

Optimizing Rod Lift VSD Wells Using Autonomous Control
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Rod lift well optimization is presented here using autonomous control to efficiently manage the speed of the pumping system to achieve target fillage and increased production. Autonomous control changes the minimum and maximum VSD speed setpoints while maintaining safe operating limits on both surface and downhole equipment.

Today on rod lift wells with VSD, Min/Max SPM or Frequency (Hz) are changed periodically, either by the Production Engineer and analyst using SCADA software or by the operator at Wellsite. The Production Engineer and analyst base their changes in the SPM on monitoring the well trends over a period of time.

On wells with varying inflow characteristics, an optimum VSD Min/Max SPM or Frequency (Hz) needs to be determined to maintain the desired target pump fillage.

On wells that maintain fillage above target pump fillage the Max SPM or Frequency (Hz) can be increased to achieve higher production after manually analyzing the well trends and performance. The increase is implemented in the controller only if the surface pumping unit system and downhole equipment design allows for it.

Existing controllers installed in the field today do not have the intelligence in place to autonomously increase the Max SPM by taking into consideration the safety factors of surface and downhole equipment. A manual change by an informed Production Engineer or well analyst is required for implementing such a change.

To find the optimum VSD Min/Max SPM and to increase Max SPM or Frequency (Hz) on the pumping unit, a rundown analysis of the well status data and safe

operating conditional checks of surface and downhole equipment are needed to be performed before changing the SPM setpoints.

In this paper we will discuss how an Edge device, that has the capability to capture high frequency data, perform physics-based calculations on the data captured to ensure both the surface and downhole equipment are operating within safe operating limits, connected to an existing Rod Pump Controlled VSD system at the well site, can change the SPM or Frequency (Hz) autonomously. Using the analysis on high frequency data and physics-based calculations, Edge will autonomously change the SPM setpoints in increments on the Rod Pump Controlled VSD. The autonomous control performed by Edge is closed loop control logic, where the SPM setpoints are reverted back on the Rod Pump Controlled VSD if the surface and downhole equipment safe operating limits are exceeded at any time. Such a programmable closed loop autonomous control logic occurring on the Edge at the well site improves the run life of the equipment while maximizing the production in a safe manner.