Pinch Valve Semantics

(A Conversational Guide to Pinch Valve Speak)

Pinch valves come in many different configurations. Certain words regarding these configurations have a very specific connotation to specialists in the field. For example:

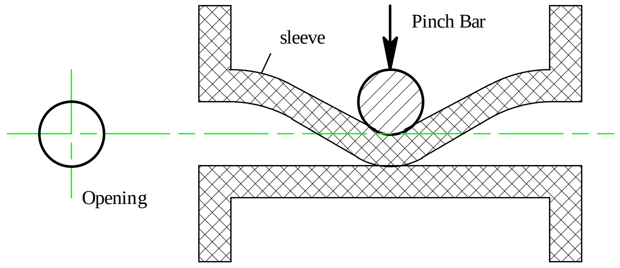

Figure 1

The valve shown in figure #1 is:

- **Full Round**
- **Full Port**
- **Single Pinch**

When the valve is open, the inside is a full round circle equal to the diameter of the adjacent pipe. In this design a full open 3” valve can pass a 3-inch diameter sphere.

This design offers good abrasion resistance, allows the pipe to drain completely, and can be cleaned with a pipe pig. It is a simple, economical design.

The limitation is valve size. This design works for pinch valves up to and including 3”. Beyond 3” the elongation required to close the valve exceeds the limits of the rubber and fabric composite. Attempting to close a larger valve with a single pinch bar would tear the sleeve behind the flange.

For valves 4” and larger, there are two possible ways to circumvent this limitation: Pre-pinched and the dual pinch design.

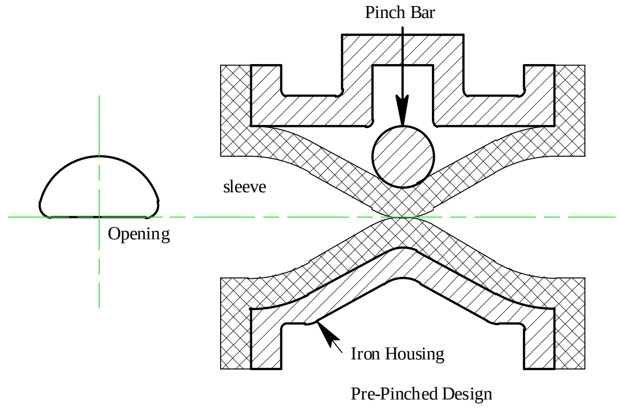

Figure 2

The valve in figure #2 is:

- **Pre-Pinched**
- **Full Port**
- **Single Pinch**

In this design, the iron valve housing has a weir cast into it that pinches the valve to centerline, resulting in a “D” shape opening.

“Pre-pinched” refers to the iron housing. It is “full port” because the sleeve started out with a full round shape before insertion into the valve housing.

This valve can pass a sphere equal to ***half*** nominal line size. If you want to pass a 4” diameter grapefruit through a 4” valve, you have to cut it in half and push the slices though flat side down.

This reduces valve capacity by 20%; adjacent pipe will not drain below centerline, and you cannot pig out the line through this valve. This design offers simple operation, reduced cost (compared to dual pinch valves) and shorter actuator stroke, reducing the cost of the associated actuator. This design is well suited to handle low concentration fluids such as raw wastewater.

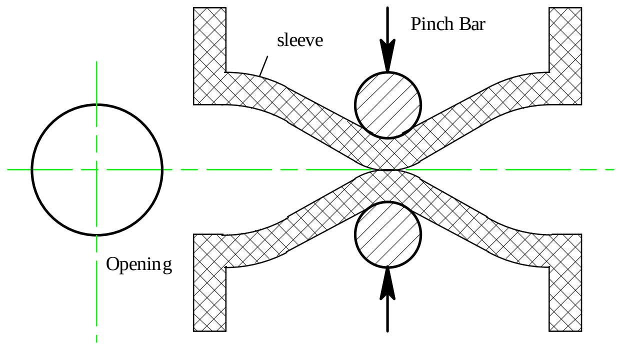

Figure 3

The valve in figure # 3 is:

- **Full Round**
- **Full Port**
- **Dual Pinch**

In this design, there are two moving pinch bars that meet at centerline to pinch off the rubber sleeve.

"Full Round" refers to the mechanical parts of the valve; "full port" refers to the sleeve design.

This design offers good abrasion resistance, allows the pipe to drain completely, and can be cleaned with a pipe pig.

Modulating valves:

Pinch valves can be used very effectively for throttling applications. The "secret" to good control is to match the port size to the actual flow conditions. Pinch valves have very high capacity, approximately equal to an equivalent length of pipe. If you install a full port pinch valve in your process and try to throttle with it, what happens is the controller drives the valve down near the seat.

Typically, you find a full port pinch valve that has been pressed into throttling service operates less than 5% open at maximum flow. For example, you could have a 4-inch valve running a quarter inch open at full flow. This is bad because you get poor accuracy, high turbulence, and rapid erosion of the valve sleeve under the pinch bars. The solution is to mold a tapered configuration into the sleeve; typically a venturri shape is used. Now the valve operates further from the seat at the same flow as before. Accuracy improves, turbulence is eliminated, and sleeve life increases dramatically.

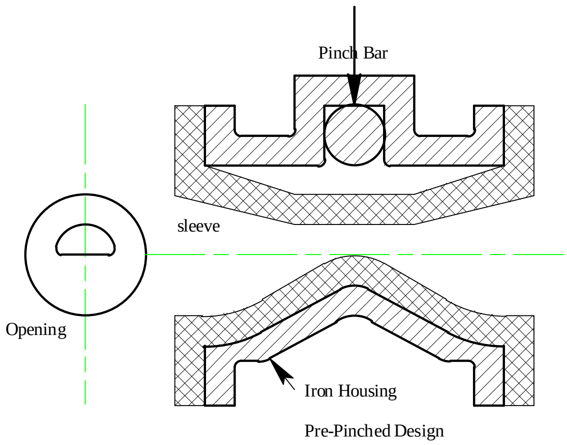

Figure 4

Figure # 4 shows a:

- **Pre-Pinched**
- **Reduced Port**
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The sleeve is tapered on the inside and outside to provide the optimum capacity for a particular flow rate. Because it is pre-pinched, you have a "D" shape opening the height of which is half the nominal port size.

It is "Pre-pinched" because of the weir in the cast iron housing. It is "reduced port" because of the taper molded into the rubber sleeve.

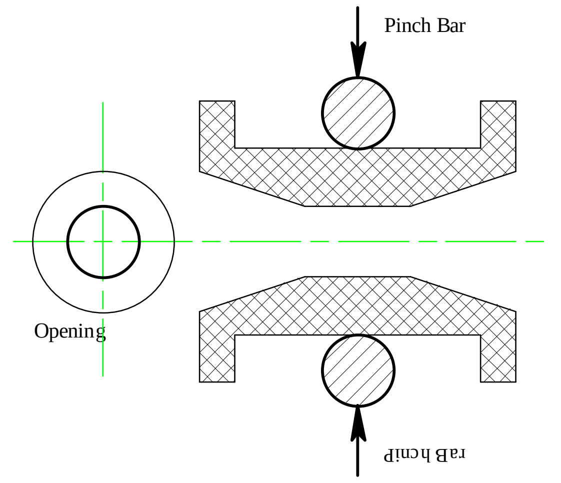

Figure 5

Figure 5 shows:

- **Full Round**
- **Reduced Port**

This sleeve is tapered to match the valve capacity to the required flow rate.

This valve is “Full Round” because the valve housing does not distort the sleeve opening into a “D” shape; the opening still has a round shape.

It is “Reduced Port” because of the taper molded into the rubber sleeve. Note that **this design adds considerable rubber to the sleeve, greatly extending sleeve life.**

A variation on this design is the “Trumpet” shape sleeve.

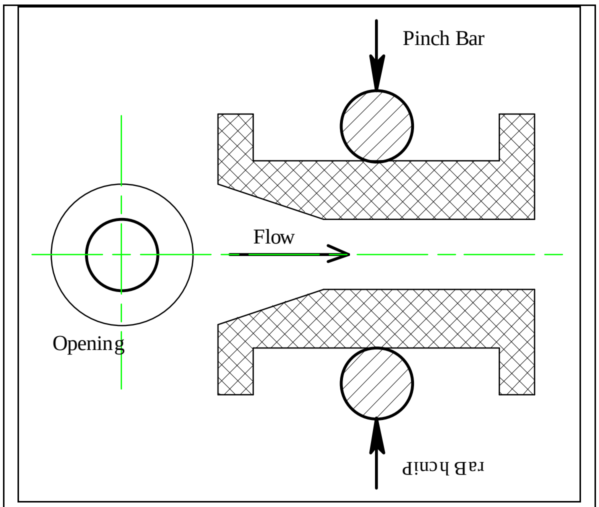

Figure 6

Figure 6 shows

- **Full Round**
- **Reduced Port**
- **Trumpet mouth (Taper Inlet Only)**

This design is essentially the same as the design shown in figure 5, except the sleeve taper is on the inlet to the valve only. This approach is used to eliminate cavitation in pinch valves. When fluid flows through the valve, the result is a sudden expansion at the outlet. This sudden expansion creates backpressure that reduces cavitation. Any remaining cavitation is focused into a stream around the central axis of the pipe.

This redirection of the collapsing bubbles away from the walls of the valve and pipe eliminate the damage usually associated with cavitation and flashing in conventional valves.

The Author:

David Gardellin, P.Eng.
President of **Onyx Valve Co**
835 Industrial Hwy, Cinnaminson NJ 08077;
Ph 609-829-2888;
fax: 609-829-3080;
e-mail: david@onyxvalve.com

Onyx Valve Company manufacturers a complete line of pinch valves, valve actuators, controls, and pressure isolators.

Previously, Gardellin was Engineering Manager for Robbins & Myers Co. He was an engineer with Met-Pro Fybroc Co where he developed fiberglass horizontal and vertical pumps from 5 to 200 HP. He holds a BS degree in engineering from Drexel University. He is a registered professional engineer in Maryland and New Jersey. He holds several patents related to pressure measurement and control, and is the author of numerous technical articles related to valves and controls including the Encyclopedia of Chemical Processing and Design.