WHITE PAPER

Pressure Regulators: An Oil & Gas Snapshot

The pressure regulator is a very common piece of instrumentation that has been used across a vast array of industries for many years. The SOR 1200 Series Pressure Regulators are fed gas through the inlet process connection at a higher pressure that is then reduced to a pressure value set by the user before it leaves the outlet process connection. Additionally, the output pressure will be regulated or maintained at the calibrated set point regardless of input pressure fluctuations, such as a sudden pressure spike. If an application involves gas media, either as the primary process media or as a supply source to operate pneumatic instrumentation, there is a strong likelihood it will require the use of pressure regulators.

Many is Better than One

In many applications, the supplied gas is at a pressure considerably higher than the final pressure value required by the system. In applications involving pneumatic instrumentation, when the gas supplied to the device exceeds the maximum pneumatic supply rating, the device may not operate properly, or in the worst-case scenario, could be rendered inoperable or cause injury to plant personnel. These types of applications may require the use of several pressure regulators to reduce the gas pressure to the required threshold in stages. The use of reduction of gas pressure in stages instead of as a single, large pressure drop. It may be obvious that using multiple pressure regulators in series gives improved accuracy and regulation of the final outlet pressure – however, it has the added benefit of reducing the potential for the regulator to freeze if moisture is present in the gas flow.

For Avoiding the Freeze

While there are many factors that contribute to a pressure regulator freezing, the primary cause is due to the pressure regulator experiencing too large of a pressure drop while having moisture in the gas. This is because the pressure and temperature of a gas are directly related; as the pressure of the gas is reduced so will the temperature. If the pressure drop is too big the gas temperature can fall below 32°F causing water vapor in the gas to freeze. Freezing due to pressure drop can still occur even in applications where the ambient temperature is above freezing. In addition to the regulator freezing internally from moisture in the natural gas, they can also freeze externally from ambient humidity. Freezing can hinder regulator performance by

partially obstructing the flow path and restricting the output flow. In some cases, freezing can completely block the flow path and stop gas output altogether. This concern can be minimized by using multiple pressure regulators in series instead of a single pressure regulator. However, there are still other potential causes for freezing within a pressure regulator. Pressure regulators installed in cold climates may also freeze. Auxiliary equipment such as catalytic heaters or heat tracing can be added to regulators installed in outdoor applications as a method of freeze protection. This practice is especially commonplace in oil and gas industry applications where remote, geographically isolated well sites are the norm.

Using multiple pressure regulators in series instead of a single regulator, can minimize freezing that can completely block the flow path and stop gas output.

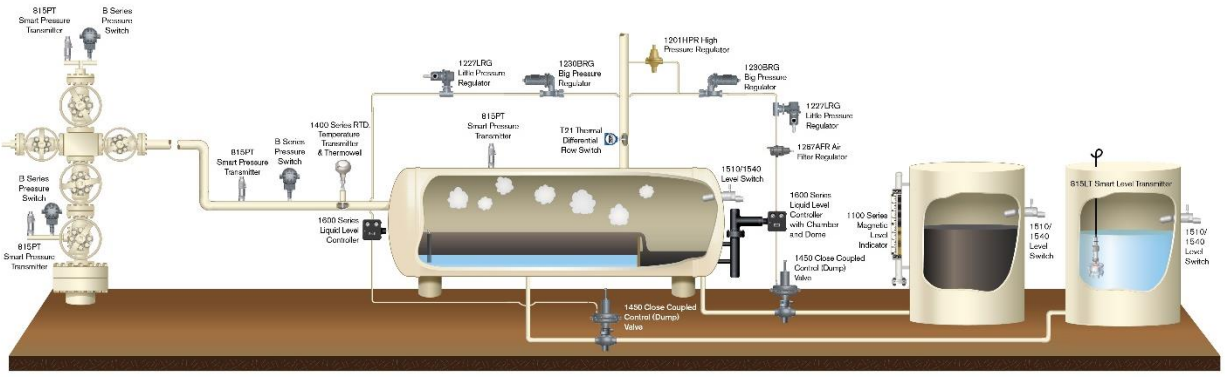
No Power Required

The 1227LRG Little Pressure Regulator and 1230BRG Big Pressure Regulator style pressure regulators are abundant in oil and gas applications. From burner management systems to heater treaters, pressure regulators are used whenever fuel gas is supplied to process equipment. Regulators ensure that the equipment is continuously supplied enough gas to meet operational demand while protecting it from over pressure. Similarly, any time pneumatic instrumentation is integrated into a regulate the pneumatic supply to a usable pressure threshold allowing the instruments to operate safely and effectively. Pneumatic instrumentation is frequently used with producing oil wells due to their isolation from electric power sources and potential for hazardous area classifications. The prevalence of pneumatic instrumentation in the oilfield is a direct result of utilizing field gas from the producing well as an energy source for the pneumatic equipment.

1230BRG Big Pressure Regulator

The Separator from Start to Finish

One of the most common applications for the 1227LRG and 1230BRG is on separator skid packages – separators are used at producing wells and serve the function of separating the media being output from the well into its primary compounds. In the case of 3-phase separators, the fluids being extracted from the well consist of natural gas as a vapor and crude oil and produced water as liquids. Rather than sending the natural gas to a processing facility or venting it to a flare, separators often utilize the well's already-pressurized natural gas as a means of supplying pneumatic signal to the instrumentation.



As depicted in the illustration above, the natural gas produced by the well is already under pressure and, because it is in the vapor phase, it naturally rises to the top of the separator vessel. At the top of the separator is an exit path with piping leading to multiple pressure regulators installed in series. Downstream of the pressure regulators are 1600 Series Liquid Level Controllers followed by 1450 Series Control Valves.

The natural gas begins at a pressure higher than what the level controller and dump valve are rated for and must be reduced to a usable level. The natural gas undergoes the 1st stage pressure drop by reducing the pressure from the wellhead to a midrange pressure (e.g. 120 psi). Next, the 2nd stage pressure regulator drops the midrange pressure down to a suitable threshold for operating the 1600 Series Liquid Level Controller (e.g. 30 psi) and thus the 1450 Close-Coupled Control Valve.

1600 Series Liquid Level Controllers

Through differences in specific gravity, the oil and water naturally separate with the water settling below the oil. As the oil collects in the separator the liquid level eventually reaches a point where it spills over the weir and accumulates on the opposite side as separated oil. A 1600 Series Liquid Level Controller is installed on each side of the weir – the level controller on the inlet side is measuring the water level while the level controller on the weir's spill-over side is measuring the oil level. Once the liquid level of either compound reaches the maximum fill threshold the 1600 Series Liquid Level Controller actuates, allowing the pneumatic signal to continue downstream to the 1450 Close-Coupled Control Valve. Each control valve dumps the corresponding compound into a storage vessel where it is held until a sufficient volume has collected, which is then transported for further processing.

1450 Close-Coupled Control Valve

In conclusion, pressure regulators are a prevalent piece of instrumentation with an install-base that stretches across numerous industries and applications. From pneumatic instrumentation to separator skids, the pressure regulator contributes to the reliable and safe supply of gas to keep essential equipment operating.

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Matt Giunta is a Product Manager at SOR and is responsible for overall product line management. He has also served as a Customer Service Engineer for the Inside Sales team handling MRO business and supporting SOR sales representatives and customers for the region of North America. Before coming to SOR, Giunta worked as a Field Engineer, cementing wells in the Permian Basin and also as a Clinical Research Technician processing biological samples for investigational drug studies. He has a B.S. in Chemical Engineering from the University of Kansas.