

Forces required to close pinch valves at high pressures

There are an increasing number of pinch valves being supplied for high pressure slurry applications. Corflex believe that in the interest of safety Engineers should be made as fully aware as possible of the forces required to not only close pinch valves but to ensure that they do not leak when closed.

Corflex has been building Pinch Valves since 1981 and can safely claim that it supplies Pinch Valves for higher pressures than any other similar valve. Over the years Corflex has conducted many tests on different size pinch valves to ascertain the actual force required to close and seal pinch valves of different sizes at different pressures.

There is no National or International Standards on the design or strengths of pinch valves as there are with many other type of valves.

Pinch Valve Sleeve

The strength of a pinch valve sleeve is dependent on the reinforcement used in its construction. The most suitable type flange is what is known as a cuff flange as opposed to a full face flange.

In Fig. 1. is a photograph of two cutaway sections of the Corflex Pinch Valve Sleeves.

The one on the right is for relative high pressure applications, it is reinforced with 2 or 4 ply of steel wire depending on pressure required.

The one on the left has 4 ply of much larger size wire, which is used for very much higher pressure applications.

A pinch valve sleeve is basically a rubber hose and similar standards to those in quality hose manufacture should apply. The industry standard is 4:1 burst pressure to working pressure with a test pressure of 2:1. High pressure pinch valves have enclosed bodies so the ratio can be reduced to 3:1 with a test pressure of 2:1. This should be the minimum standard for safe working pressures.

Pinch Valve Sleeves when closed take a shape similar to the image in Fig. 2. With other valves such as plug, ball or gate there is little or no force trying to open the valve. With Pinch Valves apart from pressure trying to move the rubber out of the way, there is also an all round force trying to open the valve. Pinch Valves when closed may look shut but when pipeline pressure is applied they will leak unless there is sufficient force on the sleeve.

Pinch Valve Bodies And Closing Mechanisms

Pinch Valve enclosed bodies should not only be strong enough to support the pincher mechanism but strong

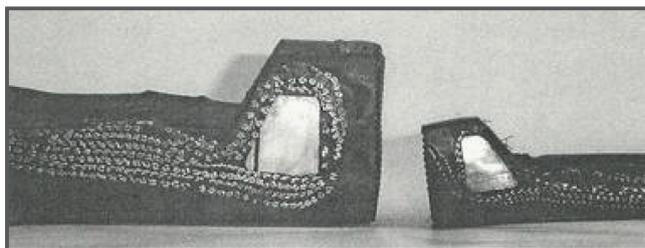


Fig. 1: Two cutaway sections of the Corflex Pinch Valve Sleeves.

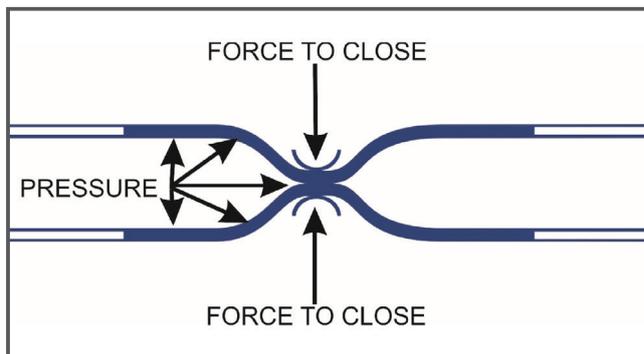


Fig. 2: Pinch Valve Sleeves when closed take a shape.

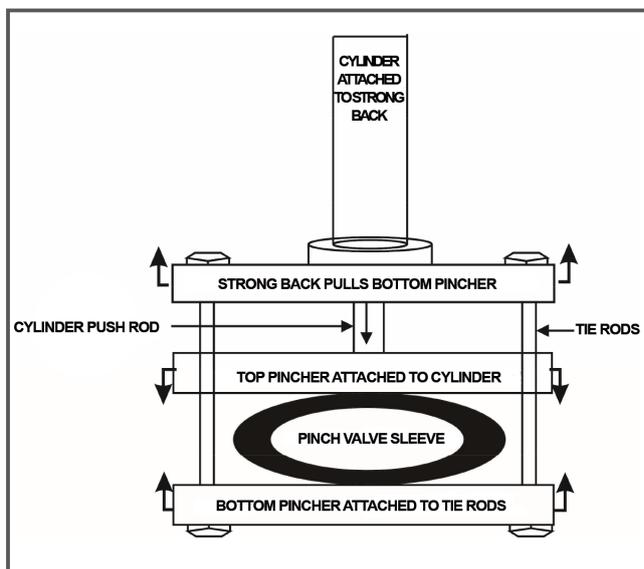


Fig. 3: These two nuts take the full force of the closing mechanism or the force trying to open the valve.

enough to contain the valve sleeve test pressure in the event of a sleeve failure.

The forces required to close and seal pinch valves are very high and increases greatly with size and pressure. The only practical way to operate them is hydraulically.

Traditionally pinch valves usually have rising actuators as this is less expensive than alternative methods.

With this type of actuation the pincher mechanisms are usually bolted together using nuts or other fasteners.

These two nuts take the full force of the closing mechanism or the force trying to open the valve (See Fig. 3.).

The high forces required to close pinch valves will generally exceed the safe working load of the nuts.

Forces to close and seal

The sealing tests that Corflex conducted are to API 598 as per Fig. 4.

Force required to close and seal pinch valves with no added safety factor.

These tests were conducted on different standard sizes

SIZE	10 BAR	16 BAR	25BAR	40 BAR
250MM	13 TONS	18 TONS	27 TONS	39 TONS
300MM	17 TONS	24 TONS	38 TONS	51 TONS
350MM	23 TONS	34 TONS	49 TONS	73 TONS
450MM	35 TONS	51 TONS	77 TONS	115 TONS
500MM	41 TONS	61 TONS	88 TONS	

from zero pressure upwards in one Bar increments. From this Corflex were able to draw curves for each size valve for all pressures.

Some of the tests were done on different sleeves of the same size with similar results.

We found that the force to close each size was in direct relation to the ratio of the square of the diameter. This meant that once you knew one it was easy to calculate the force required for other sizes, which have not been tested.

To ensure the valves do not leak a minimum of 10% should be added to the forces and preferably more.

Corflex had to design their valve to handle these forces. This meant that the valve could not have a rising actuator as it could be considered unsafe.

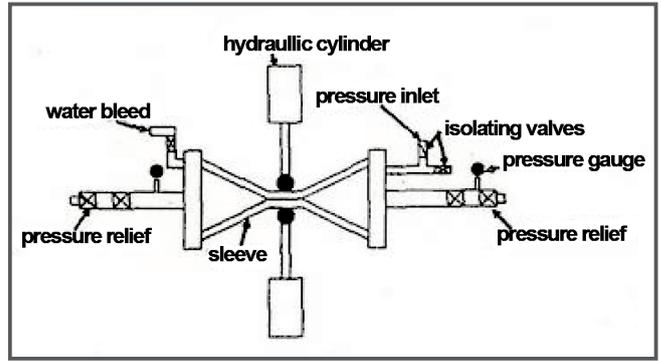


Fig. 4: The sealing tests that Corflex conducted are to API 598.

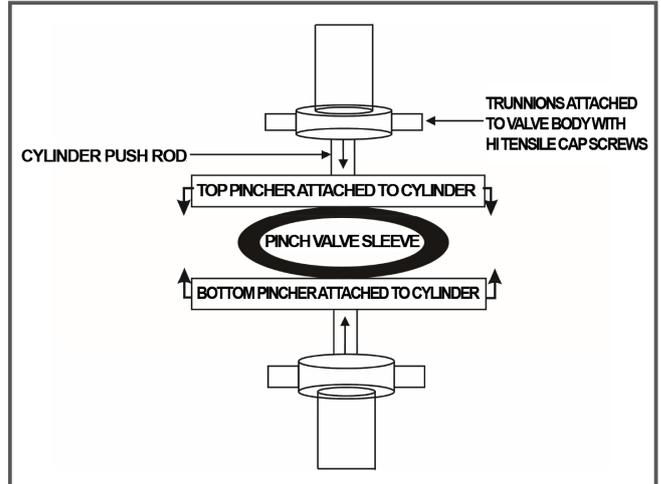


Fig. 5: The valve is closed from both sides with the hydraulic cylinders firmly attached to the valve body using 4 x large diameter Hi-Tensile Bolts.

In Fig. 5. it shows the valve is closed from both sides with the hydraulic cylinders firmly attached to the valve body using 4 x large diameter Hi-Tensile Bolts.

With the high forces involved, Pinch Valves must be built to ensure the safety of personnel as well as efficient operation.

It is possible to build pinch valve sleeves for much higher pressures but the force required to seal would damage the sleeve.

Corflex has found from practical experience that the maximum force that should be applied to their sleeves is 120 Tons on large diameter valves. Corflex has tests which were witnessed by Engineers which are available.

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For high and low pressures in slurry applications



**Corflex 500 mm XHD
Hydraulically operated
Pinch Valve
(Supplied for W/P of 25 Bar)**

**Corflex 200 mm XHD
Hydraulically operated
Pinch Valve c/w hyd
power pack
(Supplied for W/P of 43 Bar)**



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