OHIO FABRICATORS COMPANY

111 North 14th Street
P.O. Box 218
Coshocton, OH 43812

888.354.8512
Fax 740.622.3307
www.ohfab.com

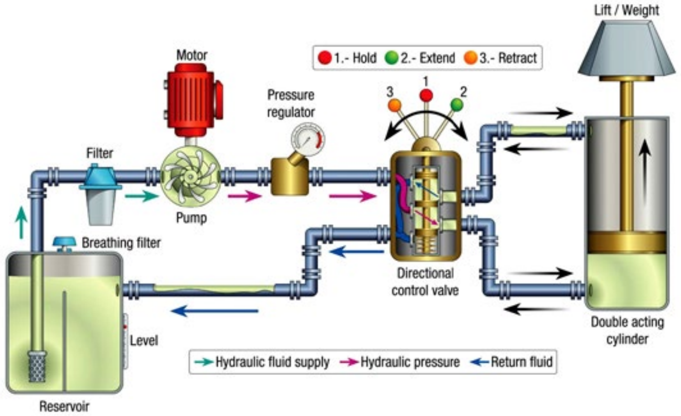
**White Paper**

# Hydraulic Filtration and System Design

When a circuit design for a hydraulic system is in the planning stage, it is much more than making a determination of what the real intention of the system is. It takes serious planning, not merely choosing components that you think may work the way you want them to. Without proper planning, total failure may occur.

First of all, look at the application and take note of what you will need to achieve your ultimate goal. What do you want to accomplish? The purpose of a hydraulic circuit is to transport a liquid through a set of interconnected discrete components. This hydraulic circuit is a system that controls where fluid flows, as well as fluid pressure. In theory, you may compare that a hydraulic circuit works similar to an electric circuit, using linear and discrete elements. The entire hydraulic system is a drive system whose movements are initiated by pressurized fluids. A system's hydraulic force can be used for various applications, such as lifting, pushing, pulling, bending, pressing, and cutting, just to name a few. Hydraulic systems are used in just about all industries for these purposes.

Design engineers will look at the big picture to initially decide on the required components for the application and its intent. Those will most likely be valves, hoses, pipe, pump, motor, actuators, filters, reservoirs, and possibly other components. But this is just a rough start. As with every component, size, type, fluid compatibility, pressure, weight, cost of operation, ease of maintenance, machine duty cycle, and replacement components to stock for emergency situations are considered. Identify the most sensitive component in the system. Ensure that all components, pipe, hoses and connections, are compatible with the fluid. There is a lot of serious preparation to do before even thinking about heading to purchasing and start buying components for assembly.




**There are actually four major areas to consider in the design process:**

1. Evaluate the process. What do you want to accomplish?
2. Layout your design. Which components do you want to use and why?
3. Select the specific design that you envision will get the job done effectively and efficiently.
4. Conduct performance analysis to make sure the design will perform the way it is intended.

You can see that there are a lot of preparations required if you read between the lines above. There are no shortcuts. One area that deserves special attention in the planning is filtration. Many times filtration is inadequately and improperly planned for the system. However, in order to maintain a system that is operating smoothly and efficiently, adequate filtration must be designed into it. Simply said, if the filtration breaks down, the system will break down. Up to 90 percent of all failures in a hydraulic system are caused by contamination. Bulk fluids must also be monitored before they are introduced into the system. Storage and handling is just as critical as keeping contamination controlled while in use. Fluid conditioning must be monitored at all levels, not just while in use. When selecting the filters, consider operating pressure, fluid compatibility, level of filtration required for the specific locations in the system where they are being installed, filter media and strength, and capacity. Where are the filters being installed? Suction line? Pressure line? Return line? For a smooth and efficient operating system, filter placement is critical. If you are not sure where the target critical locations are, contact a filter specialist.

OHIO FABRICATORS COMPANY

111 North 14th Street
P.O. Box 218
Coshocton, OH 43812

888.354.8512
Fax 740.622.3307
www.ohfab.com

# White Paper

There is yet another area where it is necessary to keep the fluid clean. Do not forget the tank breather. Outside air enters and exits the reservoir as the fluid level inside rises and falls due to standard operation. Air contains contaminants, too. Unless the reservoir has a breather installed, allowing for clean air flow into it, there is a good possibility contamination will occur within the system. Particle contamination is the number one cause of system failure, so consider the location of the entire system. Is it exposed to the environment? Can humidity have an effect? The reason is that moisture can have a destructive effect if it gets into the reservoir.

If the system is located in an environment where moisture can enter the reservoir, corrosion will occur in the headspace and contaminate the fluid. Water is the second most destructive contaminant in any system. Consider a desiccant tank breather that can eliminate this issue. A desiccant breather keeps out both particle contamination AND water.

Contamination control is the number one priority. Foremost when designing systems, make sure fluid cleanliness target levels are determined and then take the necessary steps to achieve and maintain those levels. However, don't stop there. It is imperative that these levels are measured frequently to ensure the targets are met. Check ISO levels to see if the guidelines for fluid cleanliness levels are being met. Particle counters are a necessity for any system use. When designing your system, make sure it includes sample ports so fluid samples can be taken and checked regularly for cleanliness levels.

Whether you are merely striving to keep larger contaminants out of your system, or your operation requires micro-filtration or ultra-filtration to protect its critical operation, there is a lot of planning that must take place beforehand. This paper spells out the path to take when system design is in front of you. Plus, once a system is in operation after proper design, there is a responsibility to maintain its efficiency. Just like your car, if it is not serviced regularly, it will break down. Fluid cleanliness should be most important. Fluid is the system's life blood. Understand that. Respect that. Learn about filter media, equipment, principles, fluid properties, and testing and standards.