



COMPRESSED GAS ASSOCIATION, INC.

TECHNICAL BULLETIN

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RECOMMENDATIONS TO MITIGATE HAZARDS FROM SMALL PRESSURE RELIEF VALVES THAT FAIL TO OPEN AT SET PRESSURE (CRACKING PRESSURES LESS THAN 100 PSIG)

Introduction

Pressure relief devices have been used successfully by the compressed gas industry for many decades to relieve excess pressure from cylinders and containers. Notwithstanding this excellent history, some Compressed Gas Association member companies have experienced instances where some low pressure (less than 100 psig [690 kPa]), non-ASME pressure relief valves (PRVs) with a 1/4 in (6.4 mm) or smaller (pipe or tube) inlet connection have failed to operate within their prescribed range.¹

Warning: *Failure of any pressure relief device may cause severe property damage, personal injury, or loss of life.*

Scope

This technical bulletin describes the tendency for small, spring-loaded PRVs commonly used in piping systems to not operate uniformly in the prescribed relief range due to cold vulcanization. It also offers some recommendations to mitigate this phenomenon. It does not provide information on specific instances of failure or specific acceptable or unacceptable pressure relief products.

Background

Testing has revealed that some small PRVs do not operate within the prescribed range. During some tests, the inlet pressure exceeded 150% of the maximum permitted start-to-discharge pressure before the valve opened. This occurrence can be more prevalent for PRVs with set pressures less than 100 psig (690 kPa).

This operating failure has been observed in PRVs that were set as recently as one week before the testing. It applies not only to PRVs that have been in service, but also to new PRVs that have not yet been placed in service.

In general, these PRVs use elastomer-seated, spring-loaded poppets that are set by adjusting the spring compression.

Over time periods as short as a few days the pressure applied by the spring-loaded poppet can cause the elastomer to cold-flow, increasing the contact area between the seal and valve seat. This increased contact area leads to higher operating discharge pressures.

Additional factors that can affect the operating discharge pressure include elastomer hardness, elastomer surface treatment, seal surface finish, lubrication, poppet surface finish, spring force, corrosion, and contaminants.

Recommendations

Following are recommended practices that can be used to mitigate the hazards from small PRVs that fail to open at the desired pressure. However, the manufacturer's recommendations shall take precedence.

¹ kPa shall indicate gauge pressure unless otherwise noted as (kPa, abs) for absolute pressure or (kPa, differential) for differential pressure. All kPa values are rounded off per CGA P-11, *Metric Practice Guide for the Compressed Gas Industry*.

Testing

Periodic testing of small PRVs in service and in storage is advised. Statistical analysis of data can increase understanding of the problem, identify PRV models that might not operate within their prescribed range, and aid in the formation of solutions.

Substitution

Once a nonconforming PRV is identified, it should be removed from service and substituted with another PRV that meets the performance requirements. Substitution can be understood to be another type of PRV or a different pressure relief device such as a rupture disk.

Performance check

PRVs should be checked at least once a year to ensure they continue to operate within their design parameters. This check may be required more frequently depending on the application.

Maintenance

Maintenance and inspection in accordance with manufacturer's recommendations helps ensure the integrity and operability of the device.

Periodic replacement

Environmental factors affect the performance of the PRV. Consideration should therefore be given to replace elastomeric-seated PRVs at least every 10 years.

Additional protective measures

Additional protective measures for the pressurized system can be used to mitigate the risk of nonconforming PRVs.

Multiple PRVs

The use of multiple PRVs, each valve having a flow capacity sufficient to relieve the overpressure, can significantly reduce the probability that system failure will result from the failure of any one PRV.

Protective barriers

Protective barriers can ensure personnel safety by providing direct protection against the release of product from a pressurized system(s) and by keeping personnel away from the point of any potential hazard.

Selective locations

Care should be taken to the extent possible to locate pressurized systems away from personnel.

Control systems

Control systems that sense pressure or temperature excursions may stop pressure accumulation or provide automatic venting before the pressure builds to the required PRV opening pressure.

Administrative controls

Standard operating procedures, warning signs, and lockouts can help mitigate the risk of certain hazards.

Inspections

Protected equipment should be inspected regularly for evidence of overpressure, such as leaks and cracks.