THE PHENOMENON OF PIPELINE MEASUREMENT IMBALANCE

So your pipeline measurement won't balance—even after you have checked all the measurement equipment and calculations. The problem may be a phenomenon often referred to as pulsation and it's usually present where a compressor is used to allow lower pressure production to flow into higher pressure pipelines.

This typically happens when the measurement at station A located at a compressor site doesn't match the flow at station B that is further down the pipeline. The problem can also relate to a distribution network where station A doesn't equal the measurement at station B, C, D, etc.

But what exactly is causing it to happen? A compressor operates by squeezing a small volume of gas with a piston, increasing the pressure in that small volume. It then opens a valve and allows this higher pressure to enter the pipe upstream of measurement A. If a well is producing natural gas at a lower pressure than the pressure at which the pipeline is flowing, then the compressor will need to pump up the pressure to exceed the pressure in the pipeline in order for the well to flow.

The measurement at station A is using an orifice meter that uses differential to calculate flow. An orifice plate has a hole smaller than the diameter of the pipe, which creates a pressure drop when the gas flows through the orifice. This pressure difference can be calculated into flow.

Back at the compressor, the piston has compressed the small volume of gas and the valve now opens, allowing the compressed gas to flow into meter tube at station A. This process creates a wave that travels down the pipe until it strikes the plate at meter A, causing a pulse that elevates the high side pressure up. This force is called inertia. With the high side pressure elevated, the lower pressure between the waves starts to drop. But before it gets all the way back to normal, another wave drives the pressure back up again. This is the pulsating wave.

While most flow computer transmitters are capable of measuring flow changes at 25 Hz or 25 times per second, this rate is too slow to measure the changes caused by this pulsating wave. So, the flow computer measures the elevated differential. Station A's measurement is higher because the pulsating wave causes an elevated reading when the flow enters the pipeline and the inertial energy from the pulse reduces the flow to lower than what is measured at stations B, C, D, etc. This error is greater when the compressor is running at a slower RPM, while faster compressors reduce the error because there is less of a drop between waves.

Now that you understand what is causing the error, what can you do to prevent the imbalance in your measurement?

A tester has been developed that is capable of measuring these changes at 1000 Hz or 1000 times per second and because it can see the high and low waves created by the compressor, it can accurately measure the flow. Contact SPL's technical experts today at 877-775-5227 and let us show you how our exclusive SRE tester and measurement services can reduce measurement imbalance and lessen the errors caused by pulsation.