Duplex Strainer Designs

Which Duplex Strainer Design is the "Best"?

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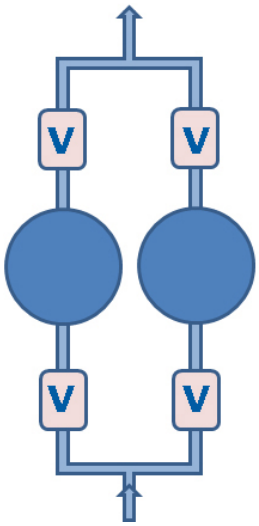
Duplex strainers are for applications that cannot be interrupted due to strainer basket clogging. Automatic strainers are another option to consider, although due to their complexity are typically only feasible for 8" and larger pipelines.

The Duplex Concept



The simplest duplex configuration consists of a pair of simplex strainers connected with a valve manifold, directing the flow through the desired chamber and isolating the other chamber so that its strainer basket can be removed. The valves can be standard ball or butterfly type or, for user simplicity, using a pair of 3-way ball valves.

If you are using four valves (one for each strainers' inlet and outlet), the operator needs to operate each of the valves in a specific order to ensure uninterrupted flow.

If you utilize a pair of three-way valves, one on the entrance to the inlet manifold and the other at the exit of the outlet manifold, the "trick" is to manipulate each simultaneously. This is where an engineered duplex design is advantageous, as the strainer bodies and valve actuators are made to simplify operation.

Although initially it might seem that duplex strainers cost significantly more than a pair of simplex strainers and some valves, if you consider the cost for the valves, construction of a manifold and the engineering/labor time involved to achieve "duplexing of simplex strainers", the engineered duplex strainer design ends-up being cost effective.

The four basic duplex strainer designs are described by the valve type used to divert the flow from one chamber to the other.

Valve Cartridge Style

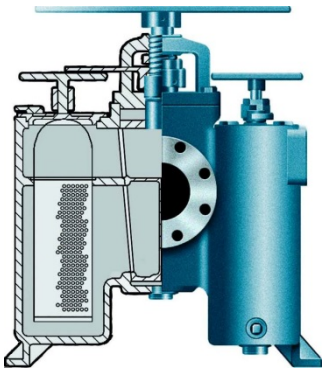
This represents the latest and most modern incarnation of duplex strainer design. Made from castings, these are for pipelines up to 4". The operation is akin to an ordinary ball valve, so diverting the flow from one chamber to the other is as simple as manually moving the diverting lever towards the chamber you want to put into service.

Besides the ease of operation, this design provides the most compact footprint possible. The sealing efficiency is just like ordinary ball valves – you can expect a completely isolated basket chamber.

It is possible that the valve seats require periodic replacement, especially if your fluid is particularly abrasive or aggressive to the buna or Viton seals.

Plug Diverting Style

Prior to the valve cartridge style, the plug diverting style represented the most compact and modern duplex strainer design. This design is used for 6" and 8" size pipelines because most duplex strainers for smaller pipelines are best served with the valve cartridge style.



The plug diverting style also utilizes a casting consisting of two strainer basket chambers and between them, a diverting valve.

To divert flow from the dirty to the clean chamber, the valve must be lifted off the valve seat (strainer body) using a jackscrew – just a few turns is all it takes to ensure the valve can be actuated with the diverting lever. The valve needs to be re-seated with the screw jack prior to accessing the isolated chamber.

One aspect of this design is that it is common for operators to forget to lift the valve from its seat … it might require a "persuasion bar", but it is possible to actuate the valve without operating the screw jack. The consequence is wear between the valve and seat.

The interface between the valve and seat is metal-to-metal, which might be advantageous for some applications involving aggressive fluids. Unfortunately, the only way to replace the "valve seat" is to replace the entire strainer body. To reduce "seat wear", a cast bronze diverting plug is used whenever possible because it's a little softer than cast iron, carbon steel or stainless steel strainer bodies. Bronze and stainless steel strainers with like material diverting valves have that potential wear issue if the lifting jackscrew is not used.

The other characteristic of this style is that the isolated chamber is not "completely isolated"; there is an acceptable leakage rate. The idea is that accessing and cleaning the strainer basket

does not take that long, so some leakage is okay. The leakage rate increases with wear of the diverting plug and valve body interface.

Butterfly or Ball Valve Diverting

This design utilizes specially configured valves and actuators to accomplish "duplexing of simplex strainers".

Cast versions using this approach are for pipelines 10"-18" and utilize resilient seated butterfly valves to divert flow from the dirty to clean chamber. A single geared actuator is connected to each of the four valves required for this design. The actuator and associated linkage assures the flow is diverted between the chambers without interrupting flow.

Although it is possible to use ball valves for flow diversion, resilient seated butterfly valves are compact and are less costly. This style of duplex strainer is only available with cast iron bodies and therefore most applications involve water, so complex ball valves or double/triple offset butterfly valves are not required.

Fabricated versions are used for higher-pressure applications and when cast iron bodies are not acceptable for 2" to 48" pipelines. Fabricated versions typically use four gear actuated resilient seated butterfly valves although it's possible to use double/triple offset butterfly valves or ball valves for flow diversion. If there are special valve requirements, we will typically provide the strainer bodies and flanged manifolds, letting the customer procure whatever valves they desire.

This design does not incorporate a unifying, single diverting device; it requires manipulation of all four valves in a specific order to divert flow without interruption.

It is possible to utilize special three-way trunnion ball valves for 2" – 12" pipelines and link them together to a single operator. After satisfying your design requirements, we will often suggest ways you might enhance your system with suggestions like this.

Sliding Valve Design

This design provides yet another way of simultaneously diverting flow between strainer basket chambers. An advantage of the sliding valve design is that the valve is completely out of the flow path.

The isolation valves are mounted to screws and slide along rails cast into the strainer body when the handwheel is rotated. There are two valves and handwheels which are connected by a chain drive, so operating one handwheel moves both inlet and outlet valves simultaneously.

The casting used for our design minimizes the pipeline centerline above grade, which also locates the basket chambers at an ergonomically friendly position. Furthermore this design uses multiple small baskets (four per chamber) to further improve ergonomics.

The sliding valve style strainer is used for raw water intake systems and they are offered in cast iron and cast steel materials for 8" – 24" pipelines.

Which Duplex Strainer Design is Best?

Often the design criteria of your application will dictate a combination of characteristics only available in a particular design; if you require a 4" Inconel duplex strainer, you only have the custom fabricated style to work with. Likewise a 2" size application for a 316SS duplex strainer will be handled more economically with a cast valve cartridge design compared to a custom fabricated one; but what about an 8" water application where cast iron is acceptable and there's diverting-plug, butterfly and sliding valve designs to choose from?

This is where the secondary design considerations such as the overall footprint, ergonomics, flow characteristics, particle load, pricing and lead-time all come into consideration.

We know what were are doing, we have been doing it for a long time. Once we have the basic design criteria for your application we will select what we believe to be the best design and provide you with suggestions; if you would like, we will even quote multiple versions for your comparison.

Chris Pasquali has been trained by Hayward Flow Control and Eaton Filtration, having provided sales and engineering support since 2001.