A REVIEW OF TRADITIONAL ROD ROTATOR PERFORMANCE AND FIELD TRIAL RESULTS OF NEW ROD ROTATOR DESIGNED TO IMPROVE WELL PRODUCTIVITY AND REDUCE MAINTENANCE COSTS

Tracie Reed

Silverstream Energy Solutions Inc.

Philip Hinojosa

Wellhead Systems Inc. (WSI)

ABSTRACT: As the complexity of well profiles on rod pumped wells increases, traditional rod rotators experience more frequent failures due to the challenging conditions. The consequence is a decline in well productivity, often accompanied by a significant increase in well maintenance costs. This session will examine common rod rotator failures and root causes. It will introduce a new alternative rod rotator designed to improve field performance and reduce operating expenses, including a comprehensive review of field trial results during the last 30 months. The field data will include a variety of well profiles and fields including the Permian, Powder River, Eagle Ford and the Bakken with cross section of different producers.

SITUATIONAL ANALYSIS:

Several factors influence the life span of rod rotators including well profile, mechanical design, quality and preventative maintenance practices. Additional elements which may impact longevity of rod rotator equipment across different basins include weather, frequency of monitoring of rod rotator performance and the handling of rod rotators during workovers. Overall, a shortened rod rotator life span and increased failure rate are being seen in both traditional ratchet pawl and one-way bearing style rod rotators across all manufacturers.

ROOT CAUSES OF ROD ROTATOR FAILURES:

1. A key factor in rod rotator longevity is the deviation commonly seen on today's horizontal, multi-well pads. The deviation is causing increases in loads and torque exposure that are shortening the operational life span of rod rotators.

2. Deviation in horizontal wells is also creating a higher likelihood of seeing spikes in rod loads that exceed the original 40,000 lb load limit of traditional rod rotators.

3. The most common cause of failure of rod rotators across all widely available products is precipitated by failure to grease at recommended greasing intervals, which is typically monthly.

4. Failure to grease and the increased torque/ load exposure frequently results in a failure of the one-way bearing, ratchet pawl or damage to the internal gearing.

5. Increasing pressure on E&P budgets, as well as a trend towards well management by exception, means field staff are managing the same amount of assets with less staff. The net result is less time allocated to maintain the products on the production tree and rod pumping units.

6. Workovers have been identified as a contributing factor to rod rotator replacement, especially if the cap is inadvertently knocked off and debris is allowed to enter the cavity of the rotator or if the cable is attached to the pumping unit haphazardly.

DEFINING THE PROBLEM:

Rod rotators have not evolved or been adapted to meet the challenging demands of deviated, horizontal well profiles. As a result, inconsistent field performance and rod rotator longevity has resulted in rod rotators being viewed as an optional wear item, instead of a key piece of equipment critical to maintaining and extending the life of the rod string and improving overall well productivity.

POTENTIAL SOLUTION:

Based on knowledge of root causes of rod rotator failures and changing well profile dynamics, design, engineer, prototype and field test a rod rotator to address common issues and perceptions encountered in the field.

KEY DIFFERENTIATORS:

- Designed and engineered for longevity to reduce replacement intervals
- Accommodate higher recommended load up to 60,000 lbs
- 400 ft-lbs of torque to address deviation
- Longer handle with clevis to reduce cable failures
- Incorporate sealed internal components to reduce greasing intervals by 85%

SUMMARY OF FIELD TRIAL OBSERVATIONS AND RESULTS:

Target wells were identified based on previous rod rotator failures and issues. Field trial units were made available to producers ranging in size from small independent producers to large multinational companies.

US Field tests began in Oct of 2022 and the original field test unit is still in operation in New Mexico.

Subsequently, broader field testing began in December 2023 with 105 units field tested with 21 producers as of March 2025.

Geographically, field trials were initiated in all major basins in the US excluding California, Pennsylvania and Ohio. Additional units were also successfully field tested in Colombia during this time period.

Participating wells were all horizontal wells with total well depths ranging from 6150 ft to total depths exceeding 17,500 ft.

Production data for field trial test wells ranged from 385 bpd to 128 bpd; please note production data was not always shared.

Wells ranged in age from new wells less than 2 months old for new pumping unit installations to wells in operation for 12 years.

Field trials of the new product were installed on a range of major pumping unit manufacturers with a footprint in the US.

Importantly, many field trials were initiated and monitored at the field level. While some field trials were certainly undertaken with input and support from production engineers, rarely do production engineers specify certain brands of rod rotators to be used on new rod pump installations.

Prior to field trials of this product, feedback from the field indicated rod rotator longevity of only 4 weeks in some cases, leading to general acceptance by some that rod rotators are a wear item that must be frequently replaced.

In one specific field trial in Powder River, on a particularly challenging well, they were replacing rod rotators on an average of 4 to 6 weeks. The field trial unit was installed Feb 2, 2024, and is still in operation with no replacement required. The return on investment in terms of cost savings and well productivity is particularly compelling for this producer.

CONCLUSIONS:

Recurring problems in the field related to rod rotator performance are driven by inadequate greasing and preventative maintenance, as well as evolving well profiles that are no longer a good fit for traditional rod rotators.

Furthermore, as producers' field maintenance resources and budgets are increasingly stretched, these failures may go undetected for longer periods of time, resulting in rod string damage or necessitating rod string replacement, leading to costly workovers.

The time and expense associated verifying rod rotator performance and replacement may result in lower well productivity and higher overall rod string maintenance costs.

Encouraging field trial results of a new rod rotator solution may merit a review of how rod rotator decisions are made by production teams. Production engineers may find specifying rod rotators a useful tool to support the investment and design of the rod string to increase well productivity and reduce maintenance costs.

ACKNOWLEDGEMENTS: WSI - Wellhead Systems Inc.; field distribution partners and producers who engaged in field testing of this rod rotator solution.