Long Term Well Monitoring

Pressure Transient Analysis (PTA) is the primary tool for reservoir management. To efficiently produce a reservoir, the operator needs to determine Reservoir Pressure (P*), permeability, skin, reservoir geometry and reservoir limits or boundaries. He also needs to know how these values change as the reservoir is produced. However, downhole PTA is expensive, interrupts production (cash flow) and runs the risk of loss of the tool string in the well bore and even loss of the well. For these reasons, management is reluctant to approve PTA unless the well is experiencing an unexpected decline in productivity. Long Term Well Monitoring (LTWM) from surface pressure measurements avoids the risk and expense of downhole testing while providing the data necessary for PTA and efficient reservoir management.

The rationale for LTWM with the SPIDR® gauge is that most wells experience unplanned shut-ins during the course of normal operations. These shut-ins can be due to pipeline problems, weather problems, control system upsets, etc. When these unanticipated shut-ins occur, an un-scheduled build-up test occurs that might be analyzed provided a SPIDR® gauge was in place to capture the build-up data. Normal SCADA systems do not sample with the frequency or resolution required for PTA. In addition to capturing un-planned shut-ins, a SPIDR® gauge installed for LTWM would be recording the decline in flowing well-head pressures and production over time allowing calculation of reserves and determination of reservoir limits. LTWM is also used to identify communication between wells and can help evaluate the need for additional wells in a reservoir or help avoid the drilling of unnecessary wells.

When multiple shut-ins occur over time, the reservoir engineer can determine the accretion of skin, changes in reservoir permeability and changes in P*. If skin is increasing production rates can be controlled to avoid excessive pressure drop across the completion which could result in loss of the well. If skin is significant, remediation could significantly increase production. As reservoir permeability changes, the reservoir model can be updated to reflect the consequent reduction in productivity. Changes in P* over time permit creation of a very accurate and reliable Decline Curve for the reservoir.

LTWM using the SPIDR® gauge data acquisition system can be accomplished in a Static Mode or Active Mode. In Static Mode, the SPIDR® gauge is installed on the well and allowed to sample unattended. When a shut-in occurs, planned or unplanned, data stored in the SPIDR® gauge can be downloaded and analyzed. In Active Mode, the SPIDR® gauge is connected to a SCADA system and the data is automatically transmitted over the internet to a specified distribution list. The transmitted data file is updated on a pre-set interval, usually hourly. Active Mode allows changes in well operation to be quickly detected allowing quick response and thereby minimizing production loss.

In addition to these methods Halliburton is now offering a new Internet communication option for the SPIDR® gauge. If your wellsite has access to the Internet or an internal network, the SPIDR® gauge can be placed online. This will allow you to operate the SPIDR® gauge remotely using our Flowcom software. You will be able to download and view SPIDR® gauge data in real-time.