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Finding Industrial Pressure Regulators in Your Refinery or Chemical Plant

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The industrial pressure regulator is a pressure control device that is simple in design, has a straightforward control philosophy, but due to a lack of 'curb appeal' is often overlooked as a safe and effective control solution by many end users. Furthermore, when installed, the industrial pressure regulator can be so effective at its 'job' that it is often forgotten during major plant maintenance events.

Many times, installed regulators are not discovered until well after their expected maintenance intervals – at which time they do not work and ultimately result in production delays and lost profits for the end user.

This article provides a brief overview of typical refinery and chemical plant pressure regulator applications and key advantages to the use of regulators. The intent is to assist engineers, process operators, maintenance personnel, and others inside the industry in identifying regulators and regulator applications and to avoid the potential consequences of overlooking these simple devices.

The areas within a chemical complex where industrial regulators are most commonly found are: plant utility systems, fired heaters, compressors, and storage tanks. This is not an exclusive list of application areas, but it is safe to assume that greater than 95 percent of all regulators used within a refinery or chemical plant are associated with one of these application areas.

Utility Systems

Plant utility systems include nitrogen, steam, plant air, instrument air, and water systems. These systems are expansive; covering entire operating facilities, making the regulators within utility applications more difficult to locate. The most notable applications are instrument air used for control (i.e. control valve positioners), utility let down stations, and purge systems (i.e. instrument panels). Due to their very nature plant utility systems require low cost, low complexity and highly reliable pressure control devices; making the industrial pressure regulator the primary choice. The specification of regulators in these applications is simple and straightforward. With basic process conditions including the required flow and pressures you or your sales professional can identify the right regulator for the application.

Figure 1: Instrument Air Regulator

Fired Heaters

Fired heaters within a chemical plant include both boilers and furnaces. Different fired heater designs, standards, and user control philosophies can dictate when a regulator should or can be used; therefore, some fired heaters may have many more regulators than others. The most common regulator applications are associated with the heater fuel gas system. Regulators are well-suited for pressure control of the fuel gas header, burner, and pilot. Figure 2 is a basic fuel gas header design. The need for high turndown, quick speed of response, and reliability make industrial regulators an ideal choice for fired heater fuel gas pressure control. Regulator turndown in some cases can be considered almost infinite allowing for a single regulator to control at minimum fire and maximum fire conditions. Since a regulator requires no command from a control system it can respond quickly to sudden changes in process conditions within tenths of a second, versus seconds, which is standard for most DCS or SCADA systems. A regulator's inherent reliability is known, but if the application requires an additional layer of reliability, a redundant regulator, known as a monitor, can also be added.

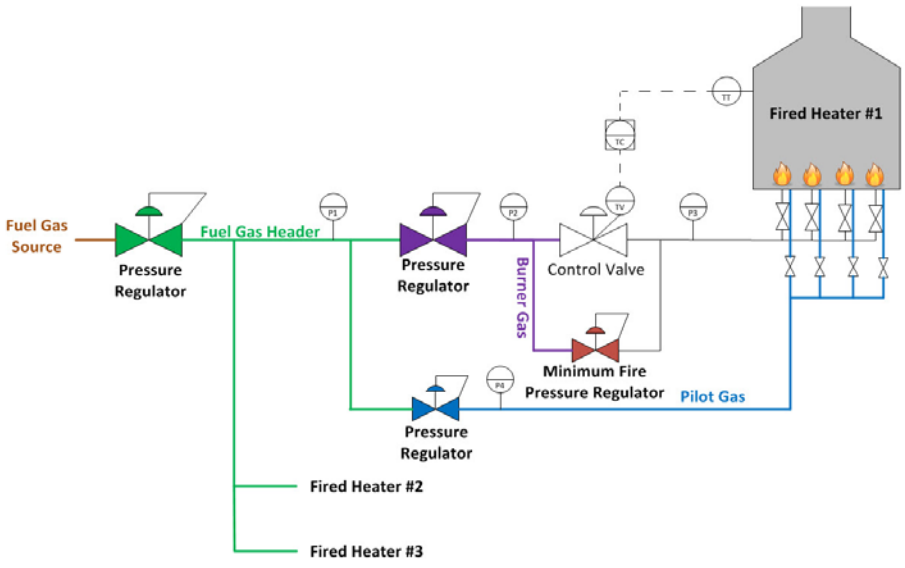

Figure 2: Fired Heater Fuel Gas System

Compressors

Applications associated with compressors, or turbo machinery, can be considered some of the most critical applications within a petrochemical plant. Regulators are typically used within the compressor auxiliary systems such as lube oil, seal oil, control oil, sealing gas, and buffer gas. Besides the obvious need for extremely high reliability the key advantage of the regulator is speed of response. Conditions within any rotating machine can change quickly and in many cases pressure control solutions that use a pressure transmitter, controller, and control valve cannot react fast enough to the changes to avoid potentially serious issues during process upsets or even normal transient operations such as pump swaps and filter changes. Unlike more standard utility applications where regulators are typically specified simply based on their required pressure and flow capacity, the specification of regulators associated with compressor auxiliary systems must go a step further ensuring the correct speed of response in addition with flow characteristics. Selecting a regulator with the incorrect characteristics can create system stability issues especially during transient operations.

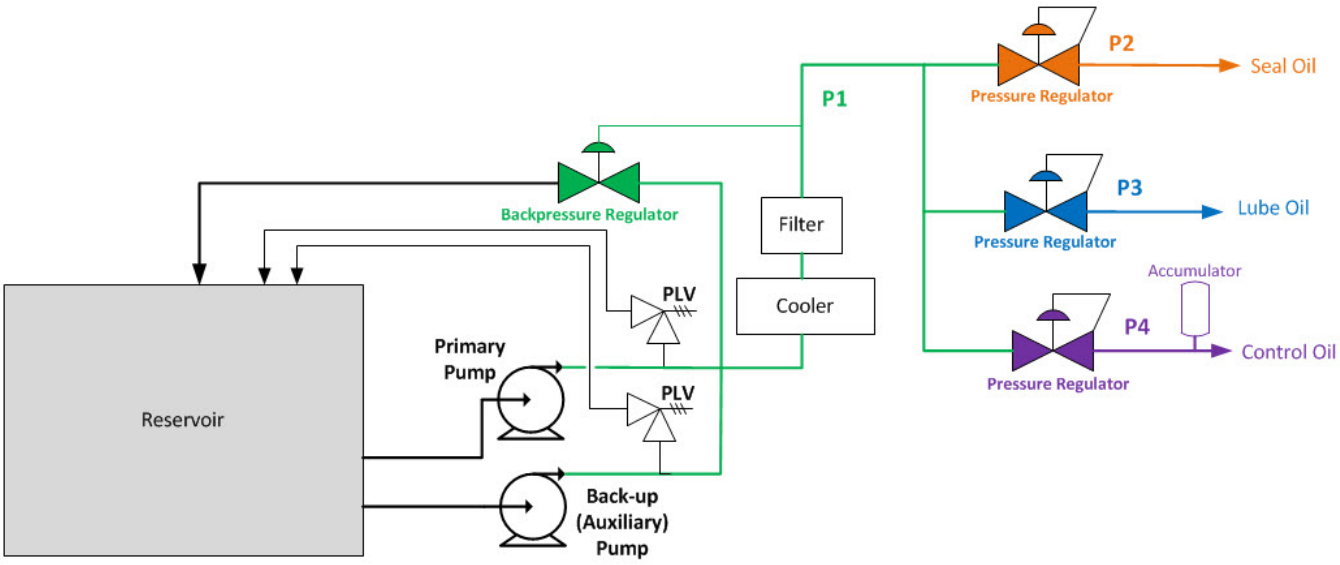

Figure 3: Lube Oil System

Storage Tanks

Storage tanks have two applications where regulators are found: tank blanketing and vapor recovery. Tank blanketing, also referred to as padding, is the process of applying an inert gas layer, typically nitrogen, to the top of storage tanks.

These blanketing layers are maintained for a number of reasons including safety, product quality, and tank protection. Vapor recovery, or de-pad, is the process of recovering the blanketing gas instead of venting it to atmosphere. A de-pad regulator is a back pressure regulator that keeps the tank from over pressuring by relieving the excess blanketing gas when the tank vapor space become compressed due to tank filling, heating, etc.

The key advantage a regulator holds is the ability to control accurately and reliably at low pressure. Tank blanketing pressures can range from 10 inches of water column to as low as 1/2 inch of water column. The lower tank pressure can be maintained the less money is spent on blanketing gas. The key consideration in the specification of a tank blanketing or vapor recover regulator is the regulator capacity. To determine the required capacity the maximum flow in and out of the tank must be calculated. There are many factors that go into this calculation including tanks size, pumping rate, product, and even latitude.

Due to the complexity of this calculation it is recommended to consult your sales professional when specifying a tank blanketing regulator.

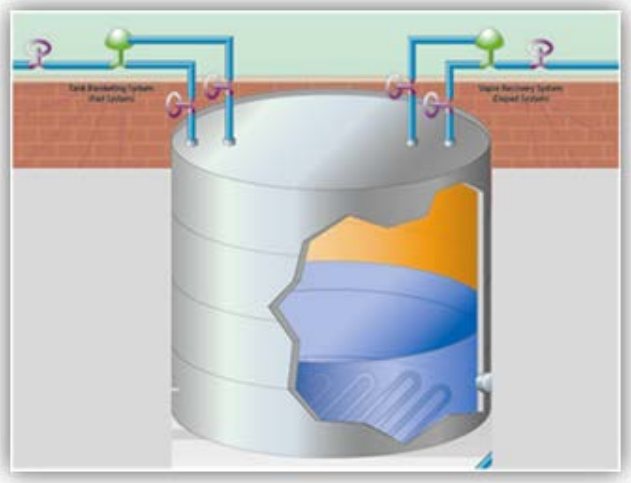

Figure 4: Tank Blanketing and Recovery

Summary

There are a number of critical applications within refineries and chemical plants where the industrial pressure regulator is the optimal pressure control solution. A basic understanding and awareness of these applications will help avoid a potentially over engineered, more costly control solutions and ensure that the existing regulator install base are recognized and maintained to ensure optimal operation and benefit to the end user.

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