

## Utilizing Algorithms to Determine Production Increases on Wells Operating with a Fluid Level Above the Pump

### **Abstract:**

One of the benefits of utilizing a Sucker Rod Pump for artificially lifted oil and gas wells is that they can achieve total drawdown of the casing fluid above the downhole pump. This allows for the pump to maximize the production of the well by minimizing the back pressure on the reservoir caused by the fluid level in the casing annulus. However, in some cases the original design of the sucker rod pump system may not be able to achieve the capacity required to drawdown the entire fluid level in the casing annulus. In order to increase production operators are tasked with identifying these wells and prioritizing them based on their opportunity for increased production and then perform the necessary operational changes to ensure the wells are producing more optimally. Previously this process was done entirely manually and could take several hours per well. Previous methods required inferences which resulted in imprecise estimations on maximum gross production available

To combat this, algorithms were developed to apply rules across several thousand wells to determine if they are good candidates for increasing production. Using a host software solution tied into wells running on pump off control, algorithms were developed to determine if a well was pumped off. If this criterion was met well test information was used to infer the well's maximum production. Then leveraging software with predictive wave equation capabilities, several outcomes where the speed was modulated in the rod pumping system were generated. After analyzing all the possible scenarios, the algorithms then determined the optimal solution based on equipment loading, well performance, and production information. Operators were able to leverage this automated process to determine real opportunities for increased production on the rod pumped wells. By automating the process of discovery, prioritization, and speed changes required, the software eliminated unnecessary man hours in the process of optimizing wells for maximum production and allowed the end users to quickly identify wells with actionable changes that led to production increases. This process also identified candidates for increasing uplift that traditional methods wouldn't have identified.