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Physics-Based AI Helps ESP Equipment Score Production Points

By Colter Cookson

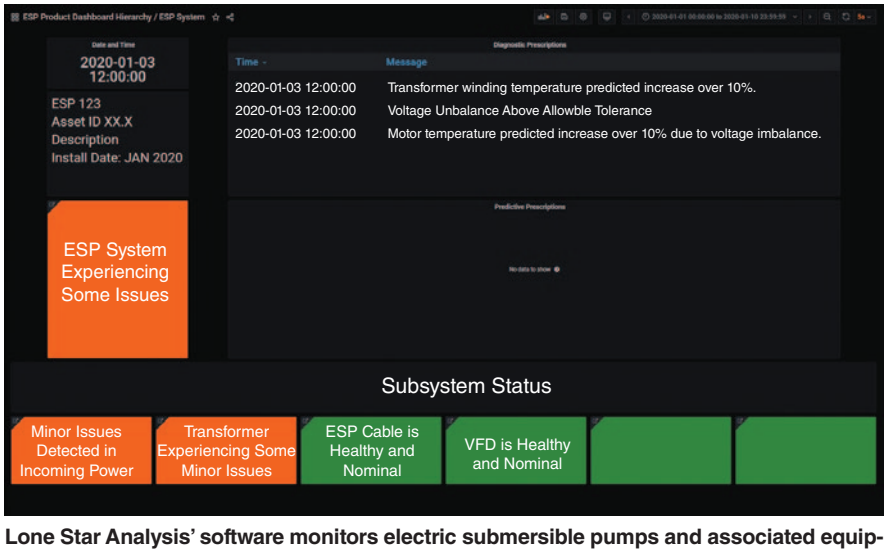
To thrive in a tough environment, oil and gas producers often draw on the same characteristics that allow professional basketball players to succeed on the court. They put in the time to master essential skills, have the situational awareness and agility to adapt quickly to unusual events, and work with others to unlock their assets' full potential.

And like the general managers who must decide whether to pay a star's salary or develop promising young talent, producers must always consider economics. To meet the world's continuing need for oil and natural gas while maintaining strong balance sheets, they are looking for ways to increase their artificial lift systems' reliability and efficiency.

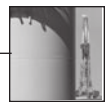
Transparent Algorithms

Roemerman describes Lone Star Analysis' software as transparent. "If a production engineer wants to understand why the software thinks a problem is coming, they can pull up a visual representation of the pump that shows the pressures, temperatures and other data from various stages," he assures. "Usually, they quickly see what is going on."

In addition to drawing on readings from actual sensors, the software estimates measurements with "virtual sensors" developed by applying physics and machine learning algorithms to analogous data. These virtual sensors allow the software to make more informed decisions than it could if it had to rely solely on the downhole data, Roemerman says.



Lone Star Analysis' software monitors electric submersible pumps and associated equipment to help producers maximize uptime and performance. The company says the software detects many issues weeks or months in advance.



"ESPs send less data to surface than an old dial-up modem, so machine learning algorithms for optimizing them cannot rely on brute force approaches that require vast datasets," Roemerman observes. "Instead, we tell the algorithms everything we already know, such as general principals about the way electric motors and pumps work, as well as the characteristics of the on-site equipment and the materials it is made from.

"The goal is to use machine learning only when it will help us discover something unknown, such as what is happening down hole at that specific site," he outlines. "Because we need so little data to train our algorithms, we often start predicting failures within an hour of our software going live."

Assuming the operator already has SCADA systems on site, Roemerman says deploying Lone Star's software will take a week or two at most. If the client uses remote monitoring platforms from one of the company's partners, such as ABB, deployment can be simple as checking a box and waiting 24 hours.

"We use a software as a service model where we charge a fee for each pump monitored," Roemerman notes. "Usually, the service will pay for itself within a month." ❐