PRESSURE RELIEF VALVES

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TECHNICAL BRIEF

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FISHER

Highlights

- **The task of providing overpressure protection has never been more important. Today, we can offer a solution that should keep everyone happy and safe.**

PLEASE, TRY NOT TO PASS GAS!

In the natural gas industry this is a very important concept. When natural gas is allowed to vent into the atmosphere, either on purpose or when an emergency occurs, chances are a safety code or an air pollution concern has been breeched. A number of codes and laws require that an overpressure protection device be provided each time a pressure reducing station is installed that supplies gas from any system to another that has a lower maximum allowable operating pressure (MAOP).

Methods Of Overpressure Protection

There are several methods that can be used, but the most common are:

- **Relief Valves**
- **Wide Open Monitors**
- **Working Monitors**
- **Shutoff Devices**

Relief Valves

This device vents the gas into the atmosphere in order to keep the downstream pressure of the regulator below the safe maximum pressure. Relief is a common form of overpressure protection. It is used in low to medium capacity, and is one of the least expensive methods available. There are several type of reliefs to discuss.

The simplest design is the pop relief valve. When the pipeline pressure hits its setpoint the pop relief goes wide open. If the gas volume that is being relieved is fairly small compared to the quick opening capacity of the relief valve, the valve can become unstable and go open and closed. Usually the repeatability of the setpoint can drift over time.

A design that is a step above the pop style is the direct-operated relief valve. It is more accurate, and can throttle better than the pop type. It tends to be more stable than the pop type, but may require more buildup to achieve the desired capacity. The setpoint can be adjusted, and tends to have less drift than the pop type.

The most accurate design is the pilot-operated relief valve. As you would expect, it is also the most complex, and expensive. The pilot relief valve is really made up by using two valves. The pilot senses the pressure to be relieved, and loads or unloads the main relief valve. This design minimizes the amount of pressure buildup over the setpoint that is required to provide the required capacity. They do have large relief capacity and are available in larger sizes than other types of reliefs.

Advantages of Relief Valves:

The relief valve serves as its own "alarm" when it vents, and keeps the customer in service even if the regulator or control valve has malfunctioned. It is reasonably priced and does not decrease the capacity of the control device that it is protecting.

Disadvantages of Relief Valves:

Relief valves vent gas into the atmosphere, and could create a hazard in the surrounding area. They must be sized correctly for a very specific set of conditions, and if anything changes with the service conditions, they may have to be replaced. They require periodic testing and maintenance. And finally, they can scare the begebers out of you when they discharge.

Wide Open Monitoring Regulators

Monitoring regulators provide overpressure control by containing the gas within the piping at a safe working pressure. The monitoring design uses two regulators installed in series with each other. The wide open monitor is set slightly higher than the working regulator, and will take over in the event of an overpressure condition.

The two types of wide open monitoring are upstream and downstream monitoring. Either method will work just fine for overpressure protection, and is really up to the preference of the regulator staff that is selecting a method.

Working Monitor Regulators

Another choice for a monitoring regulator design is to take two pressure cuts with a working monitor configuration. The first regulator is set to provide an inlet pressure to the second regulator, and then the second regulator is set for the final delivery pressure. The first regulator uses two pilots, one to hold the intermediate pressure, and another to monitor and control the final delivery pressure if the second cut regulator fails.

The working monitor allows both regulators to be in operation at all times, and they can be easily checked for proper operation. As in the wide open monitor, pressure is still contained and no venting occurs in an overpressure condition.

Advantages of Monitoring Regulators:

The major advantage is there is no venting of gas into the atmosphere. When an overpressure condition occurs, monitoring keeps the customer on line while holding the downstream pressure relatively close to the to the setpoint of the working regulator.

Testing is fairly easy and safe. In order to test the relief protection, all the customer has to do is to increase the setpoint of the working regulator and watch for the monitoring regulator to take over when its setpoint is reached.

Disadvantages of Monitoring Regulators:

The monitoring design requires two devices, and is more expensive than using a single relief valve. Wide open monitoring regulators are subject to blockage by foreign objects that may come down the pipeline, which is why filters and strainers are specified for the installation. Also, due to the fact that the regulators are in series, there is a greater over all pressure drop created in the piping, and may require the need for a larger working regulator. Wide open monitoring regulator systems usually require more frequent testing to assure that the wide open unit will perform correctly when called upon. Because Working monitors are both in constant service, they can easily be checked for proper operation by adjusting their setpoints, and watching them respond.

Shutoff Devices or Slam-Shuts

Many of the large gas transmission companies are beginning to use shutoff devices in conjunction with their regulators for overpressure protection. The shutoff valve is usually installed upstream of the regulator, and has a pilot that requires someone to manually reset it to reopen the valve after an overpressure condition occurs. By shutting off the pressure, there is no venting of the gas.

For industrial applications, there is a new generation of regulators that have the slam-shut feature built into them. These are popular for public places like schools, hospitals, and shopping centers.

The obvious disadvantage is that the customer may lose service if the gas company personnel can't restore pressure in a timely manner.

SUMMARY

As you can see, we have many solutions available for overpressure protection. However, several questions must be answered before a method is selected:

- **Can gas be vented into the atmosphere?**
- **Can service to the customer be interrupted?**
- **Does the budget allow for the monitoring designs?**

The task of providing overpressure protection has never been more important. Today, we can offer a solution that should keep everyone happy and safe.

Rick Powell, P.E.

Experitec MAKING PLANTS SMARTER.

Rick attended Rolla School of Mines in Rolla, Missouri where he received a Bachelor of Science Degree in Civil Engineering in 1971. After graduation, Rick joined Cities Service Gas Co. in Oklahoma City as a Field Engineer where he gained experience in Gas Measurement and Compressor Station Construction. In 1974 he became part of the Fisher Controls sales team when he joined B.J. Alberts Co. as an outside Fisher Sales Engineer. He later became Vice President of B.J. Alberts Co. and serves on the Board of Directors.

During his time with B.J. Alberts Co., Rick was involved with the design and sales of Industrial Control Equipment ranging from Gas Regulators and Controllers, Control Valves, Wellhead Flow Computers, and Microprocessor Based Control Systems.

He supports the continuing education of the energy industry and has presented technical programs on regulators and control topics for over 25 years for customer schools and at the Petroleum Institutes, which are held in Liberal, Kansas. He has participated in the support of career opportunities by serving on the Board of Directors for the Southwest Kansas Technical School, and has presented programs for Career Days at the Liberal High School for which he received The Friends of Education Award.

He has served as Past President and as a member of the Board of Directors of the Liberal Chamber of Commerce, Gas Measurement Institute, American Petroleum Institute, Kansas Engineering Society in Southwest Kansas, Society of Petroleum Engineers, Chairman of The Petroleum Industrial Education Committee, The Chamber of Commerce Oil and Gas Energy Committee, and The Focus On The Future Committee. Rick achieved his license as a Registered Professional Engineer in the State of Kansas in 1980 and in the State of Missouri in 2001.

In 2001 B.J. Alberts Co. merged with Experitec and Rick became a member of Experitec Inc, serving as a Senior Applications Engineer in the Kansas City Office.