

# Reducing Rod Failures

**LPS worked with an operator in the Permian Basin that experienced a short run life due to a rod part after conversion from ESP to rod lift in a well.** When the subject well was initially converted to rod lift, a rod string was installed consisting of guided fiberglass rods, conventional stick rod, and sinker bars.

After 30 days of run life, the well failed due to a rod part. When pulled, it was determined that the rod parted at approximately 1,700 feet, and the guides on the fiberglass were completely worn through. Based on the short run time and severe wear, the operator ran a 25' interval gyro. The gyro revealed that the dogleg at 1,700 feet was over 6 degrees, shown in Figure 1 and the corresponding side loading can be seen in Figure 2. Based on the short run life and gyro, continuous rod and lined tubing were installed.

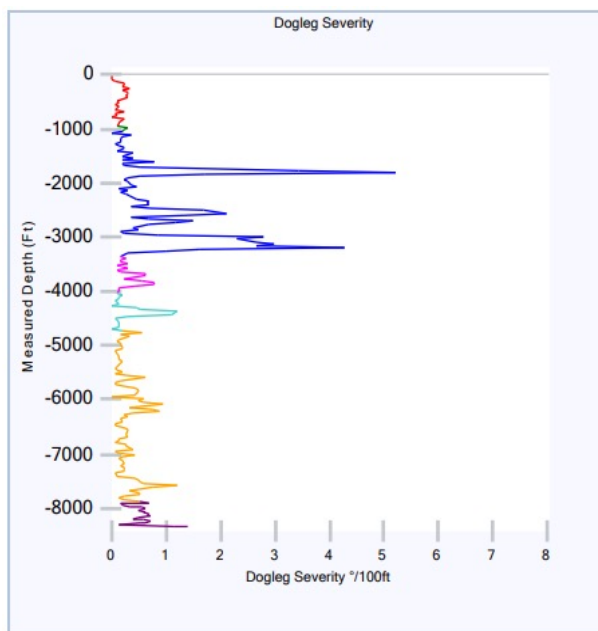


Figure 1 - Dogleg Severity of Well in Reducing Rod Parts Case Study.

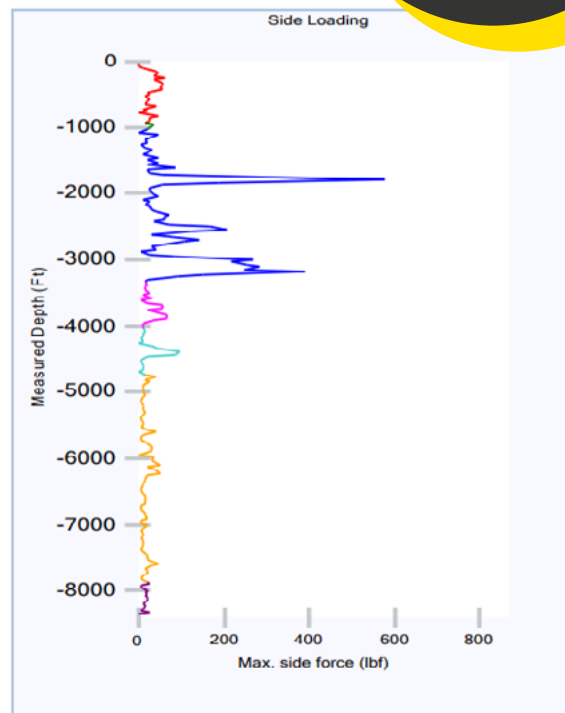


Figure 2 - Side Loading of Well in Reducing Rod Parts Case Study.

The black rectangle outlines the section where the continuous rod portion of the string was installed. The operator ran back in with 900 feet of fiberglass to lighten the loading on the gearbox, 3,800 feet of continuous rod, 3,150 feet of conventional stick rod, and 500 feet of sinker bars. The operator also ran 3,000 feet of lined tubing from 1,000 feet to 4,000 feet. This design utilized the conventional stick rod on location from initial conversion to rod lift while also optimizing the design for the best chance of a successful run time.

After this design change, the well has now been running for more than 550 days.

### Well Overview

- o PU: C640-365-168
- o PD: 8,350'
- o Casing Size: 5-1/2"
- o Tubing Size: 2-7/8"
- o Rod Design:
- o Pump Size: 1.5" insert
- o Production: 130 bfpd
- o Water Cut: 60%

### Initial Rod String Design

| DIAMETER (IN) | ROD GRADE     | LENGTH (FT) | MIN. TEN. STR. (PSI) | FRICTION COEFF. |
|---------------|---------------|-------------|----------------------|-----------------|
| + 1.24        | Fiberflex API | 1400        | N/A                  | 0.2             |
| + 1.24        | Fiberflex API | 2200        | N/A                  | 0.25            |
| + 1.24        | Fiberflex API | 800         | N/A                  | 0.2             |
| + 1           | KD (API)      | 1800        | 115000               | 0.2             |
| 0.875         | KD (API)      | 1650        | 115000               | 0.2             |
| @ 1.5         | C (API. SB)   | 500         | 900000               | 0.2             |

### Current Rod String Design

| DIAMETER (IN) | ROD GRADE     | LENGTH (FT) | MIN. TEN. STR. (PSI) | FRICTION COEFF. |
|---------------|---------------|-------------|----------------------|-----------------|
| + 1.24        | Fiberflex API | 1400        | N/A                  | 0.2             |
| 1             | LPS D43N      | 100         | 120000               | 0.2             |
| 1             | LPS D43N      | 2300        | 120000               | 0.1             |
| 0.875         | LPS D43N      | 700         | 120000               | 0.1             |
| 0.875         | KD (API)      | 1650        | 115000               | 0.2             |
| @ 1.5         | C (API. SB)   | 500         | 900000               | 0.2             |

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