

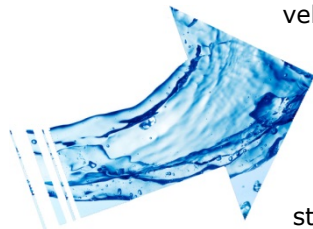
# Consider the Effects of Fluid Velocity and Differential Pressure when Selecting Pipeline Strainers

By: Chris Pasquali, CEO Factory Direct Pipeline Products, Inc.

Selecting the proper size pipeline strainer for your application reduces maintenance costs and improves reliability of your process. When fluid velocity is too high there is increased risk of strainer basket damage and if the initial differential pressure is too high the result is increased frequency of element cleaning. Adhering to the following guidelines will ensure proper strainer size and enable "apples-to-apples" comparisons of different brands/designs.

## Fluid Velocity

The velocity at which fluid enters a strainer is an important criterion that is easily overlooked. Although you can transfer fluids at velocities much higher than 5 FPS, passing through a strainer necessitates changing the flow path which results in turbulence. At



velocities >5 FPS there is an increased likelihood that the strainer basket handle will become damaged because strainer baskets are "sealed" to the strainer body via compression of the basket handle welded to it. When the basket chamber cover is closed, the downward pressure against the handle pushes the strainer basket ring firmly against the strainer body. High velocity conditions create sufficient turbulence to cause the basket to "spin" in place, placing stress on the basket handle weld and ultimately causing it to break. If such breakage occurs, the basket is no longer firmly held in place, it and the handle are going to spin around even more and this could result in damage to the strainer body itself not to mention enabling particulate to bypass the strainer basket.

Some strainer designs utilize an angled basket which will resist "spinning", however there is also a loss of available surface area, increasing the frequency of element cleaning.

## Differential Pressure

Differential pressure is the difference in pressure between the inlet and outlet side of the straining element. Initially the

differential pressure is at its lowest because the element is clean and has its maximum open area. As particulate covers the element



surface, the available open area is reduced, thereby reducing the flow through the element. Thus the

downstream side pressure of the pipeline strainer is increasingly less than the upstream side.

Most pipeline strainers have a maximum differential pressure limitation, for our products it is approximately 20 PSI non-shock differential pressure. Once the differential pressure exceeds 20 PSI, it is likely the strainer basket will become damaged, allowing particulate downstream.

The difference between the initial differential pressure and the maximum differential pressure is the differential pressure operation range that your strainer can be used. So it stands to reason that the higher the initial differential pressure, the shorter the "range of operation" becomes which equates to a higher frequency of element cleaning.

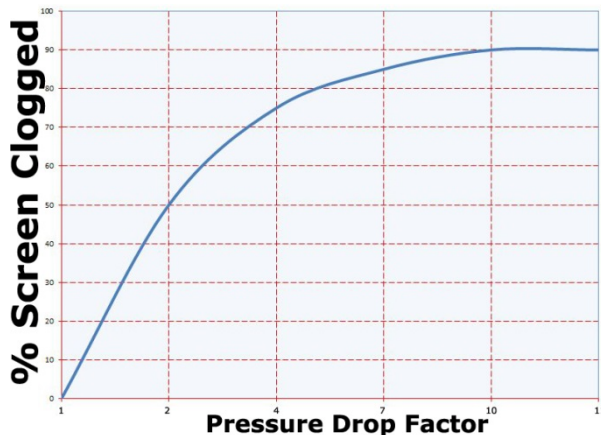
We suggest sizing your strainer such that the initial differential pressure is  $\leq 2$  PSI even if your application can "tolerate" a higher initial differential pressure. The primary factors contributing to initial differential pressure include fluid viscosity and density, open area of the strainer basket and the flow coefficient (Cv) of the strainer housing. A strainer's Cv is directly related to its design, mostly the resistance created by the path the fluid needs to traverse to pass through the strainer basket. Another important factor is the basket's open area; generally speaking the finer the retention, the less open area there is (increased restriction) for the fluid to pass-through.

Even though a straining element can

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“survive” differential pressures as high as 20 PSI, manufacturers recommend cleaning the basket once the differential pressure increases 5 PSI above the initial differential pressure. Example: if your initial differential pressure is 1.5 PSI with a clean strainer basket, once it reaches about 7 PSI it should come to somebody’s attention that it needs to be cleaned.



If you are wondering “why start cleaning at 7 PSI when I can go to 19 or 20 PSI?” it’s because differential pressure increases at an exponential rate. As the open area of the basket becomes blocked with particulate, there’s less open area available for the process fluid to flow through (thus increasing the differential pressure). Assuming the particle loading is constant (typical for pipeline strainers) this means that the rate of differential pressure increase accelerates as clogging of the basket screen continues. Therefore the time it takes for an element to go from 50% to 75% clogged is only half as long as it takes for the basket to go from 0 to 50% clogged, hence indication that the element requires cleaning at 7 PSI differential pressure should provide sufficient time to address the issue before the differential pressure damages the basket.

## Sizing and Comparison

Manufacturers provide differential pressure charts, corrective multipliers and formulas to factor-in velocity, fluid viscosity/density and retention size to assist with selecting the

proper pipeline strainer size. Our company has simplified the process from multiple steps to using a single Internet-based calculator.

We do offer several types of pipeline strainers including Y, T and basket styles and our calculators enable comparison amongst them. As an example, not only can you compare the differences in performance between a cast and fabricated design, but also different styles, such as a T and basket strainer configuration.

It is tempting to assume that all 2” Y/T/basket strainers are alike and pricing is the only difference, but this is absolutely incorrect; you will discover that often a lower cost strainer is physically smaller, weighs less and has a lower Cv value (so you will be cleaning it more often).

Model 30R	Model 72
Size (in): 8	Size (in): 8
GPM: 800	GPM: 800
Sg: 1	Sg: 1
SSU: 30	SSU: 30
Clean Δ PSI	Clean Δ PSI
Perf.: 1.8	Perf.: 0.3
40 mesh: 2.1	40 mesh: 0.4
60 mesh: 2.5	60 mesh: 0.5
80 mesh: 2.8	80 mesh: 0.5
100 mesh: 3.0	100 mesh: 0.6
200 mesh: 3.6	200 mesh: 0.7
325 mesh: 4.4	325 mesh: 0.8
Max. GPM: 848.5	Max. GPM: 1979.9

Pipeline strainers are often used for decades and making sure yours is properly sized will save countless labor hours in unnecessary basket cleaning and repairs.

*Chris Pasquali has been trained by Hayward Flow Control and Eaton Hydraulics Filtration Division, having provided sales and engineering support for these companies since 2001.*