Abstract

This is a case study designed to confirm that high frequency, high resolution pressure data measured at the wellhead of a pump jack well can be used to evaluate and optimize the performance of the downhole pump.

A company installed high-performance pressure monitoring devices on the tubing of eighteen rod pump wells upstream of the flow line check valve. An additional device was installed on the group flow line. These Internet of Things (IoT) devices are rated for Class I, Division 1 hazardous zones, measure pressure at one-second intervals, and have a pressure resolution of 0.006 psi. The per-second pressure measurements are also time-synchronized and temperature-compensated for accuracy and will be delivered to a cloud-based data service over the course of a month.

For each well, the difference in pressure between the tubing and flow line will be analyzed in five-minute data windows. The pressure differential from each five-minute data window will provide a clear picture of the pressure the pump exerts on the flow line over the course of an average pumping cycle during that interval. Because pressure can be used as a proxy for flow, fill and efficiency at the bottom hole pump can be deduced from the calculated flow profile at surface, eliminating the rods and their associated error as the conduit of pump performance data. Assessments of pump performance using this technique will also be compared to results from production tests to determine how effective this technique is in evaluating rod pump performance. The large sample of five-minute data windows collected over the course of a month will test the technique against varying operational conditions. Furthermore, we will determine if particular pressure trends correlate with certain pump conditions, which would be of use for diagnosing pumping issues.

The approach of using high frequency, high resolution pressure measurement at the wellhead to assess downhole pump performance has shown promise in a previous case study (SPE-209253-MS). The current case study will add to the body of literature around this technique. Success with this technique would offer an economical alternative for monitoring rod pump performance of aging wells.