EXTENDING RUN LIFE IN SAND-PRODUCING WELLS:
THE BENEFITS OF ROD PUMP SAND MANAGEMENT TOOLS

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ABSTRACT

Sand production has been recognized by the oil and gas industry as one of the most significant challenges affecting the operation, efficiency, and longevity of unconventional rod-pumped wells. As sand and other solid particles migrate into the pump assembly, they create abrasive conditions that accelerate wear on critical components. This abrasion not only reduces pump efficiency but also increases the risk of premature equipment failure, unplanned downtime, and costly maintenance interventions.

Given these challenges, operators have expressed the need for sand fallback protection for wells produced on Sucker Rod Pump (SRP) lift. The industry has responded to this challenge by developing tools that trap sand above the rod pump during a shutdown state. These tools have proven to reduce the total cost of operating a rod pump system by reducing pump plugging and wear. Rod pump sand management tools have improved economics by increasing run life and reducing operational costs.

This paper provides an in-depth look at a commercially available SRP sand management tool. PetroQuip has shared the operating mechanism and operational benefits of the Sand Maze SRP. The operator will share a seven-well study that evaluates the use of this tool on unconventional wells within the Midland Basin. The operator's data shows that SRP sand management tools extend run life and reduce the need to pull tubing on standard rod pump failures.

INTRODUCTION

Rod lift systems are used for artificial lift applications due to their reliability, simplicity, and cost-effectiveness. In wells producing from unconsolidated or recently fractured formations, sand production remains a persistent challenge. Once introduced into the production stream, sand behaves as an abrasive contaminant, rapidly degrading pump components and increasing maintenance costs.

Operators employ surface filtration or cyclonic separation to manage produced sand. These types of sand filtration systems are necessary and work very well. Unfortunately, there are no sand filtration systems that are one hundred percent efficient. Which means, sand can still reach the rod pump in extreme conditions. When this happens, pump components are damaged or plugged, which affects pump efficiency.

Once the sand is produced through the rod pump, it becomes suspended in the tubing due to the low fluid velocity of the SRP system. When the SRP system is in the downstroke or in a shutdown state, the suspended sand will fall on top of the rod pump (referred to as fallback). These scenarios can cause rod pump damage or even failure.

The SRP sand management tool is a solution to sand fallback. The tool catches the sand above the rod pump and uses the tubing string as a reservoir to hold the sand while the fluid movement is static.

This paper uses the PetroQuip Sand Maze SRP as an example of an SRP sand management tool, hereafter referred to as the SRP sand management tool.

MECHANISM OF OPERATION

The SRP sand management tool employs a design that combines a self-cleaning sand filtration chamber with a check-valve system. During normal operation, the check valve remains open on the upstroke and closed on the downstroke. This allows fluid to flow through the system with minimal pressure drop.

When pumping ceases, the weight of the fluid causes the check valve to close, which creates a seal around the sucker rod and prevents solids from falling back on top of the pump. Instead, any settling particles are captured within the tool's containment chamber. Once the containment chamber is full, any excess sand is deposited on top of the diverter rubber at the head of the tool. This allows the chamber to overflow.

Upon restart, the flow is directed through the tool's external bypass. This causes the collected solids in the containment chamber to slowly move upward into the production stream. Once the chamber clears, the check valve reopens, which restores the primary flow path of the SRP sand management tool.

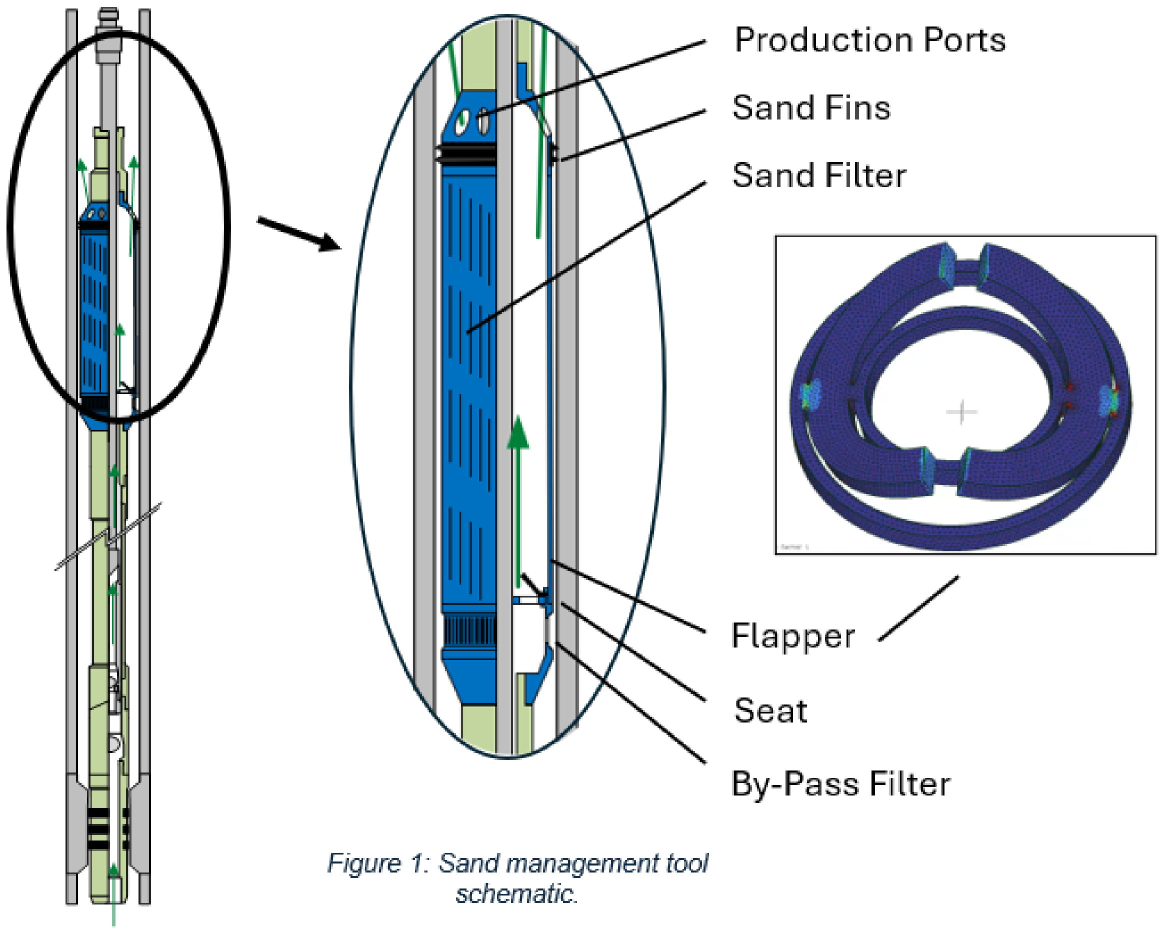


Figure 1: Sand management tool schematic.

SRP SAND MANAGEMENT TOOL BENEFITS TO OPERATIONS

1. Protection Against Solids Fallback

By creating a physical barrier against descending solids during the downstroke and during shutdowns, the SRP sand management tool prevents sand accumulation on top of the pump. This reduces startup friction and decreases the chances of premature pump damage/failure.

2. Extends Pump and Rod String Life

Reduced solids abrasion results in less degradation on the internal components of the rod pump system. When abrasive forces are minimized, critical pump parts and the rod string experience less wear and/or compressive loads. This has a direct effect on the overall service life and efficiencies of these components. Field implementations have demonstrated significant increases in equipment run life.

3. Improved Operational Efficiency

With reduced wear and fewer pump failures, rod lift systems can maintain higher mechanical and volumetric efficiency throughout the life of the equipment. Lower friction and minimized component degradation allow the pump to transfer energy more effectively to the downhole assembly which results in more consistent production rates. This translates into smoother, more reliable operation with fewer interruptions, as well as reduced power requirements due to lower resistance in the system.

4. Reduced Nonproductive Time (NPT)

Workovers and troubleshooting are major contributors to deferred production. By minimizing sand-induced troubleshooting or equipment failures, the SRP sand management tool helps maximize well uptime without human intervention.

5. Cost Savings and ROI

The relatively low installation cost of the SRP sand management tool is offset by the reduction in workovers, equipment replacement, and deferred production. In general, the operator expects a return on investment within the first run cycle due to extended equipment life and stabilized production. By implementing the tool, the likelihood of pumps being stuck in the tubing is reduced. This leads to fewer unplanned tubing pulls on rod or rod pump workovers. The operation benefits from more reliable performance, lower maintenance requirements, and a decrease in intervention cost.

6. Ease of Integration

The SRP sand management tool is compact and is compatible with standard rod lift designs using API standard threading. It can be deployed in both new installations and existing wells during routine workovers without extensive modification to existing hardware. The tool attaches directly to the barrel, between the top of the barrel and the rod guide. The mechanism is assembled at the rod pump providers shop, which minimizes any changes for the field personnel on location.

<u>THE OPERATORS CASE STUDY</u>

The Operators Problem

Large amounts of sand are often encountered in unconventional wells produced on sucker rod pumps. The heavy sand movement is caused by the initial fracture or fracture hits by nearby completions. In many cases, sand accumulates on top of the pump, resulting in stuck pumps which require extra steps in the pulling process. This problem results in elevated workover costs and short runtimes between failures. Figures 2 and 3 provide photos of the severity of sand problems that are being encountered. Figures 4 through 6 are examples of dynamometer cards from these sand-producing wells. (a dynamometer card is a graph that plots the polished rod load in relation to its vertical displacement during a pump stroke.)

Figure 2: Examples of solids found during the pulls and pump teardowns.

plunger packed off with sand

primary traveling valve ball and seat

Standing valves prior to cleaning

Figure 3: More examples of solids found during pump teardowns.

Sand in primary standing valve

Barrel packed off/sand

Figure 4: Stuck plunger dynamometer card.

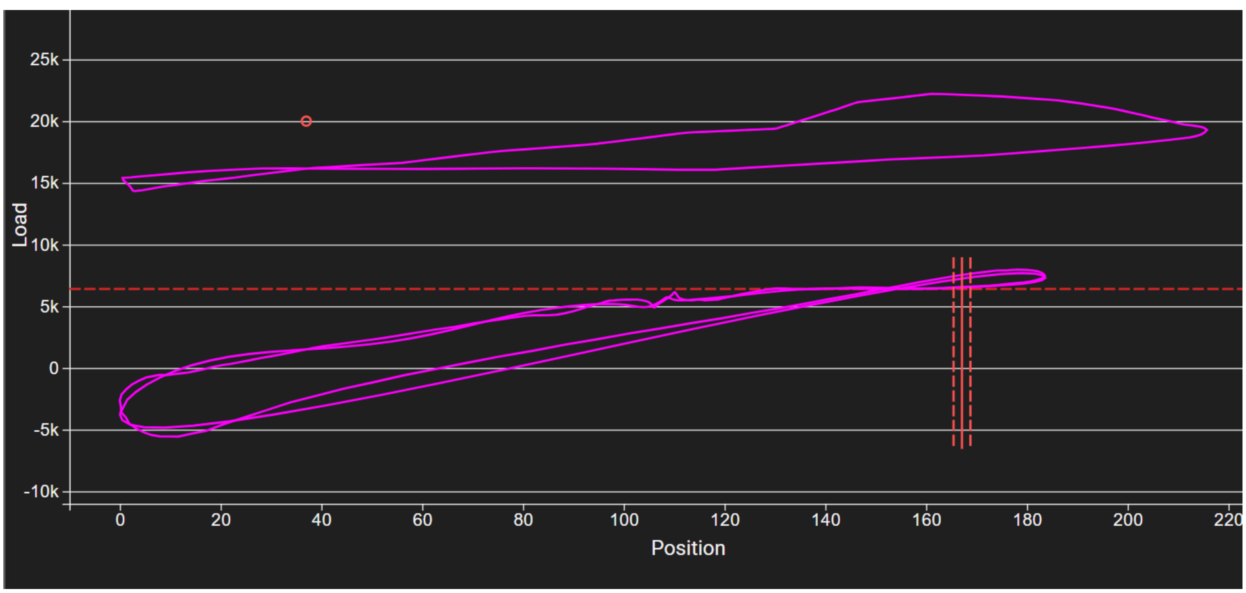


Figure 5: Added pump friction from solids in a dynamometer card.

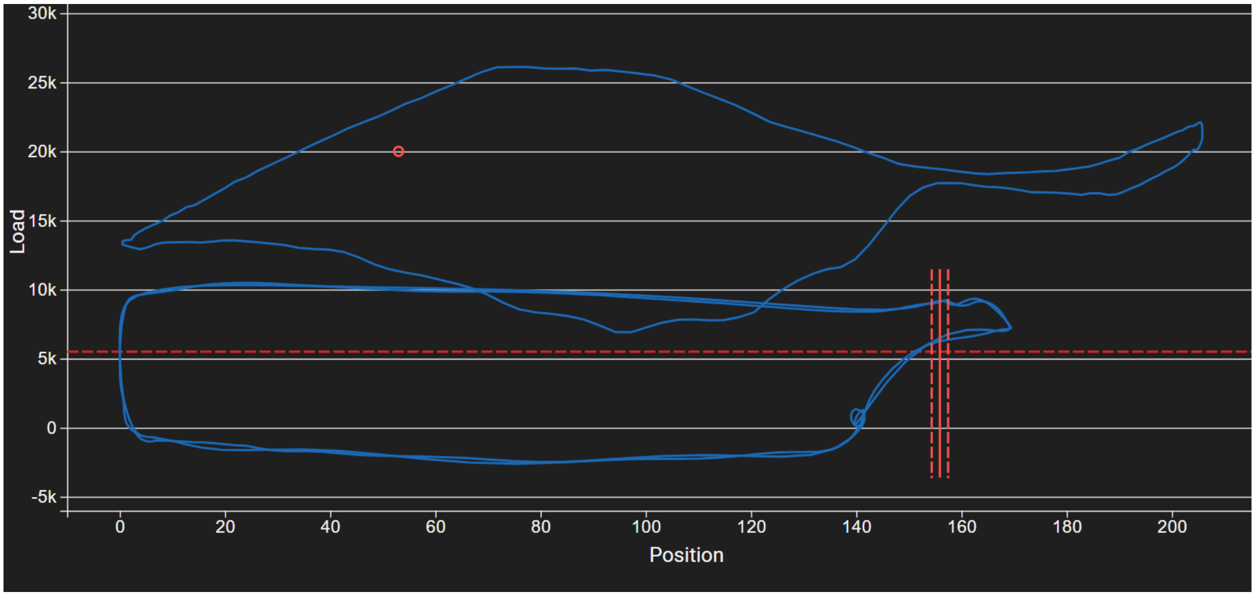
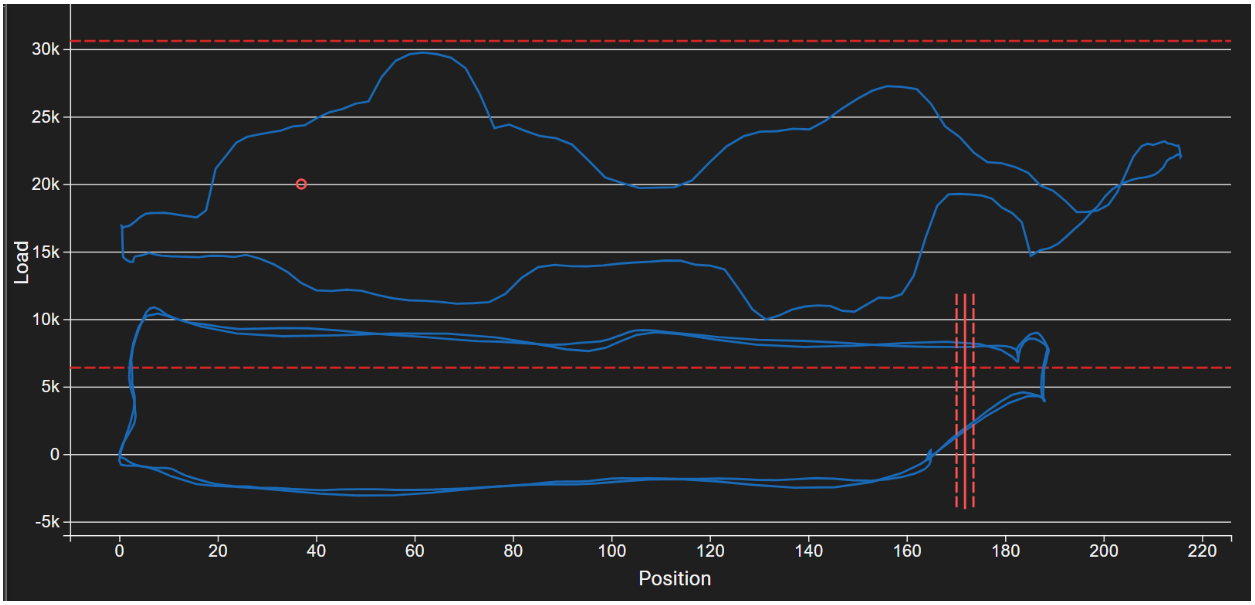


Figure 6: Dynamometer card showing added pump friction from solids.



The Operator's Goal for the Case Study

Initially, the goal was to reduce the amount of sucker rod pumps that were stuck in the tubing after sandy conditions were encountered. A secondary goal was to increase runtime on the most server sand-producing wells.

The Operator's Data and Analysis

This dataset includes wells with the SRP sand management tools installed in high sand-producing unconventional wells within the Midland Basin. All these wells are produced by sucker rod lift on VFD (variable frequency drive) controllers. Thirteen of sixteen tool installations have been selected to be a part of this dataset. The three installations that were excluded from the dataset, have not accrued enough runtime or lack historic information. Within the dataset, thirteen sand management tools have been installed in ten different wells. Three versions of the tool have been installed since the trial began in February 2025. Each version addressed issues as they were identified during the pump teardowns.

The data analysis (Table 1) shows that the tool has increased runtime by twenty percent over the historic SRP runtime averages. The run time cutoff date was February 28, 2026. It is critical to note that ten of the thirteen installations are still accruing runtime. The runtime will continue to increase daily until failures are confirmed. Four of the tools have been pulled and all resulted in easy pump hold down releases.

Table 1: Dataset analysis.

Total Installations	
Total tool installations*	16
Version 1 installations	2
Version 2 installations	3
Version 3 installations	11
Data Set Analysis	
Total number of wells still running	10
Total number of installations included	13
Mean Percentage Run Time Increase	20%
Standard pump mean run time**	132
Mean run time – ***Sand management tool***	158
Standard pump median run time	124
Median run time ***- Sand management tool***	110
Number of pulls	4

Number of pumps unseated	4
Number of failures	4
Date data was finalized	2/28/2026

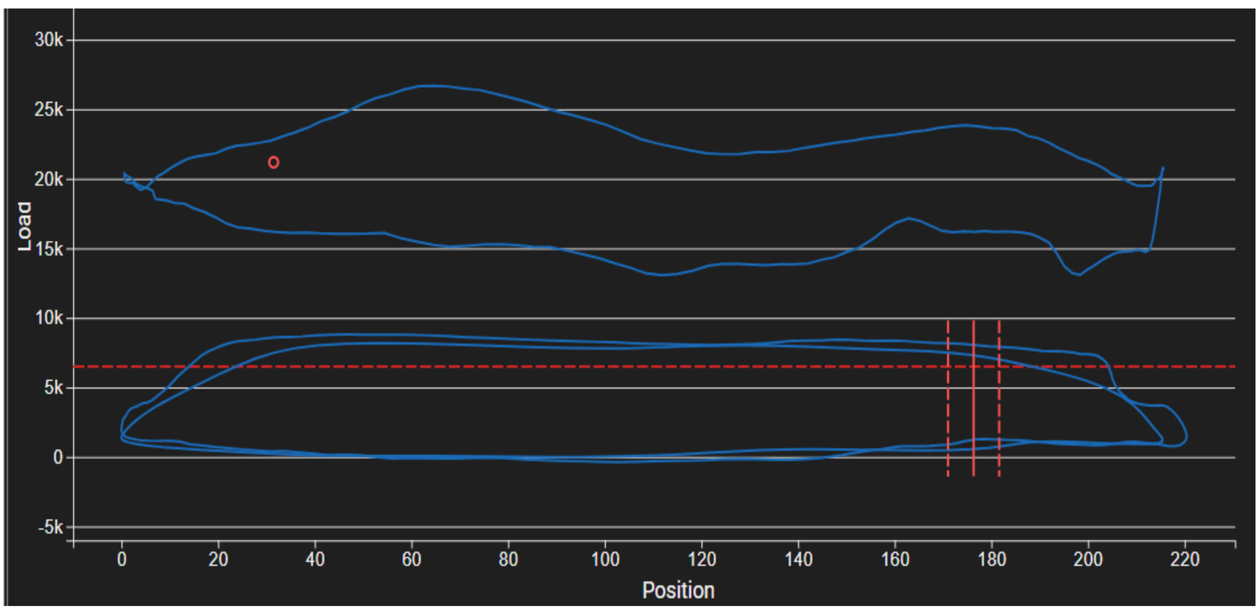
** Only thirteen of the installations are part of the dataset analysis.*

*** Run time shown in days.*

CASE STUDY 1

The Case Study 1 well was converted to SRP June 5, 2024. It has had one failure since the conversion, with a runtime of two hundred thirty-six days. The root cause of the failure was sand. On February 12, 2025, an SRP sand management tool was installed. The well is currently still running (three hundred eighty-one days). In August 2025, the dynamometer cards (Figure 7) started to show a worn traveling valve.

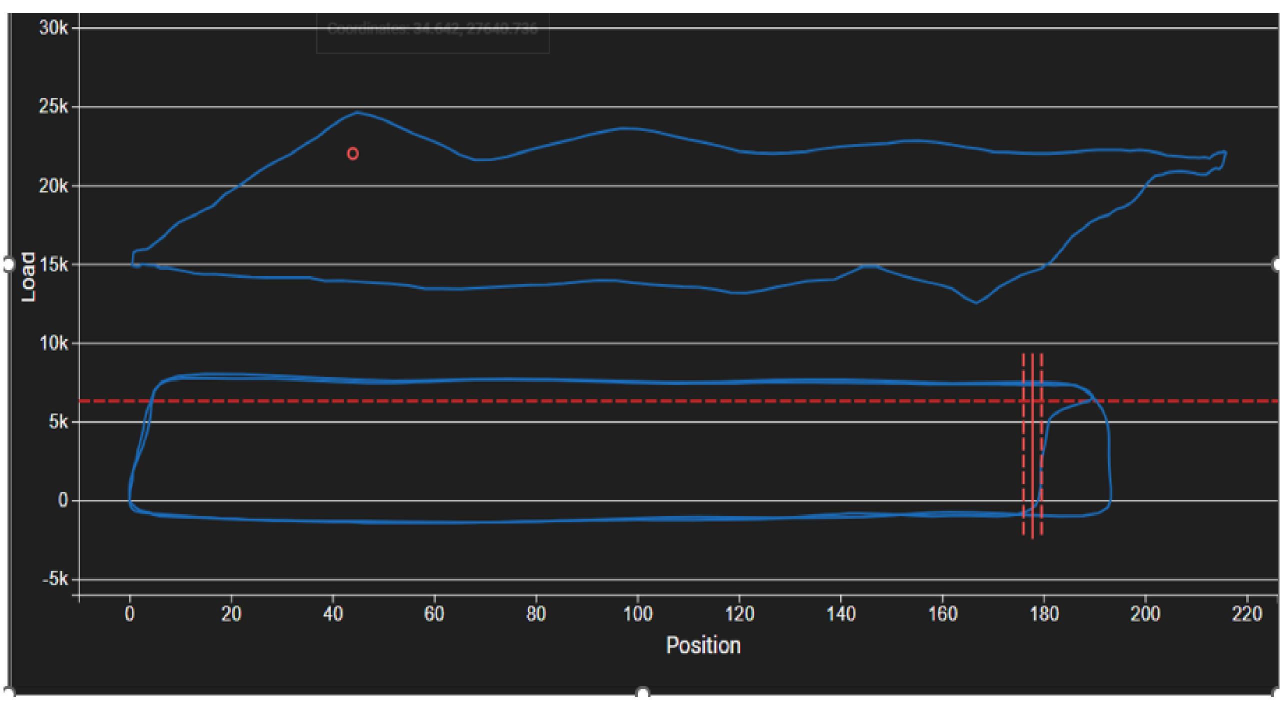
Figure 7: Case Study 1 dynamometer card.



CASE STUDY 2

The Case Study 2 well has a long history of sand-related pump failures since being converted to SRP July 5, 2023. The SRP lift mean time to failure is approximately seventy days. Many different bottomhole assemblies and pump configurations have been tested with similar results. On March 17, 2025, an SRP sand management tool was installed and ran one hundred nineteen days before a rod part event on July 14, 2025. The tool resulted in an easy pump hold down release. The operator tried a different sand separation/management tools that resulted in short several runs. On November 11, 2025, an SRP sand management tool was reinstalled and has been running for one hundred ten days. The dynamometer cards show worn traveling valve (Figure 8).

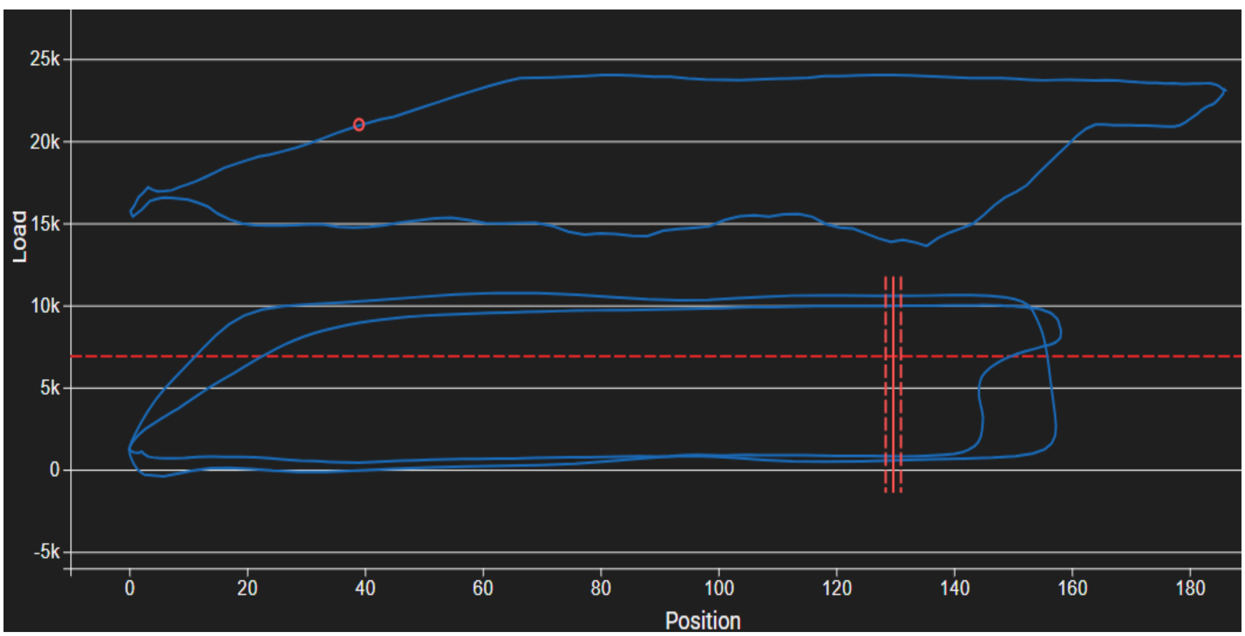
Figure 8: Case Study 2 dynamometer card.



CASE STUDY 3

The well in Case Study 3 was converted to SRP February 28, 2023. Since conversion, the SRP mean time to failure is approximately one hundred seventy-two days. All but one failure has been caused by sand. An SRP sand management tool was installed May 14, 2025, and is currently still running (two hundred ninety days). This well was shut in for offset fracture defense from October 9 through October 24, 2025. There have been no signs of pump issues during the post downtime startup or since.

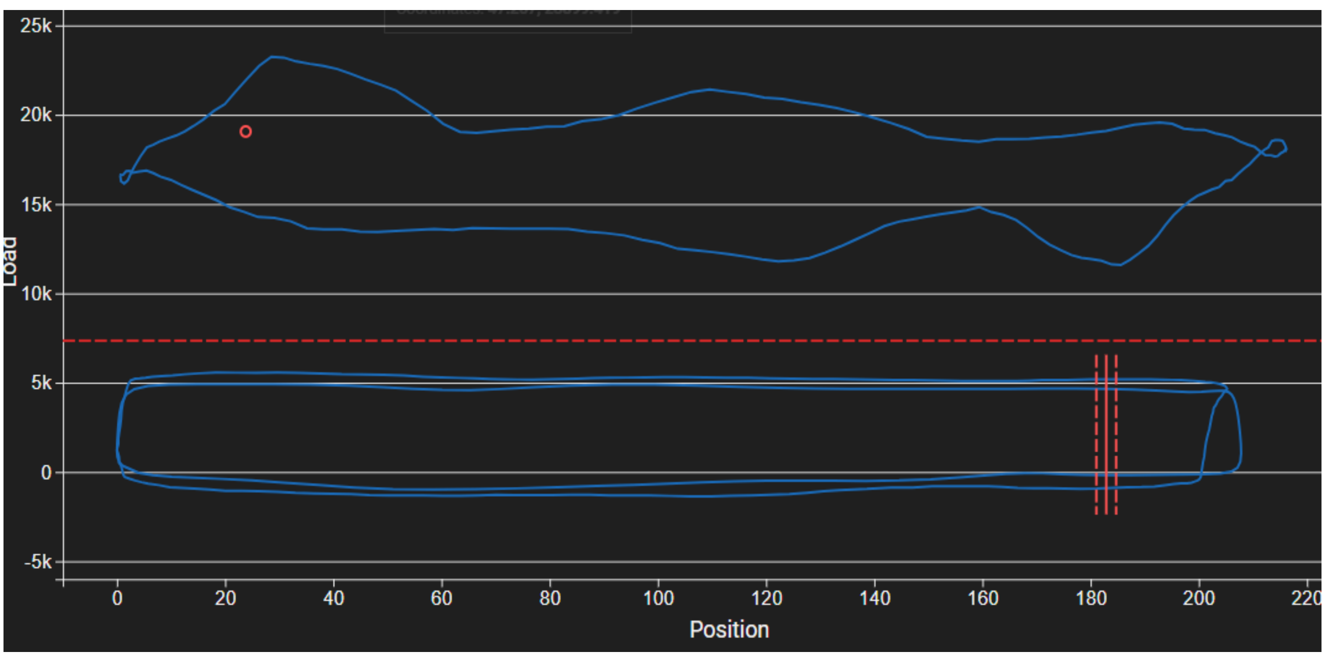
Figure 9: Case Study 3 dynamometer card.



CASE STUDY 4

The Case Study 4 well was converted to SRP September 1, 2023. The mean time between failures is approximately one hundred ninety-seven days. All four of the failures are sand-related. On May 12, 2025, an SRP sand management tool was installed. Currently, the well has been running for two hundred eighty-two days. The dynamometer cards show periodic gas interference but no signs of pump wear or solids. This well was shut in for offset frac defense October 6, 2025, through October 27, 2025. There have been no issues with the post downtime startup or since.

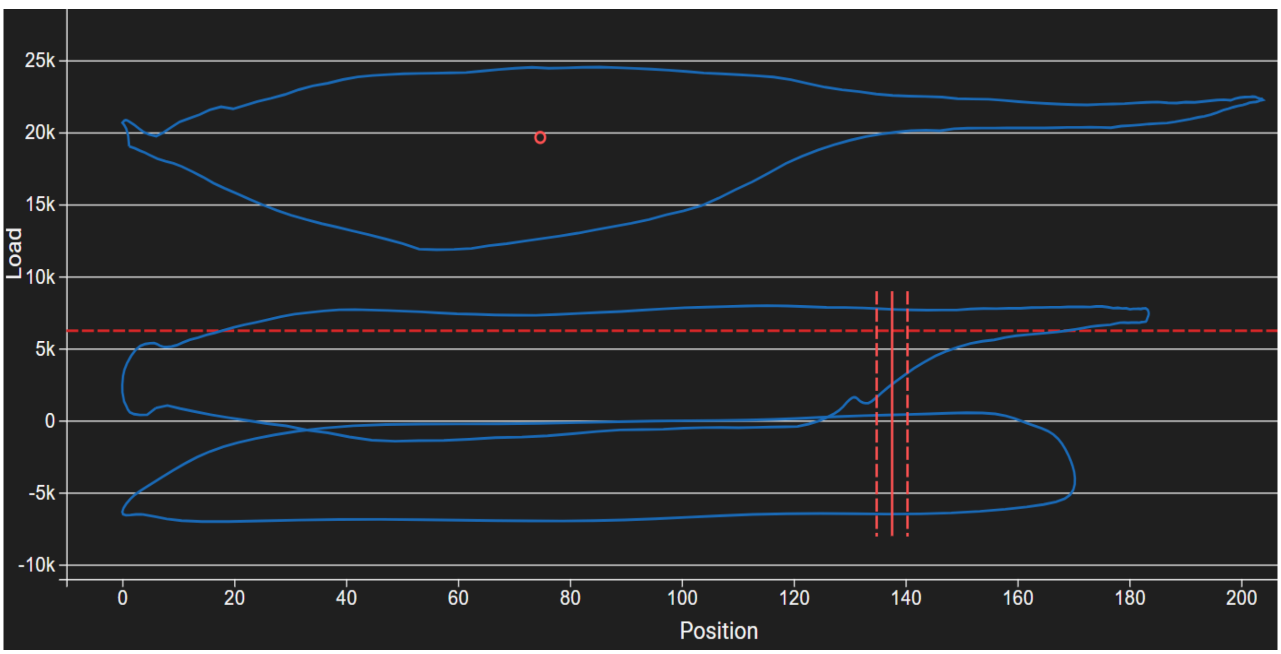
Figure 10: Study 4 dynamometer card.



CASE STUDY 5

The Case Study 5 well was converted to SRP March 27, 2024. The mean time between failures is approximately one hundred twenty-four days. All three previous failures were caused by sand. On May 14, 2025, an SRP sand management tool was installed. This well was shut in January 24 through January 28, 2026, for surface issues after a winter storm. There were no issues at start up post downtime. The dynamometer cards (Figure 11) show gas interference and a worn standing valve, but no sign of solids.

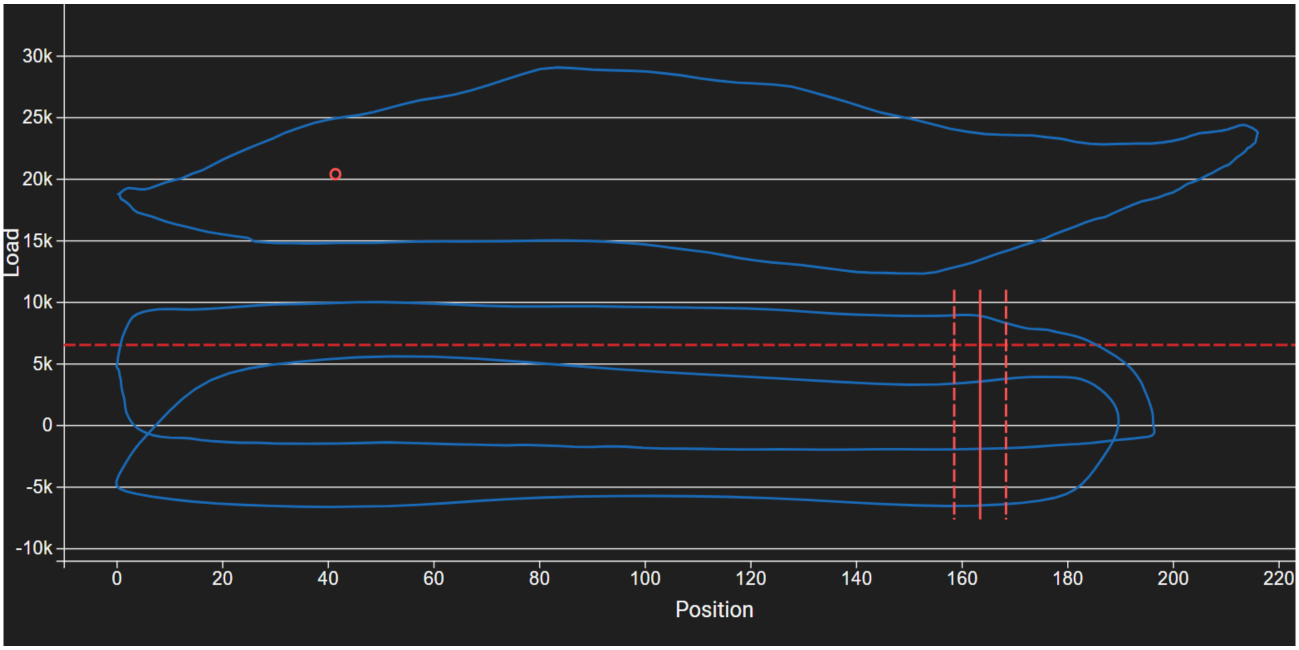
Figure 11: Case Study 5 dynamometer card.



CASE STUDY 6

The Case Study 6 well was converted to SRP October 2nd, 2024. The mean time to failure is approximately one hundred twelve days. The last two failures have been caused by sand. On November 17, 2025, an SRP sand management tool was installed. There was some downtime December 19th through December 23rd, 2025. There were no issues encountered during the startup after downtime. A rod pump failure was confirmed February 19, 2026 after a ninety-four-day run. The pump was easily unseated, and the pump was plugged with sand. The dynamometer (Figure 12) cards are normal but show a worn traveling valve in the weeks leading up to failure.

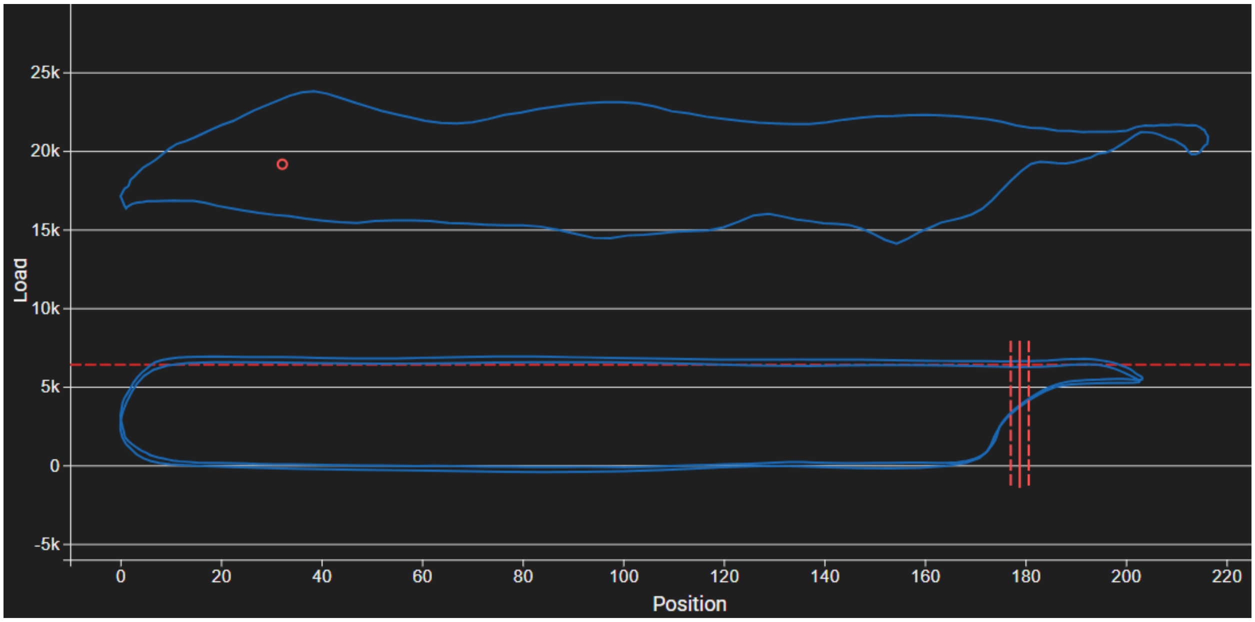
Figure 12: Case Study 6 dynamometer card.



<u>CASE STUDY 7</u>

The Case Study 7 well was converted to SRP April 8, 2023. The mean time between failures is approximately one hundred twenty-four days. All six of the failures have been caused by sand. On December 8, 2025, a SRP sand management tool was installed. On December 12, the dynamometer cards indicated a worn traveling valve. The pump was unable to recover and was classified as failure on December 16, 2025. The total run days were eight. The pump was unseated easily, and the report shows that there was heavy sand found throughout the pump. On December 31, 2025, an SRP sand management tool was reinstalled and has been running for fifty-nine days. The dynamometer cards (Figure 13) are normal and have no signs of solids. There have been no downtime events.

Figure 13: Case Study 7 dynamometer card.



CONCLUSION

Effective sand and solids management is a critical factor in ensuring the performance, reliability, and longevity of rod lift systems. While conventional separation and filtration techniques can remove sand from produced fluids, they do not address the issue of solids falling back into the pump.

The SRP sand management tool addresses this challenge by providing reliable, downhole protection against solids fallback. By maintaining mechanical and volumetric efficiency, the tool extends the service life of the pump and rod string.

For the operator in this study, wells producing from sand-prone formations or recent fractures demonstrated measurable operational benefits when equipped with an SRP sand management tool. The field results indicate improved production consistency and reduced costs associated with operating under extreme sand conditions.