Alpine SAFE PRESSURE REDUCING STATION



Apine Flow Control Valves offer an Inherently Safe Pressure Reducing Station for those critical applications where failure of a control valve will have disastrous results. The main item is the Alpine ACV Ratio Reducing valve, which has no Pilots or any external item that can be damaged or tampered with. Even when the internal seals start leaking after extended operation, the valve will continue to operate.

In today's world of water shortages where broken pipes cause massive water losses, the Alpine Safe Pressure Reducing Station provides a simple and inexpensive solution. Available in sizes up to 400mm and 150bar pressure rating



In a lot of Pipeline applications when pressures go above a particular Pipe rating due to the Geographical contours, Engineers specify a "Break-Pressure" tank or reservoir to ensure a safe way of destroying the residual pressure at that point. Although this is a good and safe solution, there are factors that weigh against it:

- Expensive and bulky structure
- Mechanisms inside the tank to control level and flow etc. are vulnerable to tampering and damage
- Pressure gets reduced to atmospheric, which creates problems for providing water with enough pressure in the immediate downstream area.

Legitimate arguments against the use of Standard Pressure Reducing valves (instead of Break-Pressure tanks) in these cases is that they are vulnerable to failure due to:

- Tampering with the Pilot settings
- Breakages or malfunctioning of the Pilots or main valve
- Reaction delay causing an increased pressure downstream after demand reduction.

Some precautions can be taken to improve the overall safety of such a station, but not enough to give the Engineer a feeling that such a PRV station is completely safe.

Although it has been used in the Mining Industry for many years the Ratio Reducing valve is a relatively new concept for the Water Industry. Some companies have been offering their Pilot operated valves as a Ratio Reducing valve by installing a hose from downstream to the control chamber. This will provide a ratio depending on the area difference between the Control diaphragm and bottom Plug.

Unfortunately this has a fixed limited ratio of less than 2:1 for most valves and is not Tamper Proof as you still have an external hose which can break or be tampered with. It also does not have the big advantage of instant reaction as the valve still depends on water flow in and out of the control chamber, which causes delays.



Alpine Diaphragm Operated Ratio Reducing valve



Ultra ACV Ratio Reducing valve

This valve works on the principal of Pressure forces on different areas between the inlet and outlet of a Piston, which will keep the Piston in balance. These areas are calculated to provide a certain area ratio between inlet and outlet and which will in turn reduce the pressure in a chosen ratio. Thus, if you wish to reduce pressure from 12bar to 4 bar, the areas are calculated to provide a 3:1 ratio. Due to the valve working on pressure forces and without the need for Pilots it has many benefits such as:

- Immediate reaction to pressure or demand changes without the typical "lag" in pilot operated control valves.
- Wide rangeability enabling the valve to cope with a wide range of flows without the typical instability found in Pilot operated PRV's at low flows.
- Immune to dirty water with particles in it as the valve has no small orifices that can clog up with dirt.
- Simplicity of operation without pilots or external controls. In fact, the valve looks like a pipe "spool" piece and will not even be recognized as a valve.

Besides all the above benefits, the most "stand-out" feature is the fact that this valve is **"Inherently" Fail Safe**. This means that there are no conditions which can make this valve fail into the open position. This is the single most important benefit which would allow this valve to act in place of a Break Pressure tank ... **INHERENTLY FAIL SAFE**.

A broken O-ring seal would result in a "telltale" leak through the breather hole in the body. This would only cause the valve to not close drop-tight and which may result in small releases from a downstream relief valve.

A typical Failsafe Pressure Reducing Station would consist of the following items:

Upstream and downstream Isolating Gate valves.

We would recommend Gate valves (instead of Butterfly valves) as the downstream valve would be required to slowly fill the line after maintenance shutdown, and gate valves are better suited to cope with high differential pressures generated during this action.

Strainer

Although the Ratio Reducing valve is not vulnerable to particles in the water, large objects could prevent the valve from closing completely.



Ratio Reducing valve

These are currently available in sizes up to 400mm and 150bar pressure.

Relief Valve

Always recommended even though with the Ratio Reducing valve there is less need for this. Relevant sizing for the relief valve depends on the System size.

Maric Flow Control valve

This is a good idea to prevent "Run-away" flows in case of Downstream Pipe failure. This unique flow control valve is also Inherently fail safe and has no pilots.





Air Release valve

To install an Air Release valve on the downstream side of the PRV Station is always a good idea in order to ensure stable control. Air comes out of solution after any Pressure Reducing device, and if it has nowhere to go (particularly on a downward sloping pipeline), this air has to be removed at source.

The above items are considered essential in order to provide a completely safe PRV Station and which we would feel confident to recommend in any case where money and space can be saved in providing a break in pressure gradient in any pipeline.

Please note that all items shown are not necessarily required in all installations and depend on the critical nature of the application and opinion of the Engineers involved.

Below drawing shows what a Lockable Rural Safe Pressure Reducing station would look like.

Inherently failsafe can be likened to

- Solenoid valve in an explosive environment should be 12 VDC. Even if there is a spark it will be of negligible magnitude and cannot cause fire or explosion. Such a solenoid valve is known to be **Inherently Fire Safe**
- Metal Seated Butterfly, Ball and Gate Valves are
 Inherently Fire Safe as they will continue to shut off
 even during or after a fire, as there are no soft seals
 which can be destroyed by the fire.

Pilot operated valves can never be made "Inherently Failsafe"

What is Inherently Fail-Safe

The meaning of Inherently Failsafe means that no matter what happens to the valve, it will continue to operate even though it may be in a diminished capacity, but still doing the job it was intended to do.

Comparison between Pilot operated and Ratio Reducing

Event	Pilot operated PRV	Ratio Reducing PRV
Dirt	Very vulnerable - needs fine strainers and regular maintenance	No small ports - dirt is generally no problem
Tampering	Very vulnerable – at least 2 or 3 adjustable settings	Tamperproof
Breakages	Very vulnerable - many items on the pilot system can be easily broken	Nothing can break except the seals the valve will still operate
Failsafe mode	Breakages of pilots or internal diaphragm will cause the valve to fail to the open position	The valve will continue to operate and will not fail to any position

Alpine ACV Safe Pressure Reducing Stations have been installed in a number of installations in South Africa and with a very successful record.



LOCKABLE FIXED RATIO PRESSURE REDUCING STATION

