Bakersfield (661-746-0511)
Calgary (403-234-7692)
Houston – Headquarters
(281-495-1100)

LUFKIN AUTOMATION

Midland (432-697-2228)
Oklahoma (405-677-0567)
Lufkin Automation Website
http://www.lufkinautomation.com

# *SROD v6.8.6 - PREDICTION OF ROD PUMPING SYSTEM PERFORMANCE*

WELL NAME : Well 5A  DATE/TIME : 9/10/2014 8:13:41 PM
ANALYST : Scott Malone  COMPANY : Sandia Data
DATA FILE : Sandia Data Well 5A (SnapOn).inp6e (BASE  WELL TYPE : Deviated
COMMENTS : Test Number: 5A. Test Date July/Aug 1996
Tubing pressure: 205 psi on 8/4/96
Casing pressure: 180 psi (Buildup 10.2 psi in 2 minutes) on 8/4/96
Production: 71 bopd, 340 bwpd, 407.3 mcfpd, 5737 GOR scfpb on 8/4/96
Fluid Properties: 35 degree API oil, water specific gravity = 1.01

*WARNINGS/NOTIFICATIONS* (Please see Input Data Summary Report)

## ** PRIME MOVER **

Mfgr and Type : ROBBINS & MYERS 60 HP (FRAME 444U) (OLD TYPE)

| | | | |
|---|---|---|---|
| Max Speed (rpm) | : 1231 | Speed Variation (%) | : 8.7 |
| Min Speed (rpm) | : 1124 | Cyclic Load Factor | : 2.248 |
| Power Required (hp) | : 39.36 | Peak Regenerative Power (hp) | : -34.99 |
| Motor Load (% of Rating) | : 65.6 | Prime Mover Output (hp) | : 16.6 |
| Sheave Ratio (Unit/ Prime Mover) | : 4.514 | | |

## ** PUMPING UNIT **

Mfgr and Type : LUFKIN C640-305-168 WITH 94110B CRANKS (4 pins) (CC'WISE)

| | | | |
|---|---|---|---|
| Actual Max Load (lbs) | : 16389 | Actual Min Load (lbs) | : 7161 |
| Average Pumping Speed (spm) | : 9.13 | Max Load (% of Rating) | : 53.7 |
| Polished Rod Power (hp) | : 14.94 | Unit and Drive Train Loss (hp) | : 1.66 |
| Computed Surface Stroke (in) | : 169.8 | | |

## ** SUMMARY OF REDUCER LOADING **

| | IN BALANCE |
|---|---|
| Max Torque (m in-lbs) | 407.1 |
| Min Torque (m in-lbs) | -214.3 |
| Counterbalance Moment (m in-lbs) | 1091.7 |
| Counterbalance Effect (X100 lbs) | 120.97 |
| Percent of Reducer Rating | 63.6 |

## ** ROD LOADING **

| | Diameter (in) | Length (ft) | Modulus (MM psi) | Fr Coeff | Guides | Loading |
|---|---|---|---|---|---|---|
| 1) | 1 * | 1510 | 30.5 | 0.2 | N (0) | 47 |
| 2) | 0.875 | 1600 | 30.5 | 0.2 | N (0) | 42 |
| 3) | 0.75 | 1700 | 30.5 | 0.3 | M (0) | 39 |
| 4) | 1.5 | 250 | 30.5 | 0.2 | N (0) | 5 |

* Requires slimhole couplings
Norris PPS-Standard guide weights has been considered

Max Stress (surf.) (psi) : 20740  Min Stress (surf.) (psi) : 9244

***ROD LOADING AT SURFACE AS % OF RATING***

| Service Factor | Class C,K | Class D | API D |
|---|---|---|---|
| 1 | 62 | 47 | 47 |
| 0.9 | 73 | 54 | 54 |
| 0.8 | 89 | 64 | 64 |
| 0.7 | 113 | 79 | 79 |

## ** DOWNHOLE PERFORMANCE **

| | Stroke (in) | BPD at 100% eff. | BPD at 85% eff. |
|---|---|---|---|
| Gross: | 173.3 | 738 (24h/d) | 627 (24h/d) |
| Net: | 173.3 | 738 (24h/d) | 627 (24h/d) |

| | | | |
|---|---|---|---|
| Tubing Stretch (in) | : 0.1 | Lost Displacement (bpd) | : 0 |
| Loss Along Rod String (hp) | : 7.61 | Pump Power (hp) | : 7.33 |
| Tubing Size (in) | : 2.875 | Tubing Anchor Location (ft) | : 4970 |
| Pump Spacing Guide (in) | : N/A | Pump Fillage (%) | : 100 |

## ** Non-Dimensional Variables **

| | | | |
|---|---|---|---|
| Fo/S/Kr | : 0.03 | N/No' | : 0.18 |

**** OTHER BASIC DATA ****

| | | | |
|---|---|---|---|
| Reducer Rating (in-lbs) | : 640 | Crank Rotation | : (CC'WISE) - Well to right |
| Overall Speed Ratio | : 129.1 | Rod Damping Factors (up/down) | : 0.05 / 0.15 |
| Min/Max Tubing Head Press. (psi) | : N/A | Buoyant Rod Weight (lbs) | : 10614 |
| Total Load on Pump (lbs) | : 1459 | Pump Bore Size (in) | : 2 |
| Pump Load Adjustment (lbs) | : 0 | Tubing Gradient (psi/ft) | : 0.433 |
| Pump Depth (ft) | : 5060 | Pump Intake Pressure (psi) | : 1932 |
| Pump Friction (lbs) | : 200 | SV Load (lbs) | : 10314 |
| TV Load (lbs) | : 12373 | | |

## ** ROD LOADING AT SPECIAL DEPTHS (Top of Lower Interval) **

WELL NAME : Well 5A — DATE/TIME : 9/10/2014 8:13:41 PM
ANALYST : Scott Malone — COMPANY : Sandia Data
DATA FILE : Sandia Data Well 5A (SnapOn).inp6e (BASE — WELL TYPE : Deviated
COMMENTS : Test Number: 5A. Test Date July/Aug 1996
Tubing pressure: 205 psi on 8/4/96
Casing pressure: 180 psi (Buildup 10.2 psi in 2 minutes) on 8/4/96
Production: 71 bopd, 340 bwpd, 407.3 mcfpd, 5737 GOR scfpb on 8/4/96
Fluid Properties: 35 degree API oil, water specific gravity = 1.01

---

***Interval : 1***

| | | | |
|---|---|---|---|
| Depth (ft) | : 0 | Rod Diameter (in) | : 1 * |
| Max Stress (psi) | : 20740 | Min Stress (psi) | : 9244 |
| Min Stress at Bottom (psi) | : 4995 | Rod Weight (lbs/ft) | : 2.904 |

***ROD LOADING AS % OF RATING***

| Service Factor | Class C,K | Class D | API D |
|---|---|---|---|
| 1 | 62 | 47 | 47 |
| 0.9 | 73 | 54 | 54 |
| 0.8 | 89 | 64 | 64 |
| 0.7 | 113 | 79 | 79 |

***Interval : 2***

| | | | |
|---|---|---|---|
| Depth (ft) | : 1510 | Rod Diameter (in) | : 0.875 |
| Max Stress (psi) | : 17504 | Min Stress (psi) | : 6786 |
| Min Stress at Bottom (psi) | : 2259 | Rod Weight (lbs/ft) | : 2.224 |

***ROD LOADING AS % OF RATING***

| Service Factor | Class C,K | Class D | API D |
|---|---|---|---|
| 1 | 55 | 42 | 42 |
| 0.9 | 63 | 48 | 48 |
| 0.8 | 75 | 56 | 56 |
| 0.7 | 92 | 67 | 67 |

***Interval : 3***

| | | | |
|---|---|---|---|
| Depth (ft) | : 3110 | Rod Diameter (in) | : 0.75 |
| Max Stress (psi) | : 14286 | Min Stress (psi) | : 3634 |
| Min Stress at Bottom (psi) | : -21 | Rod Weight (lbs/ft) | : 1.634 |

***ROD LOADING AS % OF RATING***

| Service Factor | Class C,K | Class D | API D |
|---|---|---|---|
| 1 | 51 | 39 | 39 |
| 0.9 | 58 | 44 | 44 |
| 0.8 | 67 | 51 | 51 |
| 0.7 | 79 | 59 | 59 |

***Interval : 4***

| | | | |
|---|---|---|---|
| Depth (ft) | : 4810 | Rod Diameter (in) | : 1.5 |
| Max Stress (psi) | : -444 | Min Stress (psi) | : -1721 |
| Min Stress at Bottom (psi) | : -2509 | Rod Weight (lbs/ft) | : 6 |

***ROD LOADING AS % OF RATING***

| Service Factor | Class C,K | Class D | User Defined API C |
|---|---|---|---|
| 1 | 5 | 4 | 5 |
| 0.9 | 6 | 5 | 6 |
| 0.8 | 7 | 5 | 7 |
| 0.7 | 8 | 6 | 8 |

**Note: if this section is a sinker bar, the rod loading at elevator neck 1" at 1 sevice factor will be 12%**

*** Slimhole couplings are required for this rod section.**

**** SUGGESTED ROD GUIDES ****

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Production: 71 bopd, 340 bwpd, 407.3 mcfpd, 5737 GOR scfpb on 8/4/96
Fluid Properties: 35 degree API oil, water specific gravity = 1.01

| Rod Number From Surface | Interval From (ft) - To (ft) | Max Side Load in Interval (lbs/rod) | Molded Guides (number/rod) | Wheeled Guides (number/rod) | Rod Taper Index |
|---|---|---|---|---|---|

**** ROD GUIDE DESIGN ****

WELL NAME : Well 5A DATE/TIME : 9/10/2014 8:13:41 PM
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Fluid Properties: 35 degree API oil, water specific gravity = 1.01

| Rod Number From Surface | Interval From (ft) | To (ft) | Max Side Load in Interval (lbs/rod) | Molded Guides (number/rod) | Wheeled Guides (number/rod) | Rod Taper Index |
|---|---|---|---|---|---|---|
| 1 | 0 | 10 | 0 | 0 | 0 | 1 |
| 2 | 10 | 35 | 0 | 0 | 0 | 1 |
| 3 | 35 | 60 | 0 | 0 | 0 | 1 |
| 4 | 60 | 85 | 0 | 0 | 0 | 1 |
| 5 | 85 | 110 | 0 | 0 | 0 | 1 |
| 6 | 110 | 135 | 0 | 0 | 0 | 1 |
| 7 | 135 | 160 | 0 | 0 | 0 | 1 |
| 8 | 160 | 185 | 0 | 0 | 0 | 1 |
| 9 | 185 | 210 | 0 | 0 | 0 | 1 |
| 10 | 210 | 235 | 0 | 0 | 0 | 1 |
| 11 | 235 | 260 | 0 | 0 | 0 | 1 |
| 12 | 260 | 285 | 0 | 0 | 0 | 1 |
| 13 | 285 | 310 | 0 | 0 | 0 | 1 |
| 14 | 310 | 335 | 0 | 0 | 0 | 1 |
| 15 | 335 | 360 | 0 | 0 | 0 | 1 |
| 16 | 360 | 385 | 0 | 0 | 0 | 1 |
| 17 | 385 | 410 | 0 | 0 | 0 | 1 |
| 18 | 410 | 435 | 0 | 0 | 0 | 1 |
| 19 | 435 | 460 | 0 | 0 | 0 | 1 |
| 20 | 460 | 485 | 0 | 0 | 0 | 1 |
| 21 | 485 | 510 | 0 | 0 | 0 | 1 |
| 22 | 510 | 535 | 0 | 0 | 0 | 1 |
| 23 | 535 | 560 | 0 | 0 | 0 | 1 |
| 24 | 560 | 585 | 0 | 0 | 0 | 1 |
| 25 | 585 | 610 | 0 | 0 | 0 | 1 |
| 26 | 610 | 635 | 0 | 0 | 0 | 1 |
| 27 | 635 | 660 | 0 | 0 | 0 | 1 |
| 28 | 660 | 685 | 0 | 0 | 0 | 1 |
| 29 | 685 | 710 | 0 | 0 | 0 | 1 |
| 30 | 710 | 735 | 0 | 0 | 0 | 1 |
| 31 | 735 | 760 | 0 | 0 | 0 | 1 |
| 32 | 760 | 785 | 0 | 0 | 0 | 1 |
| 33 | 785 | 810 | 0 | 0 | 0 | 1 |
| 34 | 810 | 835 | 0 | 0 | 0 | 1 |
| 35 | 835 | 860 | 0 | 0 | 0 | 1 |
| 36 | 860 | 885 | 0 | 0 | 0 | 1 |
| 37 | 885 | 910 | 0 | 0 | 0 | 1 |
| 38 | 910 | 935 | 0 | 0 | 0 | 1 |
| 39 | 935 | 960 | 0 | 0 | 0 | 1 |
| 40 | 960 | 985 | 0 | 0 | 0 | 1 |
| 41 | 985 | 1010 | 0 | 0 | 0 | 1 |
| 42 | 1010 | 1035 | 0 | 0 | 0 | 1 |
| 43 | 1035 | 1060 | 0 | 0 | 0 | 1 |
| 44 | 1060 | 1085 | 0 | 0 | 0 | 1 |
| 45 | 1085 | 1110 | 0 | 0 | 0 | 1 |
| 46 | 1110 | 1135 | 0 | 0 | 0 | 1 |
| 47 | 1135 | 1160 | 0 | 0 | 0 | 1 |
| 48 | 1160 | 1185 | 0 | 0 | 0 | 1 |
| 49 | 1185 | 1210 | 0 | 0 | 0 | 1 |
| 50 | 1210 | 1235 | 0 | 0 | 0 | 1 |
| 51 | 1235 | 1260 | 0 | 0 | 0 | 1 |
| 52 | 1260 | 1285 | 0 | 0 | 0 | 1 |
| 53 | 1285 | 1310 | 0 | 0 | 0 | 1 |
| 54 | 1310 | 1335 | 0 | 0 | 0 | 1 |
| 55 | 1335 | 1360 | 0 | 0 | 0 | 1 |
| 56 | 1360 | 1385 | 0 | 0 | 0 | 1 |
| 57 | 1385 | 1410 | 0 | 0 | 0 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 58 | 1410 | 1435 | 0 | 0 | 0 | 1 |
| 59 | 1435 | 1460 | 0 | 0 | 0 | 1 |
| 60 | 1460 | 1485 | 0 | 0 | 0 | 1 |
| 61 | 1485 | 1510 | 0 | 0 | 0 | 1 |
| 62 | 1510 | 1535 | 0 | 0 | 0 | 2 |
| 63 | 1535 | 1560 | 0 | 0 | 0 | 2 |
| 64 | 1560 | 1585 | 0 | 0 | 0 | 2 |
| 65 | 1585 | 1610 | 0 | 0 | 0 | 2 |
| 66 | 1610 | 1635 | 0 | 0 | 0 | 2 |
| 67 | 1635 | 1660 | 0 | 0 | 0 | 2 |
| 68 | 1660 | 1685 | 0 | 0 | 0 | 2 |
| 69 | 1685 | 1710 | 0 | 0 | 0 | 2 |
| 70 | 1710 | 1735 | 0 | 0 | 0 | 2 |
| 71 | 1735 | 1760 | 0 | 0 | 0 | 2 |
| 72 | 1760 | 1785 | 0 | 0 | 0 | 2 |
| 73 | 1785 | 1810 | 0 | 0 | 0 | 2 |
| 74 | 1810 | 1835 | 0 | 0 | 0 | 2 |
| 75 | 1835 | 1860 | 0 | 0 | 0 | 2 |
| 76 | 1860 | 1885 | 0 | 0 | 0 | 2 |
| 77 | 1885 | 1910 | 0 | 0 | 0 | 2 |
| 78 | 1910 | 1935 | 0 | 0 | 0 | 2 |
| 79 | 1935 | 1960 | 0 | 0 | 0 | 2 |
| 80 | 1960 | 1985 | 0 | 0 | 0 | 2 |
| 81 | 1985 | 2010 | 0 | 0 | 0 | 2 |
| 82 | 2010 | 2035 | 0 | 0 | 0 | 2 |
| 83 | 2035 | 2060 | 0 | 0 | 0 | 2 |
| 84 | 2060 | 2085 | 0 | 0 | 0 | 2 |
| 85 | 2085 | 2110 | 0 | 0 | 0 | 2 |
| 86 | 2110 | 2135 | 0 | 0 | 0 | 2 |
| 87 | 2135 | 2160 | 0 | 0 | 0 | 2 |
| 88 | 2160 | 2185 | 0 | 0 | 0 | 2 |
| 89 | 2185 | 2210 | 0 | 0 | 0 | 2 |
| 90 | 2210 | 2235 | 0 | 0 | 0 | 2 |
| 91 | 2235 | 2260 | 0 | 0 | 0 | 2 |
| 92 | 2260 | 2285 | 0 | 0 | 0 | 2 |
| 93 | 2285 | 2310 | 0 | 0 | 0 | 2 |
| 94 | 2310 | 2335 | 0 | 0 | 0 | 2 |
| 95 | 2335 | 2360 | 0 | 0 | 0 | 2 |
| 96 | 2360 | 2385 | 0 | 0 | 0 | 2 |
| 97 | 2385 | 2410 | 0 | 0 | 0 | 2 |
| 98 | 2410 | 2435 | 0 | 0 | 0 | 2 |
| 99 | 2435 | 2460 | 0 | 0 | 0 | 2 |
| 100 | 2460 | 2485 | 0 | 0 | 0 | 2 |
| 101 | 2485 | 2510 | 0 | 0 | 0 | 2 |
| 102 | 2510 | 2535 | 0 | 0 | 0 | 2 |
| 103 | 2535 | 2560 | 0 | 0 | 0 | 2 |
| 104 | 2560 | 2585 | 0 | 0 | 0 | 2 |
| 105 | 2585 | 2610 | 0 | 0 | 0 | 2 |
| 106 | 2610 | 2635 | 0 | 0 | 0 | 2 |
| 107 | 2635 | 2660 | 0 | 0 | 0 | 2 |
| 108 | 2660 | 2685 | 0 | 0 | 0 | 2 |
| 109 | 2685 | 2710 | 0 | 0 | 0 | 2 |
| 110 | 2710 | 2735 | 0 | 0 | 0 | 2 |
| 111 | 2735 | 2760 | 0 | 0 | 0 | 2 |
| 112 | 2760 | 2785 | 0 | 0 | 0 | 2 |
| 113 | 2785 | 2810 | 0 | 0 | 0 | 2 |
| 114 | 2810 | 2835 | 0 | 0 | 0 | 2 |
| 115 | 2835 | 2860 | 0 | 0 | 0 | 2 |
| 116 | 2860 | 2885 | 0 | 0 | 0 | 2 |
| 117 | 2885 | 2910 | 0 | 0 | 0 | 2 |
| 118 | 2910 | 2935 | 0 | 0 | 0 | 2 |
| 119 | 2935 | 2960 | 0 | 0 | 0 | 2 |
| 120 | 2960 | 2985 | 0 | 0 | 0 | 2 |
| 121 | 2985 | 3010 | 0 | 0 | 0 | 2 |
| 122 | 3010 | 3035 | 0 | 0 | 0 | 2 |
| 123 | 3035 | 3060 | 0 | 0 | 0 | 2 |
| 124 | 3060 | 3085 | 0 | 0 | 0 | 2 |
| 125 | 3085 | 3110 | 0 | 0 | 0 | 2 |
| 126 | 3110 | 3135 | 0 | 0 | 0 | 3 |
| 127 | 3135 | 3160 | 0 | 0 | 0 | 3 |
| 128 | 3160 | 3185 | 0 | 0 | 0 | 3 |
| 129 | 3185 | 3210 | 0 | 0 | 0 | 3 |
| 130 | 3210 | 3235 | 0 | 0 | 0 | 3 |
| 131 | 3235 | 3260 | 0 | 0 | 0 | 3 |
| 132 | 3260 | 3285 | 0 | 0 | 0 | 3 |
| 133 | 3285 | 3310 | 0 | 0 | 0 | 3 |
| 134 | 3310 | 3335 | 0 | 0 | 0 | 3 |
| 135 | 3335 | 3360 | 0 | 0 | 0 | 3 |
| 136 | 3360 | 3385 | 0 | 0 | 0 | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 137 | 3385 | 3410 | 0 | 0 | 0 | 3 |
| 138 | 3410 | 3435 | 0 | 0 | 0 | 3 |
| 139 | 3435 | 3460 | 0 | 0 | 0 | 3 |
| 140 | 3460 | 3485 | 0 | 0 | 0 | 3 |
| 141 | 3485 | 3510 | 0 | 0 | 0 | 3 |
| 142 | 3510 | 3535 | 0 | 0 | 0 | 3 |
| 143 | 3535 | 3560 | 0 | 0 | 0 | 3 |
| 144 | 3560 | 3585 | 0 | 0 | 0 | 3 |
| 145 | 3585 | 3610 | 0 | 0 | 0 | 3 |
| 146 | 3610 | 3635 | 0 | 0 | 0 | 3 |
| 147 | 3635 | 3660 | 0 | 0 | 0 | 3 |
| 148 | 3660 | 3685 | 0 | 0 | 0 | 3 |
| 149 | 3685 | 3710 | 0 | 0 | 0 | 3 |
| 150 | 3710 | 3735 | 0 | 0 | 0 | 3 |
| 151 | 3735 | 3760 | 0 | 0 | 0 | 3 |
| 152 | 3760 | 3785 | 0 | 0 | 0 | 3 |
| 153 | 3785 | 3810 | 0 | 0 | 0 | 3 |
| 154 | 3810 | 3835 | 0 | 0 | 0 | 3 |
| 155 | 3835 | 3860 | 0 | 0 | 0 | 3 |
| 156 | 3860 | 3885 | 0 | 0 | 0 | 3 |
| 157 | 3885 | 3910 | 0 | 0 | 0 | 3 |
| 158 | 3910 | 3935 | 0 | 0 | 0 | 3 |
| 159 | 3935 | 3960 | 0 | 0 | 0 | 3 |
| 160 | 3960 | 3985 | 0 | 0 | 0 | 3 |
| 161 | 3985 | 4010 | 0 | 0 | 0 | 3 |
| 162 | 4010 | 4035 | 0 | 0 | 0 | 3 |
| 163 | 4035 | 4060 | 0 | 0 | 0 | 3 |
| 164 | 4060 | 4085 | 0 | 0 | 0 | 3 |
| 165 | 4085 | 4110 | 0 | 0 | 0 | 3 |
| 166 | 4110 | 4135 | 0 | 0 | 0 | 3 |
| 167 | 4135 | 4160 | 0 | 0 | 0 | 3 |
| 168 | 4160 | 4185 | 0 | 0 | 0 | 3 |
| 169 | 4185 | 4210 | 0 | 0 | 0 | 3 |
| 170 | 4210 | 4235 | 0 | 0 | 0 | 3 |
| 171 | 4235 | 4260 | 0 | 0 | 0 | 3 |
| 172 | 4260 | 4285 | 0 | 0 | 0 | 3 |
| 173 | 4285 | 4310 | 0 | 0 | 0 | 3 |
| 174 | 4310 | 4335 | 0 | 0 | 0 | 3 |
| 175 | 4335 | 4360 | 0 | 0 | 0 | 3 |
| 176 | 4360 | 4385 | 0 | 0 | 0 | 3 |
| 177 | 4385 | 4410 | 0 | 0 | 0 | 3 |
| 178 | 4410 | 4435 | 0 | 0 | 0 | 3 |
| 179 | 4435 | 4460 | 0 | 0 | 0 | 3 |
| 180 | 4460 | 4485 | 0 | 0 | 0 | 3 |
| 181 | 4485 | 4510 | 0 | 0 | 0 | 3 |
| 182 | 4510 | 4535 | 0 | 0 | 0 | 3 |
| 183 | 4535 | 4560 | 0 | 0 | 0 | 3 |
| 184 | 4560 | 4585 | 0 | 0 | 0 | 3 |
| 185 | 4585 | 4610 | 0 | 0 | 0 | 3 |
| 186 | 4610 | 4635 | 0 | 0 | 0 | 3 |
| 187 | 4635 | 4660 | 0 | 0 | 0 | 3 |
| 188 | 4660 | 4685 | 0 | 0 | 0 | 3 |
| 189 | 4685 | 4710 | 0 | 0 | 0 | 3 |
| 190 | 4710 | 4735 | 0 | 0 | 0 | 3 |
| 191 | 4735 | 4760 | 0 | 0 | 0 | 3 |
| 192 | 4760 | 4785 | 0 | 0 | 0 | 3 |
| 193 | 4785 | 4810 | 0 | 0 | 0 | 3 |
| 194 | 4810 | 4835 | 0 | 0 | 0 | 4 |
| 195 | 4835 | 4860 | 0 | 0 | 0 | 4 |
| 196 | 4860 | 4885 | 0 | 0 | 0 | 4 |
| 197 | 4885 | 4910 | 0 | 0 | 0 | 4 |
| 198 | 4910 | 4935 | 0 | 0 | 0 | 4 |
| 199 | 4935 | 4960 | 0 | 0 | 0 | 4 |
| 200 | 4960 | 4985 | 0 | 0 | 0 | 4 |
| 201 | 4985 | 5010 | 0 | 0 | 0 | 4 |
| 202 | 5010 | 5035 | 0 | 0 | 0 | 4 |
| 203 | 5035 | 5060 | 0 | 0 | 0 | 4 |

**** INPUT DATA SUMMARY ****

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Fluid Properties: 35 degree API oil, water specific gravity = 1.01

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| | |
|---|---|
| WELL NAME | : Well 5A |
| ANALYST | : Scott Malone |
| COMPANY | : Sandia Data |
| PUMPING UNIT ID | : LC640-305-168 |
| (Description) | (LUFKIN C640-305-168 WITH 94110B CRANKS (4 pins)) |
| MOTOR ID | : RM60HP |
| (Description) | (ROBBINS & MYERS 60 HP (FRAME 444U) (OLD TYPE)) |
| C'BAL OPTION | : SROD Defined |
| COUNTERBALANCE MOMENT (in-lbs) | : 0 |
| CRANK HOLE | : 1 - 169.8 (in) |
| ROTATION OF UNIT | : CC'WISE |
| SPEED VARIATION | : VARIED |
| PUMP DEPTH (ft) | : 5060 |
| PUMP DIAMETER (in) | : 2 |
| PUMP INTAKE PRESSURE (psi) | : 1931.5 |
| PERCENT COMPLETE PUMP FILLAGE | : 100 |
| PUMPING SPEED (SPM) | : 9.1 |
| TUBINGHEAD PRESSURE (psi) | : 205 |
| TUBING ANCHOR DEPTH (ft) | : 4970 |
| TUBING GRADIENT (psi/ft) | : 0.433 |
| TUBING SIZE | : 3 - 2 7/8 in. |

**Rod/Taper Information:**

ROD STRING DESIGN OPTION : SPECIFY ROD DESIGN

| | Diameter (in) | Length (ft) | Tensile (psi) | Modulus (MM psi) | Weight (lbs/ft) | Guide Type |
|---|---|---|---|---|---|---|
| 1) | API D | | | | | |
| | 1 | 1510 | 115000 | 30.5 | 2.904 | N |
| 2) | API D | | | | | |
| | 0.875 | 1600 | 115000 | 30.5 | 2.224 | N |
| 3) | API D | | | | | |
| | 0.75 | 1700 | 115000 | 30.5 | 1.634 | M |
| 4) | API C | | | | | |
| | 1.5 | 250 | 90000 | 30.5 | 6 | N |

| | |
|---|---|
| SERVICE FACTOR | : 1. |
| ELECTRIC COST (cents/kwh) | : 10 |
| UPSTROKE DAMPING FACTOR | : 0.05 |
| DOWNSTROKE DAMPING FACTOR | : 0.15 |
| PUMP FRICTION (lbs) | : 200 |
| STUFFING BOX FRICTION (lbs) | : 100 |
| PUMP LOAD ADJUSTMENT (lbs) | : 0 |
| BUOYANT WEIGHT ADJUSTMENT (lbs) | : 0 |
| PUMP LOAD COEFFICIENT (lbs/ft/sec) | : 5 |
| Run Time (h/d) | : 24 |
| MAX SIDE LOAD FOR BASE ROD (lbs/rod) | : 50 |
| MAX SIDE LOAD FOR MOLDED GUIDE (lbs/rod) | : 40 |
| MAX SIDE LOAD FOR WHEELED GUIDE (lbs/rod) | : 200 |
| ROD FRICTION COEFFICIENT | : 0.2 |
| MOLDED GUIDE FRICTION RATIO | : 1.5 |
| WHEELED GUIDE FRICTION RATIO | : 0.1 |
| OTHER GUIDE FRICTION RATIO | : 2 |
| WELL DEVIATION SURVEY | : See Well Deviation Report |

Auto Add Rod Guide Weights

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**** WARNINGS / NOTIFICATIONS ****

Slimhole couplings have been added.

**** DYNO GRAPH ****

WELL NAME : Well 5A DATE/TIME : 9/10/2014 8:13:41 PM
ANALYST : Scott Malone COMPANY : Sandia Data
DATA FILE : Sandia Data Well 5A (SnapOn).inp6e (BASE WELL TYPE : Deviated
COMMENTS : Test Number: 5A. Test Date July/Aug 1996
Tubing pressure: 205 psi on 8/4/96
Casing pressure: 180 psi (Buildup 10.2 psi in 2 minutes) on 8/4/96
Production: 71 bopd, 340 bwpd, 407.3 mcfpd, 5737 GOR scfpb on 8/4/96
Fluid Properties: 35 degree API oil, water specific gravity = 1.01

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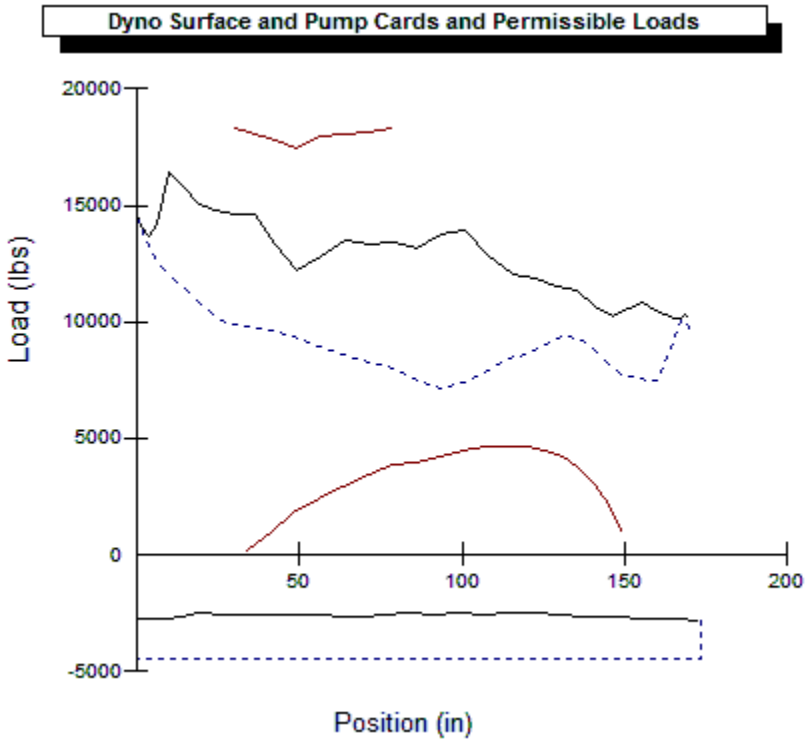

**** REDUCER TORQUE ****

WELL NAME : Well 5A DATE/TIME : 9/10/2014 8:13:42 PM
ANALYST : Scott Malone COMPANY : Sandia Data
DATA FILE : Sandia Data Well 5A (SnapOn).inp6e (BASE WELL TYPE : Deviated
COMMENTS : Test Number: 5A. Test Date July/Aug 1996
Tubing pressure: 205 psi on 8/4/96
Casing pressure: 180 psi (Buildup 10.2 psi in 2 minutes) on 8/4/96
Production: 71 bopd, 340 bwpd, 407.3 mcfpd, 5737 GOR scfpb on 8/4/96
Fluid Properties: 35 degree API oil, water specific gravity = 1.01

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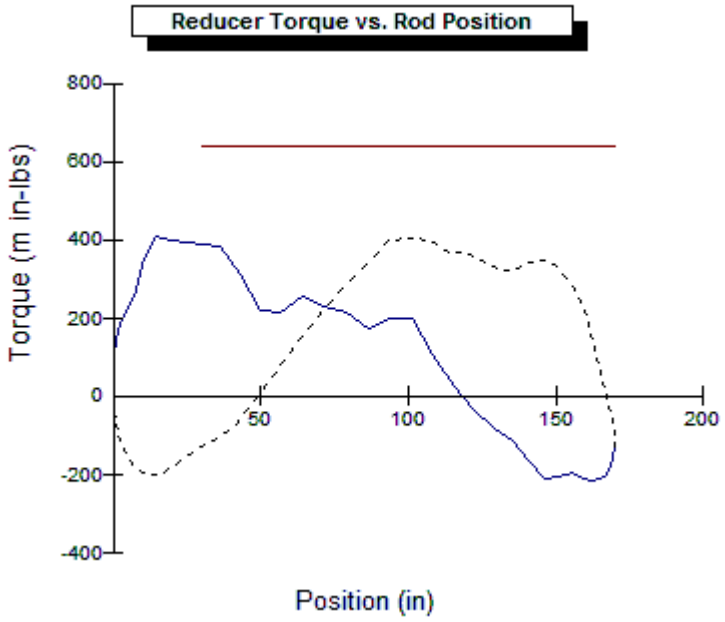

**** AXIAL LOAD ~ BUCKLING TENDENCY ****

WELL NAME : Well 5A DATE/TIME : 9/10/2014 8:13:42 PM
ANALYST : Scott Malone COMPANY : Sandia Data
DATA FILE : Sandia Data Well 5A (SnapOn).inp6e (BASE WELL TYPE : Deviated
COMMENTS : Test Number: 5A. Test Date July/Aug 1996
Tubing pressure: 205 psi on 8/4/96
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Production: 71 bopd, 340 bwpd, 407.3 mcfpd, 5737 GOR scfpb on 8/4/96
Fluid Properties: 35 degree API oil, water specific gravity = 1.01

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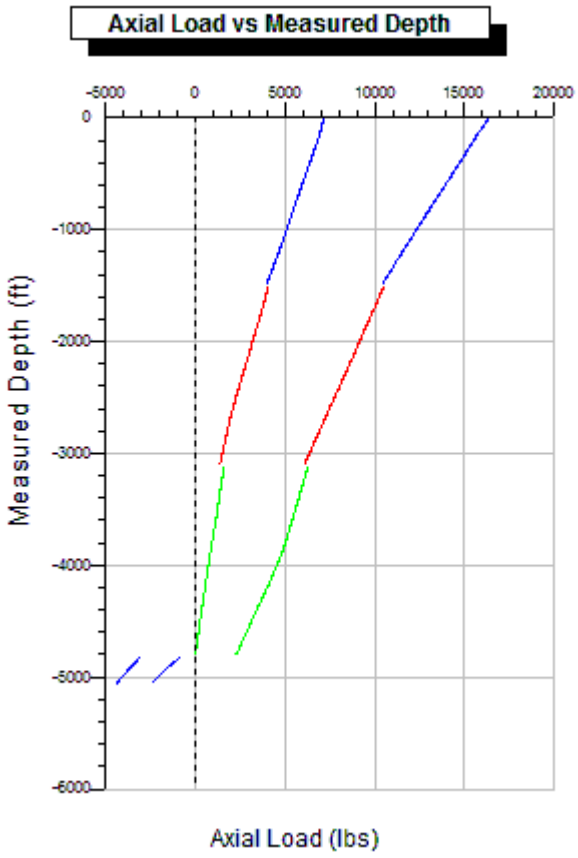


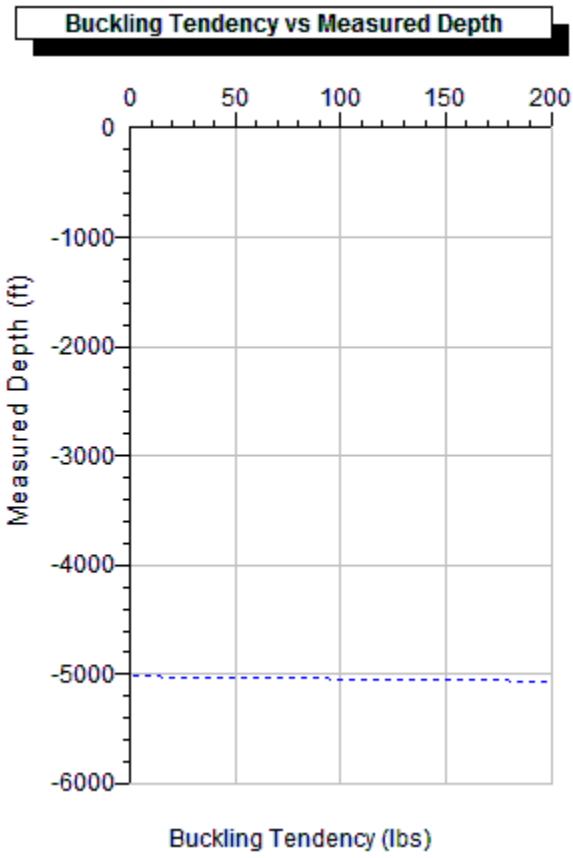


| | Rod Type | Rod Diam in (in) | Max Load (lbs) | Min Load (lbs) | Max Stress (psi) | Min Stress (psi) | Rod Load @ 1 % |
|---|---|---|---|---|---|---|---|
| 1. | API D | 1 | 16289 | 7261 | 20740 | 9244 | 47 |
| 2. | API D | 0.875 | 10526 | 4081 | 17504 | 6786 | 42 |
| 3. | API D | 0.75 | 6312 | 1605 | 14286 | 3634 | 39 |
| 4. | API C | 1.5 | -785 | -3042 | -444 | -1721 | 5 |

Max Buckling (lbs) : 199
Location of Max Buckling (ft) : 5060
Buckling Starts at (ft) : 5026
Buckling tendency does not include buoyancy forces because buoyancy forces do not cause buckling.

*** Neutral Point in Rod String (Buoyancy Considered) ***
Measured Depth (ft) : 4807
Rod Diameter (in) : 0.75
Max/Min Load (lbs) : 2256/-7
Buckling Tendency (lbs) : 0

**** SIDE/DRAG LOAD ****

WELL NAME : Well 5A DATE/TIME : 9/10/2014 8:13:42 PM
ANALYST : Scott Malone COMPANY : Sandia Data
DATA FILE : Sandia Data Well 5A (SnapOn).inp6e (BASE WELL TYPE : Deviated
COMMENTS : Test Number: 5A. Test Date July/Aug 1996
Tubing pressure: 205 psi on 8/4/96
Casing pressure: 180 psi (Buildup 10.2 psi in 2 minutes) on 8/4/96
Production: 71 bopd, 340 bwpd, 407.3 mcfpd, 5737 GOR scfpb on 8/4/96
Fluid Properties: 35 degree API oil, water specific gravity = 1.01

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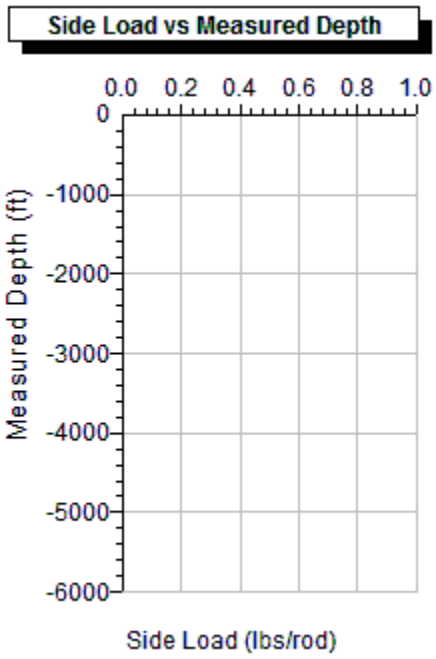


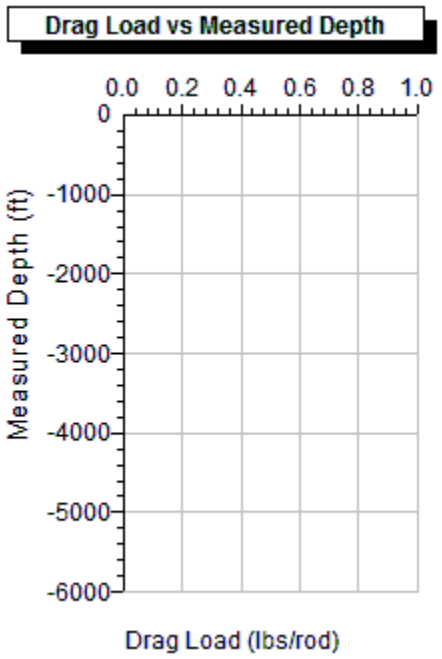


Max Side Load (lbs/rod) : 0
Max Drag Load (lbs/rod) : 0
Rod Length for Steel/Fiberglass (ft/ft) : 25/37.5

**** WELL DEVIATION ****

```
WELL NAME : Well 5A                                    DATE/TIME : 9/10/2014 8:13:42 PM
ANALYST   : Scott Malone                               COMPANY   : Sandia Data
DATA FILE : Sandia Data Well 5A (SnapOn).inp6e (BASE WELL TYPE : Deviated
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Tubing pressure: 205 psi  on 8/4/96
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Production:   71 bopd,  340 bwpd, 407.3 mcfpd, 5737 GOR scfpb  on 8/4/96
Fluid Properties: 35 degree API oil, water specific gravity = 1.01
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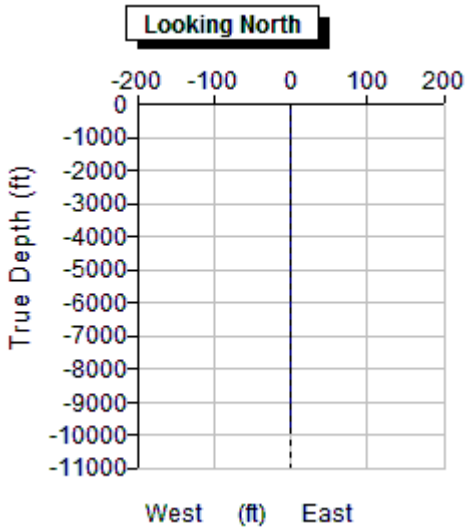


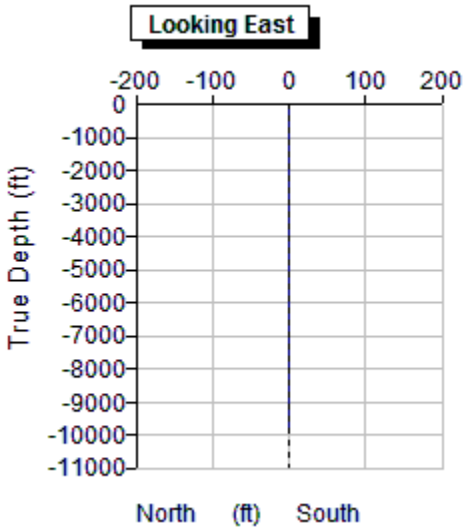


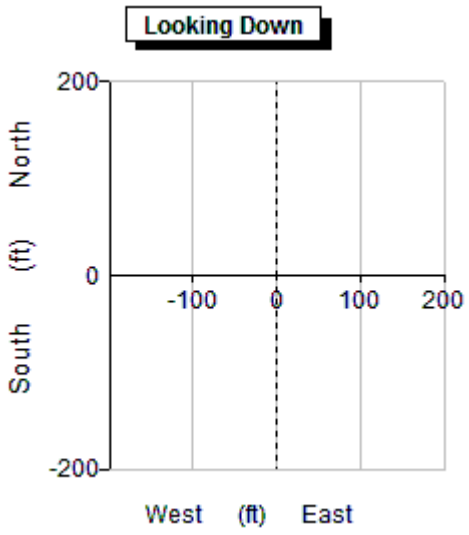


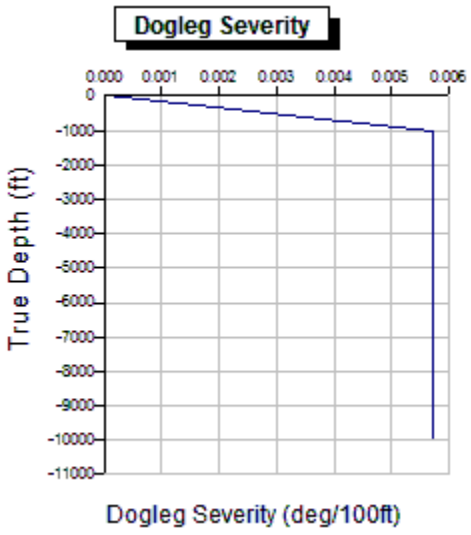

| MD (ft) | INC (deg) | Azimuth (deg) | TVD (ft) | N-S (ft) | E-W (ft) | Dogleg Severity (deg/100ft) |
|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00N | 0.00E | 0.00 |
| 1000.00 | 0.00 | 0.00 | 1000.00 | 0.00N | 0.00E | 0.01 |
| 3000.00 | 0.00 | 0.00 | 3000.00 | 0.00N | 0.00E | 0.01 |
| 8000.00 | 0.00 | 0.00 | 8000.01 | 0.00N | 0.00E | 0.01 |
| 10000.00 | 0.00 | 0.00 | 10000.01 | 0.00N | 0.00E | 0.01 |