Gauge Quality Will Affect Analysis

In the past three decades there have been major technological improvements in the field of pressure measurement. These improvements have been especially evident in the oilfield, which is the driving force behind most of these advances. When the SPIDR® gauge was created in 1985 most operators were using mechanical style pressure gauges (strain gauges) to capture both wellhead and downhole pressure data. As new technology became available most operators and service companies moved away from these simple mechanical gauges to ones that used strain gauges or quartz crystals. These new transducers yielded a much higher accuracy and resolution.

One downside of the accuracy gained by using electronic transducers is that they are very sensitive to ambient temperature effects. These pressure transducers are so sensitive that the pressure they measure will be directly affected by ambient temperature changes on the electronics. For low quality gauges this may result in a one PSI change in pressure reading for every 1 degree Fahrenheit change in temperature. These types of effects will be seen not only at surface, but also by downhole pressure gauges. Downhole temperatures will change dramatically any time a well goes from flowing to shut-in. This change may have a serious effect on the pressure data being recorded downhole.

The plot below shows an example of a pressure build-up data set that was provided to Halliburton to be used for analysis. This data was collected using a silicon on sapphire pressure gauge. It can clearly be seen that the temperature fluctuation from day to night is affecting the pressure readings.

This effect on the data is even more evident in the derivative plot below.
This data can still be used for basic analysis using semi-log plots. Any attempt to try to use this data for more advanced derivative type analysis will cause most pressure transient analysis (PTA) software to fail. This will be especially true if the goal of your test is to look for limits or other late time derivative behavior that will be masked by the pressure fluctuations.

The SPIDR® gauge employs a dual-quartz pressure transducer. Quartz crystal transducers are currently the highest quality available in the industry. As the name suggests, the dual-quartz transducer employs two quartz crystal transducers. One transducer reads pressure while the other transducer reads the internal temperature. The pressure data read by the transducer can then be compensated for the current temperature. This allows the SPIDR® gauge to record very accurate pressure data without worrying about the effects of day to night temperature swings.

The linear and derivative plots below show actual SPIDR® gauge data over a 30 day period. It can be seen from the derivative that the SPIDR® gauge data experience no day to night pressure fluctuations.
If your goal in gathering surface pressure data is to simply watch the general trend over a long period of time, then most any type of pressure gauge will suffice. If you wish to use wellhead pressure data to perform pressure transient analysis you will need to take into consideration the type of transducer and the quality of the gauge itself.

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