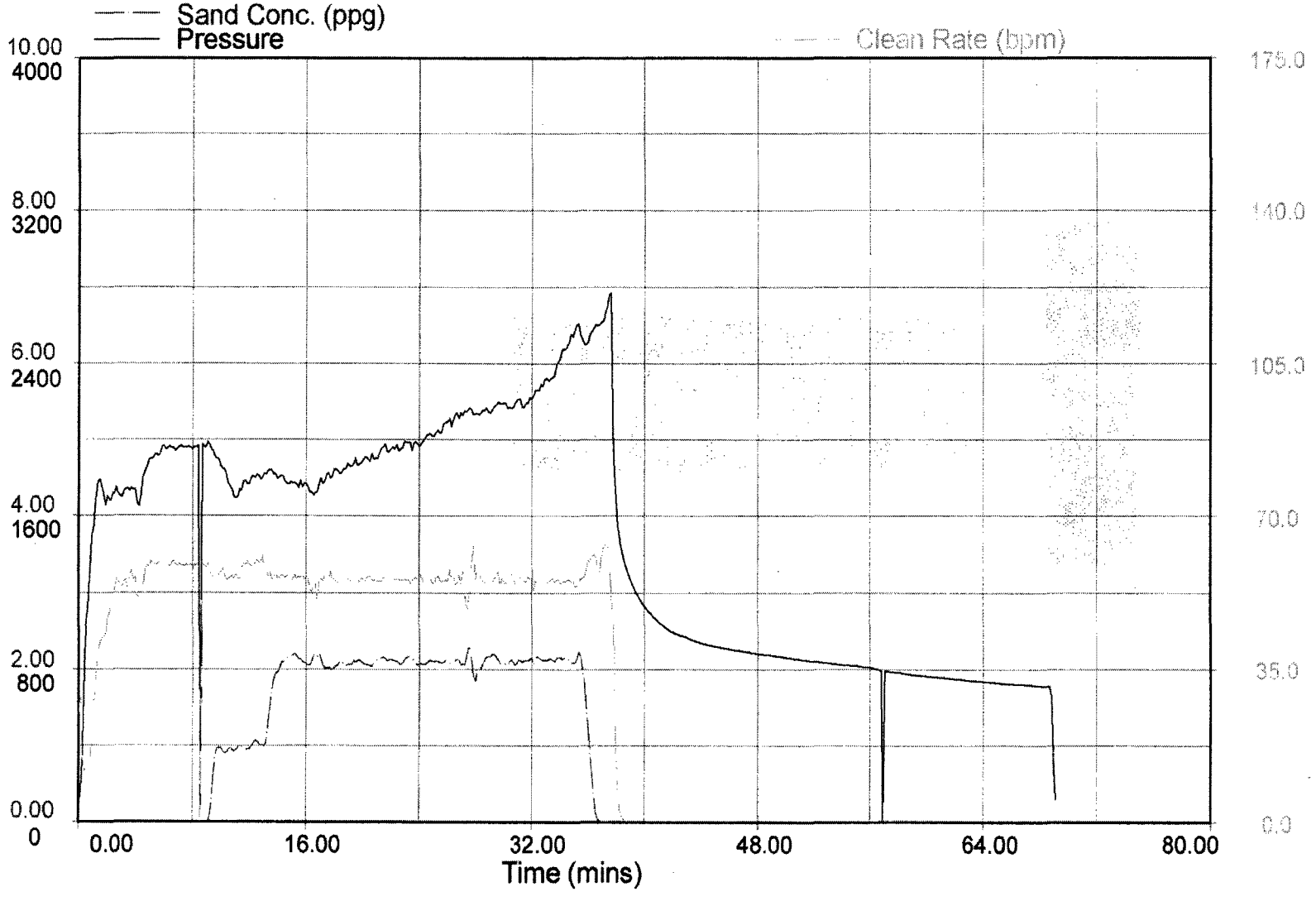
Tubular Goods are defined to the TOP of the deepest set of perforations that are being modeled.

| | Frac #1 | Frac #2 | Frac #3 |
|---|---|---|---|
| Top of Perfs - TVD (ft) | 4288 | 4405 | 4427 |
| Bot of Perfs - TVD (ft) | 4390 | 4410 | 4438 |
| Perf Diameter (in) | 0.380 | 0.380 | 0.380 |
| # of Perfs | 102 | 5 | 9 |

Near Wellbore Friction Parameters & Perf Multiplier

| Time min:sec | Flow Rate #1 (bpm) | Flow Rate #2 (bpm) | Delta P (psi) | Perf Coeff Multiplier |
|---|---|---|---|---|
| 0:00 | 0.00 | 0.00 | 0.00 | 1.00 |

# Dugan Production Company
# Mesa SWD #4




Point Lookout

October 21th, 2004

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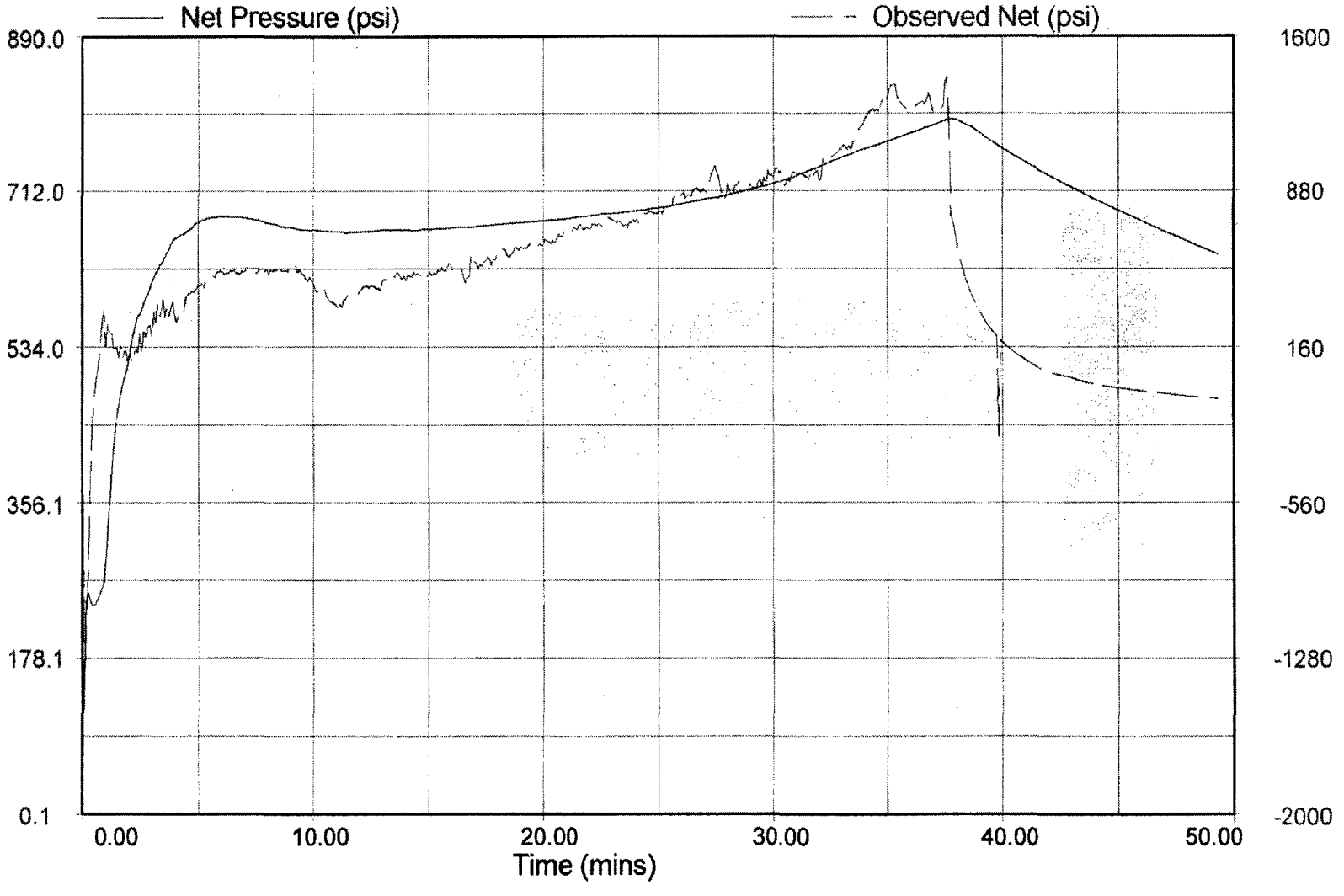


Point Lookout

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