

Maximize Production Over a Well's Lifecycle Using AI for Rod Pump Optimization

BACKGROUND

Rod pumps are ubiquitous across the North American landscape, and for good reason. With relatively low installation and operating costs, rod pumping is the most common artificial lift method in North America.

Bottom hole rod pumps have few moving parts and this simplicity translates into high reliability and longevity of equipment. In order to maximize return on investment, it is more critical than ever for oil and gas operators to be prepared to constantly monitor their systems, quickly identify issues, and resolve them in a cost-effective and timely manner to optimize their production.

WHAT'S YOUR CHALLENGE?

Despite the simple design of rod pumps, finding and maintaining the ideal settings for stroke speed and length adjustments in order to maximize production on each well can be a tedious and time-consuming proposition.

Additionally, rod pumping equipment can experience a range of issues over its lifetime. While hardware failures such as parted rods and worn tubing can be partially mitigated with proper design and maintenance practices, well bore related issues such as wax build-up, gas interference, or gas locking are more unpredictable.

Historically, operators have relied on routine physical reviews of wells, with field operators travelling to each well site sequentially to do individual status checks of all wells. This often resulted in unnecessary visits to wells with no issues, and delays in discovering and addressing issues at troubled wells.

Local surveillance and control technology have allowed for improved visibility of operational variables, but data storage capabilities are often limited, preventing operators from identifying changes in a well's behavior that could be a critical, immediate issue or one that is developing.



What if you could...

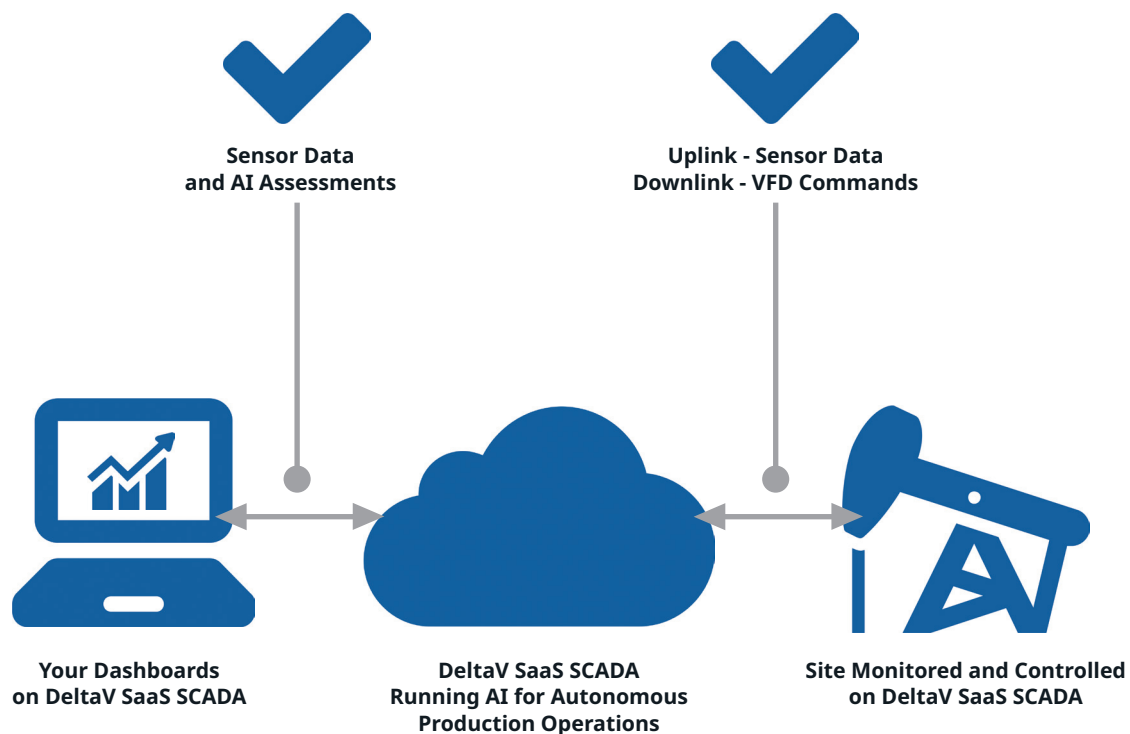
- Easily monitor your rod pump system to quickly identify issues and ensure rapid, cost-efficient resolution?
- Minimize unnecessary trips to the field to monitor the health of your rod pump?
- Have greater data storage capabilities to better utilize data trends over time?
- Use an AI to ID anomalies & automatically adjust stroke & speed without humans?
- Provide your staff with mobility & access to critical operational data wherever they are?

APPLICATION NOTE

WHAT'S YOUR OPPORTUNITY?

Using Emerson's DeltaV™ SaaS SCADA cloud-native platform and DeltaV SaaS SCADA Mobile operators can remotely enter, monitor, and manage production data including adjusting pumping parameters without traveling to the site. DeltaV SaaS SCADA with Autonomous Rod Pump, an AI powered feature that identifies common operational anomalies and makes the appropriate adjustments to the rod pump stroke and speed, all without operator intervention.

With this powerful combination of solutions, the operator can prioritize daily tasks, providing the ability to focus on troubleshooting wells that indicate anomalies and avoid the wasted time of unnecessary trips to the field. The end result is an increase in production revenues due to reduced downtime, fewer workforce and maintenance costs, and improved safety.



ADVANTAGES OF EMERSON'S SOLUTION

DeltaV SaaS SCADA with Autonomous Rod Pump takes full advantage of state-of-the-art AI algorithms and can identify multiple and even simultaneous anomalies in near real time. As pump cards and other data are pulled into the cloud-native IIoT platform the AI engine analyzes all parameters and indicates an assessment on your DeltaV SaaS SCADA dashboard. When an anomaly is identified, the analytics engine can autonomously issue commands to the rod pump's pump off controller to adjust the variable frequency drive's (VFD) operation to correct the situation. Corrective actions consist of sequences of learned commands to the VFD to adjust the stroke rate as needed based on the type and severity of the anomaly, just as an operator would.

Instructions can be autonomously delivered to the pump off controller to make the appropriate corrective action to the pump, or alternatively raised as an alarm to the operator, identifying the issue and recommending action.

The AI algorithms are continuously enhanced with support from production engineering and data science subject matter experts as well as user feedback. Because it is a cloud solution, the enhancements are delivered seamlessly to all users.

APPLICATION NOTE

ADVANTAGES OF EMERSON'S SOLUTION - CONTINTUED...

The AI engine can identify and correct for the most common modes of failure in North American rod pump wells and can identify a problematic situation even if it is beyond the current set of identifiable anomalies. Emerson continues to progress the sophistication of the AI engine, adding to the growing list of identifiable anomalies.

Over time, the technology becomes more valuable as the breadth of recognition and autonomous response grows. Identified anomalies currently include:

- **Fluid Pounding**
- **Gas Interference**
- **Gas Lock**
- **Parted Rods**
- **Sticking Pump Barrel**
- **Waxing**
- **Sanding**
- **Stuck Piston**
- **Traveling Valve Stuck Open**
- **Traveling Valve Stuck Closed**

Examples of Autonomous Actions

Anomaly	Action	Benefit
Fluid Pounding	Increasing pump fill	Improve pump efficiency and lower risk of rod buckling
Gas Interference	Increasing pump fill	Improve pump efficiency



DeltaV SaaS SCADA is built for oil and gas producers for remote SCADA monitoring, control, and optimization at the well-pad, regardless of the field device used at the site. Our cloud-native IIoT platform delivers up-to-the-minute, accurate and relevant data for rod pump monitoring to authorized end users, enabling each user to actively see the information that is relevant to their role.

Optimize Rod Pumps with AI Solution that Automatically Adjusts for Known Anomalies

Performance Opportunities	How Your Operation Will Benefit
Long Term Data Trending	Identifies changes in a well's behavior that could be an indication of a current or developing issue.
Dashboard to View Pump Data and Health	Displays relevant data and health status of the pump, including pump cards, pump fill, rod loads, current stroke rate, type of anomaly, and target stroke rate set by the AI engine.
Remote Intervention	Reduces unnecessary trips to well sites and minimize personnel hazard exposure.
Alarming	Alarms triggered when anomalies are detected.
Additional Anomaly Flagging	In addition to anomalies with specified corrective actions, the Zedi Rod Pump Analytics solution identifies 'other' anomalies for experts to investigate and enact corrective actions.
Flexible, Scalable Integration	Able to integrate with existing field devices.

APPLICATION NOTE

DeltaV™ SaaS SCADA is an IIoT cloud-native platform designed to enable asset-intensive industries to quickly and securely connect, acquire analytics and provide control of remotely located devices anywhere, anytime by anyone of your authorized users. We help our customers become more productive, profitable and sustainable to improve life around the globe.

SECURITY	SCALABILITY	SERVICE
<ul style="list-style-type: none"> ✓ Monthly automatic security updates ✓ Secure web access anywhere, anytime ✓ Two-factor authentication ✓ Backups & disaster recovery ✓ ~3500 Microsoft™ security experts 	<ul style="list-style-type: none"> ✓ Mobile app anywhere, anytime access ✓ Customer roadmap involvement ✓ Customize your user groups ✓ Budget friendly & low CapEx ✓ 26 effortless software updates in 2023 	<ul style="list-style-type: none"> ✓ Live 24/7/365 support included ✓ eLearning courses & workshops ✓ Project Management available ✓ Data Exchange service available ✓ Alarm Management available



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