

Protect Your Investment and Your Personnel: The Benefits of using a Rupture Disk with a Pressure Relief Valve

Protection against system overpressure in a manufacturing facility is critically important, not only to protect equipment and systems, but also to prevent personal injury and potential loss of life. Pressure control systems are a first line of defense, limiting pressures to acceptable and legislated levels. Reclosing pressure relief valves and rupture disks are typically used to achieve pressure relief if your control systems should fail.

Pressure relief valves, need to be protected to extend their lifespan and maintain a safe environment, both within and outside the pressurised system.

Threats to the operation of Pressure Relief Valves (PRVs) include:

- Product build-up
- Corrosion
- Leakage

An established solution to reduce risks to PRVs is to place a solid metal rupture disk upstream of the PRV to protect it against all of these potential threats. Rupture disks are industry-proven, non-mechanical devices which require lower investment and maintenance in comparison to PRVs.

What are the advantages to pairing a rupture disk with a pressure relief valve?

- Leak Prevention
- Corrosion Protection
- Cost Savings
- Testing Can be done in place
- Elimination of Fugitive Emissions

Leak Prevention

Isolating a pressure relief valve with a rupture disk has a major advantage; it prevents the process from leaking into the environment. A typical safety relief valve will begin to leak as it approaches the set pressure. A rupture disk serves as a solid metal barrier between the process and the PRV.

Leakage is becoming globally more unacceptable due to international environmental restrictions, the toxic nature of the process media, or simply to avoid the loss of expensive product out of the system. Even if the process does not contain any toxic or expensive elements, safety equipment should be able to operate leak-free over long periods. The addition of a rupture disk to the valve will accomplish this.

Corrosion Protection

If the pressure relief valve's sealing surface is exposed to a corrosive process, it can be damaged over time, resulting in the need to replace an expensive valve, lined with material such as Hastelloy® or Tantalum. Corrosion can erode alloys, and result in the valve leaking or it can fail to open when required to relieve pressure. By contrast, there are metal rupture disks that are virtually leak-free and, when used upstream, are a simple and effective way to isolate the PRV. If used downstream from a valve, a disk will prevent corrosive vapours from contacting valve internals. It will also prevent backpressure from affecting the valve's set pressure. Some rupture disks can be equipped with burst indication that will signal if the PRV opens or leaks

Cost Savings

The PRV with its higher initial investment, is reusable and must be maintained while the lower-cost rupture disk is disposable. Pairing a rupture disk with a PRV allows for less expensive materials to be used for the valve internals, since the need for corrosion protection is reduced. Despite the additional up-front costs of installing both disks and PRVs, the combination actually saves a substantial amount of money due to:

- reduced maintenance costs including calibration,
- less downtime for testing or overhaul
- longer life-span for the PRV itself
- reduction in capital cost of the PRV due to standard materials used for the trim parts

all while ensuring the reliability of the safety system.

PRVs and rupture disks can be complementary to each other, each offering their own advantages and limitations. The combination of the two, either in parallel or series, can be the best solution for comprehensive protection of the facility.

The combination of disks with PRVs is recognized by ASME Boiler & Pressure Vessel Code API520, and EN ISO 4126-3 in Europe and Internationally and used in a variety of industries, including oil & gas, chemical and petrochemical plants.

Testing in Place

In any facility, downtime for inspection and maintenance can be expensive, as are replacement parts for PRVs. All have an impact on workflow and the profitability of a company. Regulations require that testing and monitoring be done to ensure safe operation of the system, but time-consuming overhauls and expensive replacement parts can be avoided with the added protection of a metal disk.

Some companies still require removal of a PRV, if used alone, for off-site testing and service, but when protected by a rupture disk, PRVs can be tested in place. In particular, with the use of a reverse-buckling disk installed at the inlet, the PRV can be tested using a portable pressure source. Air, or an inert gas such as nitrogen, can be injected into the space between the disk and the PRV to initiate the set pressure of the PRV to ensure the settings are correct with minimal plant downtime.



Fugitive Emissions

Fugitive emissions are emissions of gases or vapors from pressurized equipment due to leaks and other unintended releases of gases, mostly from industrial activities. As well as the economic cost of lost commodities, fugitive emissions contribute to air pollution and climate change. Many countries have strict regulations regarding the monitoring and reduction of these gas emissions. Fugitive emissions present other risks and hazards. Emissions of volatile organic compounds such as benzene from oil refineries and chemical plants pose a long-term health risk to workers and local communities. In situations where large amounts of flammable liquids and gases are contained under pressure, leaks also increase the risk of fire and explosion. API standard 526 allows for a maximum leak rate of 40 bubbles per minutes, or 6 cubic feet per 24 hours.

Fugitive emissions are reduced or eliminated with the addition of a rupture disk to a PRV. Zero emissions during normal operation means no collection and disposal costs, and significantly reducing possible fugitive emission fines.

Conclusion

Three risk factors: build-up of product media, corrosion and leakage that can adversely affect PRVs can be reduced or eliminated by pairing the PRV with a solid metal rupture disk. For a small additional investment, the benefits are clear:

- Prevent leaking into the valve internals and fugitive emissions
- No corrosion to the PRV or other equipment means lower capital and long term costs
- Reduce maintenance downtime

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