

Pressure Relief Valve Maintenance

The first Law of Physics, Conservation of Energy, has driven Mankind's pursuit of progress since the Dawn of Time. Efforts to harness the power of wind, water and fire brought about huge advances in technology. More recently, the potential of fire and water were combined to bring on a Steam Powered Industrial Revolution. Today Nuclear Energy is converted to Electricity to power our modern civilization.

The second Law of Physics, Increasing Disorder, is the reason that all the equipment used to harness, distribute and utilize energy requires maintenance to continue operating properly. Machines deteriorate due to wear caused by friction, vibration, corrosion, etc. In order to counteract the inevitable effects of this deterioration, periodic maintenance must be performed.

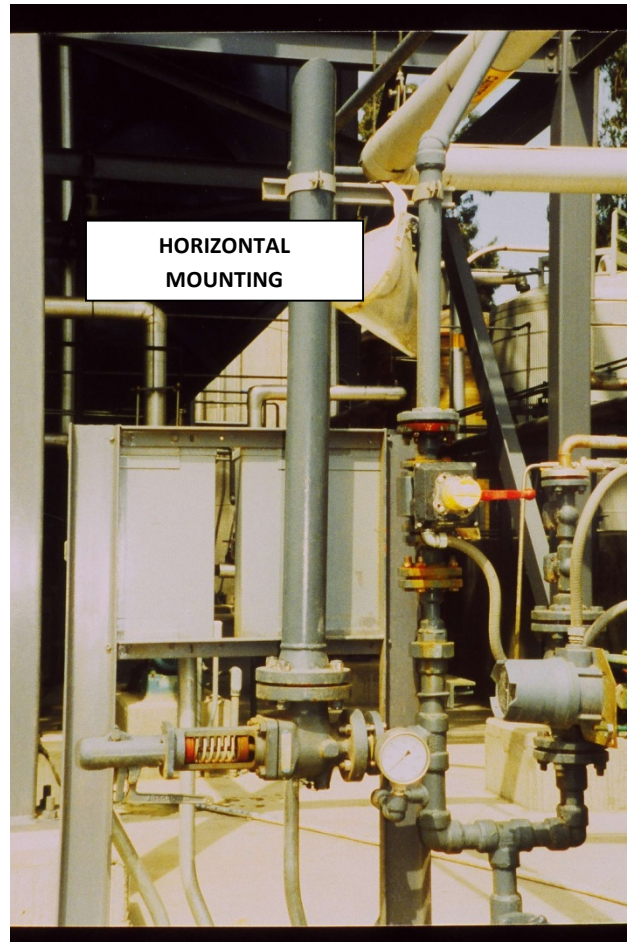
The energy required to operate and maintain manufacturing equipment is typically supplied by boilers or electric motors which power Turbines, Compressors, Pumps, Hydraulic Systems, etc. All of this equipment uses pressure to move fluids through the process in the manufacturing plant. Fluids under pressure are capable of performing consistently over an extended period. However, fluids under pressure also pose a threat to property and personnel should an uncontrolled release of energy occur. The catastrophic failure of a pressurized system can be fatal.

Therefore, it is of paramount importance that pressurized systems be protected from catastrophic failure by safety measures including Preventive Maintenance. The most important piece of equipment in the pressurized system, the **Pressure Relief Valve**, is the one piece of equipment that must always be ready to operate properly when needed. However, the **Pressure Relief Valve** is also the one piece of equipment we hope never needs to operate. The **Pressure Relief Valve** is the last line of defense against a catastrophic failure of a pressurized system. In order to provide the confidence necessary to operate a pressurized system, the **Pressure Relief Valve** must be maintained in "like new" condition.

The philosophy of "Run to Failure" is not an option with a **Pressure Relief Valve**. Failure of a **Pressure Relief Valve** may result in property damage or even loss of life. Maintaining a **Pressure Relief Valve** properly requires periodic testing, as a minimum, with internal inspection and repair as dictated by the results of testing.

Troubleshooting Pressure Relief Valve Problems is the first step in a properly performed repair. Unless the root cause of the failure is determined and corrected, the problem will be a recurring one.

There are Repair Shops nationwide qualified to perform **Pressure Relief Valve** repair and testing. Working to a nationally recognized standard, **Pressure Relief Valve** Service Facilities perform repairs that include disassembly, cleaning, inspection, machining and part replacement (as necessary), reassembly, testing, sealing and the application of a Repair Nameplate for traceability.



PRESSURE RELIEF VALVE TROUBLESHOOTING

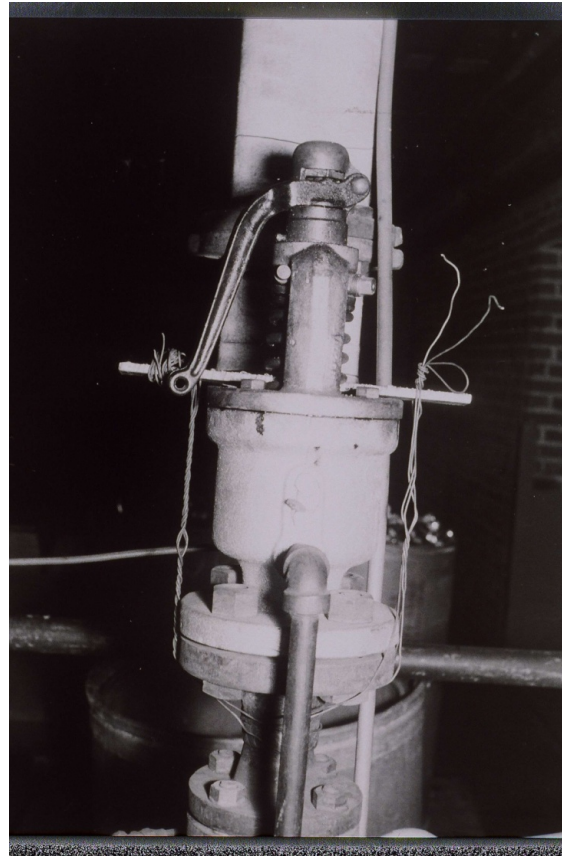
Troubleshooting begins with Pressure Relief Valve installation and application. Installation is the piping configuration and the Pressure Relief Valve physical orientation. Application refers to the protected system pressure, temperature and physical properties of the contained fluid.

Installation problems often result in Pressure Relief Valve operational malfunction. Trained and qualified maintenance personnel may recognize and correct such issues. Proper Pressure Relief Valve installation is the first step in preventive maintenance. However, when improper installation results in a Pressure Relief Valve failure and the system shuts down there is an unscheduled emergency repair to be performed. Unless the installation issues such as piping stress due to vessel expansion or unsupported outlet piping are corrected, the Pressure Relief Valve will not function properly. While installation problems are outside the scope of the typical Pressure Relief Valve repair, it is incumbent upon the Pressure Relief Valve Repair Organization to pass along information to the user regarding such issues. Failure to correct installation problems will result in repeated Pressure Relief Valve operational malfunction, thereby shortening the life expectancy of the Pressure Relief Valve and costing the user money in unscheduled downtime, additional repairs, spare parts and possibly fines for fugitive emissions.

Application is also an important aspect of Pressure Relief Valve Troubleshooting. Improper application of a Pressure Relief Valve can result in part damage due to elevated temperature, backpressure, material incompatibility or incorrect pressure setting.



DRAINED PLUGGED



RUN BEYOND FAILURE?



CLOGGED WITH PRODUCT



RUPTURED BELLOWS

“As found” conditions may be an aid in troubleshooting. Troubleshooting typically addresses application and installation. In some cases, a Pressure Relief Valve may be both misapplied and improperly installed.



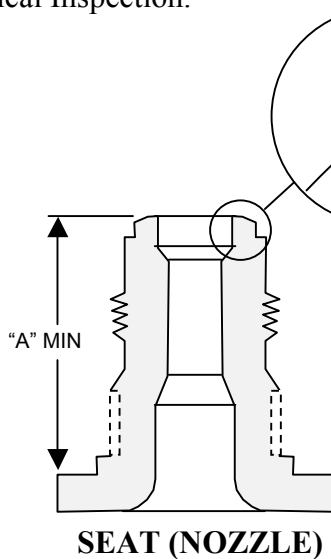
PART CORROSION



CORRODED SPRING & WASHERS

PRESSURE RELIEF VALVE CRITICAL INSPECTION

Following disassembly and cleaning the Pressure Relief Valve parts are examined by a trained and qualified Pressure Relief Valve Technician. Pressure Relief Valve Critical Inspection is the Key to the repair process. The results of Critical Inspection affect quality as well as economic Issues. Comparison of actual part dimensions to the Pressure Relief Valve Manufacturer's Acceptance Criteria determines the disposition of the part. Parts may be "used as is", machined within the Pressure Relief Valve Manufacturer's Published Criteria or replaced with Original Parts from the Pressure Relief Valve Manufacturer. Pressure Relief Valve Springs are verified to be the correct range by comparison to the Original Manufacturer's Charts. In some instances the cost of labor and parts to repair a Pressure Relief Valve make it unfeasible to perform the repair. In such cases, economic considerations are based on the results of the Critical Inspection.



SEAT (NOZZLE)



DIGITAL CALIPERS

Pressure Relief Valve Inspection points include the guide area comprised of adjacent sliding surfaces fabricated from corrosion resistant materials. The finish of these parts and the clearances between them are critical to proper Pressure Relief Valve Operation. Pressure Relief Valve spindles are also checked for concentricity or “run out”. A bent spindle may adversely affect alignment.

PRESSURE RELIEF VALVE LAPPING

Following Critical Inspection, Disc and Nozzle Seats are reconditioned by machining and lapping to obtain the proper finish. Seat tightness helps to reduce fugitive emissions.



CAST IRON LAPPING BLOCKS

The lapping process removes imperfections from the seating surfaces of the Pressure Relief Valve and improves the fit between the two seats by providing a polished finish on the mating parts.

PRESSURE RELIEF VALVE REASSEMBLY

Following reconditioning of Pressure Relief Valve Seats by lapping to obtain the proper finish, Pressure Relief Valves are reassembled and made ready for testing. Any parts that are found unacceptable during critical inspection and beyond the Original Manufacturer’s specifications for refurbishment must be replaced during reassembly. Only Original Manufacturer’s parts may be used for Pressure Relief Valve repairs. Use of Original Manufacturer’s parts maintains the traceability of the Pressure Relief Valve back to the nationally recognized standard that it was required to meet during construction. Pressure Relief Valve adjustments are returned to the Original Manufacturer’s recommended settings.



Threaded Connection Pressure Relief Valve



Flanged Connection Pressure Relief Valve



PRESSURE RELIEF VALVE TEST BENCH

PRESSURE RELIEF VALVE TESTING & SEALING

Following inspection, lapping and reassembly, each repaired Pressure Relief Valve is tested to demonstrate set pressure and seat tightness in accordance with nationally recognized standards. Trained and qualified technicians test Pressure Relief Valves on the proper fluid based on the intended service. Steam service Pressure Relief Valves are tested on steam. Pressure Relief Valves for compressible fluid service other than steam may be tested on air or gas. Pressure Relief Valves in liquid service are tested on water or other suitable liquid.



WATER SERVICE PRESSURE RELIEF VALVE MOUNTED ON TEST BENCH

Upon successful completion of Testing, the repaired Pressure Relief Valve is sealed to identify the responsible party and prevent unauthorized tampering.

PRESSURE RELIEF VALVE REPAIR NAMEPLATES

Finally, the Pressure Relief Valve is equipped with a metal Repair Nameplate. The Repair Nameplate contains information such as the set pressure and the date of repair. It also has a unique identifier that links the Pressure Relief Valve to a document or traveler containing a record of the scope and extent of repairs performed. The nationally recognized Pressure Relief Valve repair shop is required to document repairs and maintain the records for at least five years. This repair history is helpful in troubleshooting.

SUMMARY

Primary concerns for manufacturing plants include maintaining safe operation, minimizing unscheduled downtime and impact on the environment. Improperly maintained Pressure Relief Valves pose a danger to equipment and personnel. The Original Code of Construction requires that Pressure Relief Valves operate consistently. Improperly maintained Pressure Relief Valves contribute to unscheduled outages primarily because they do not operate consistently. Inconsistent operation may cause a Pressure Relief Valve to fail to meet no less than three nationally recognized requirements. In addition, inconsistent operation often results in pollution due to leakage across the seating surfaces of the pressure relief Valve. A seat tightness test is performed following repair, but misalignment due to piping stress may cause lateral binding in the Pressure Relief Valve. Lateral binding is the leading cause of inconsistent operation in a Pressure Relief Valve. Repair by a nationally recognized Pressure Relief Valve Repair Organization includes Troubleshooting, Disassembly, Inspection, Machining, Lapping, Part Replacement, Reassembly, Testing, Sealing and the application of a Repair Nameplate. Properly repaired Pressure Relief Valves will protect manufacturing facilities from catastrophic failure, reduce unscheduled downtime and help prevent pollution. In order to have the highest possible level of confidence regarding the safe operation of a Manufacturing plants, it is imperative that only a nationally recognized Repair Facility be utilized to perform Pressure Relief Valve maintenance.