Operating

keeping the lines clean and flowing

Controlling contamination and keeping fluids clean can extend the life of system components that work together to complete a task. Installing filtration devices in strategic areas allows the system to operate at peak efficiency. This article focuses on an area where filtration is an absolute necessity: the suction line.

The most important component in any system is the pump; it's the "heart" of the system. If a human heart stops working, all body functions cease, ending in death. The same applies to a system pump. To keep the system operating smoothly and efficiently we need to protect the pump, because if the pump ceases to function, the system does too. Filtration is the first step in protecting the entire system's operation.

Sump strainers or suction strainers are effective types of filtration for this purpose. Specialized strainers are designed to be installed in three locations:

1. A simple suction strainer can be submersed in the bottom of the reservoir;
2. A tank-mounted strainer can be installed through the side wall of the reservoir;
3. A strainer inside a housing can be installed in the suction line outside of the reservoir.

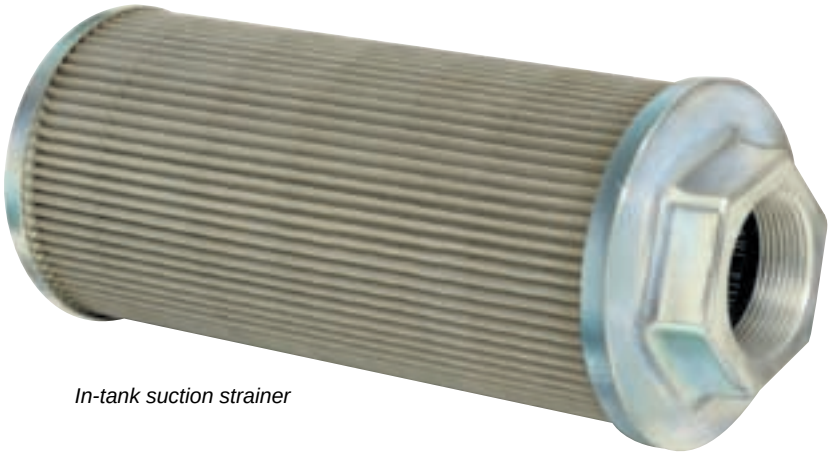
If selecting options 1 or 2, it is critically important that the strainer be mounted below the minimum oil level of fluid. If the fluid level drops below the top of the strainer, aeration could occur, possibly damaging or destroying the pump.

Some feel that if there is filtration in other areas of the system, they do not need a suction strainer. Again, I go to my favorite whipping post: fluid cleanliness.

Simply stated, contamination is anything that doesn't belong in the fluid. When introducing 'clean' new fluid to any system, is it really clean? Take a look at the chart below to see that even "new" hydraulic oil is never clean. For example, a 100 ml sample of tested hydraulic oil —new oil, direct from the supplier — has 6,500 particles of contamination the size of 26–50 micron.

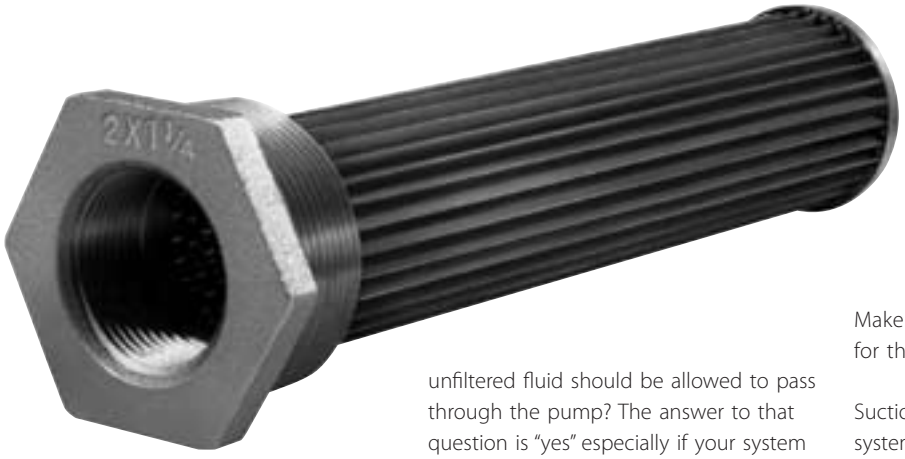
Remember, the first component the fluid is going to pass through is the pump. Knowing that the number 1 enemy of any system is contamination, your number 1 priority should be removing it immediately at that first juncture.

Listed below are some very general rules of thumb to follow in designing a typical hydraulic system, depending on what type of pump is installed. Figuring standard hydraulic fluid (150 SUS viscosity) and standard operating temperature



In-tank suction strainer

In-Line suction strainer



Tank-mounted strainer

(100° F), the flow rate in a suction line should never exceed 4 ft./sec.

The three most common types of pumps used today are piston, vane, and gear pumps. What follows are some examples of levels of filtration that should generally be installed to protect each type.

- Piston pump
  - Low pressure: 250–500 psi — 149 micron or 100 mesh
  - High pressure: 1,000–2,000 psi — 74 micron or 200 mesh
- Vane pump
  - Low pressure: 250–500 psi — 238 micron or 60 mesh
  - High pressure: 1,000–5,000 psi — 149 micron or 100 mesh
- Gear pump
  - Low pressure: 250–500 psi — 595 micron
  - High pressure: 1,000–3,000 psi — 149 micron

Keep in mind, these are general rules of thumb for typical applications. One thing that's for certain is there are many, many different systems with many different applications performing many different functions. Always consult a filtration specialist if you have any questions or concerns regarding your specific application and equipment.

Next, should the strainers have a bypass? That is, are there ever times that unfiltered fluid should be allowed to pass through the pump? The answer to that question is "yes" especially if your system requires cold-weather start-up.

Before starting your system up in the cold, ensure that you have a bypass in place to allow unfiltered fluid to pass through the pump. Start-up is a temporary event, and as long as you set the bypass in cold weather, it most likely will not harm the pump. Trying to start it in the cold without a bypass may cause the pump to cavitate, and then you will have a real problem. Another option for cold weather start-up is to oversize the strainer, which offers more surface area for filtration. This will reduce the pressure drop caused by restricted flow. You may even consider using a coarser filter (larger openings) than what is generally used. Take a look at each application's total operation individually. Most suction strainers are available either with or without the bypass option. Some modifications may also be made when using more viscous fluids.

What if you are still not sure what level of filtration to place in your suction line? You can contact a filtration specialist, as mentioned earlier, and you can keep these rules of thumb handy for reference. Remember to always consider collectively what type of pump is being used, the viscosity of the fluid, the flow rate, the system pressure, and the line size in your selection. The suction line is never a place for 'filtering' (a term generally used for anything finer than 74 micron); it is normally a place for "straining" (coarser than 74 micron).

Make sure your strainer is sized properly for the application.

Suction strainers are not meant to be a system's only defense against contamination. I have yet to hear a valid reason for not using suction strainers, providing they are installed properly. Filtration also needs to be installed in the pressure line, the return line, and don't forget the filler-breather port or tank breather, because airborne particles carry destructive contaminants, too. It is also a wise decision to use a portable filtration device, like a filter cart for example, to clean and polish the fluid in the system at scheduled intervals. If your pump manufacturer requires a certain level of filtration to protect the pump in order to keep its warranty in effect, by all means, follow their instructions.

A familiar term known to many is 'reactive' maintenance. This is when you fix a problem only after noticing that something has gone terribly wrong. My advice to you is to remain one step ahead in servicing and maintaining your system at all times. My philosophy has always been, if you don't have time to do it right the first time, how are you ever going to find the time to fix it when it breaks?

Take a proactive approach to ensure your hydraulic system's proper operation and longevity. This includes careful system design, regular monitoring, fluid analysis, and preventive maintenance. Suction strainers serve one purpose and one purpose only: to protect the pump. A suction strainer is an inexpensive and effective investment that will safeguard the 'heart' of your hydraulic system, and, in doing so, prolong its life. ■

Is new oil really clean?

	Number of particles in 100 ml	Number of particles in 1 ml
5-10 micron	128, 000	1, 280
11-25 micron	42,000	420
26-50 micron	6,500	65
51-100 micron	1,000	10
101+ micron	62	0.62

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