Safety Alert 09
Shut Down Valve Failure

What happened?

A recent incident involving the failure of a shut down valve (SDV), and the subsequent failure of two pressure safety valves (PSV), has highlighted issues associated with the selection of SDVs and the need for regular maintenance and testing of SDVs and PSVs.

The failure occurred after an electrical supply fault caused an emergency shutdown of a gas processing plant. Upon subsequent start up of the plant and one of the plant's compressors, an SDV passed on closure allowing the gas pressure to build up in a crossover header between high pressure and low pressure pipework systems. Another compressor was then started further increasing the pressure. Two PSVs in the gas line failed to operate at their set pressure and the pressure continued to rise until a rupture disk relieved to flare.

What went wrong?

The incident investigation found that the SDV failed due to internal damage as a result of the externally actuated valve breaking through an internal stop. The SDV was an actuated ball valve design with stops internal to the valve. Internal inspection of the valve found that the stop slot in the ball was damaged allowing the valve to over travel, and the valve seats had been sheared.

Debris from the damaged SDV was found to have lodged in a downstream PSV which contributed to its failure to activate. This PSV also showed signs of corrosion and had not been stripped down for an extended period due to failure to carry out planned maintenance. Another downstream PSV partially opened, but then re-seated, failing to fully relieve the increasing gas pressure. While this PSV had been previously tested, no records of previous strip downs of the valve were found. In addition, the regular inspection of the SDVs did not include testing to ensure SDVs closed and sealed on actuation.

Key Lessons

- Shut down valves (SDV) and their actuators must be properly selected and sized for their intended service. For shut down and isolation service, movement of valves is usually limited by stops on their external actuators – it is not normal practice to have a stop pin or key internal to the valve when it is actuated. Recommended industry practice is for use of external stops for most applications, while positive internal stops are generally only suitable for light duty applications. Existing SDVs should be reviewed to ensure that the combination of actuator and stops is suitable for the service.
- Pressure safety valves (PSV) should be regularly inspected and tested in accordance with manufacturer's specifications and relevant Standards. These inspections should include regular stripping down of the valves, where appropriate.

- Regular inspection and testing of emergency shut down systems should include testing of the final element (i.e. appropriate closure and sealing of the SDV).

Contact

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