OHIO FABRICATORS COMPANY

White Paper

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

888.354.8512
Fax 740.622.3307
www.ohfab.com

Where Does System Fluid Filtration Begin?

How Dirt Levels Affect Hydraulic System Performance

Let's save the answer to this question until the end while we look at the overall picture of a fluid power system and how contamination can affect it. Did you know that by controlling the level of contamination (dirt) to acceptable levels you can eliminate as high as 80–90 percent of the potential causes of system failure? That is extremely important when you consider high labor and equipment costs and our dependence on today's sophisticated and complex fluid power systems.

The reason dirt plays an important role in system inefficiency is simple. In reality, dirt is a minute, abrasive, "gravel-like" substance that travels through a system and internally deteriorates and destroys sensitive hydraulic components, causing reduced efficiency and eventual system failure. When we talk about "dirt" and "contamination," what exactly are we talking about? Contamination is defined as, anything that is in the system that is not supposed to be there. Being aware of what can ruin system operation is critical and why we should work on keeping it in check.

Here is what happens….

- **Surface scoring.** Produced when abrasive particles flow across contact surfaces of hydraulic seals.
- **Clearance honing.** From dirt flowing through spaces between moving parts, creating greater clearances and destroying critical tolerances.
- **Fluid degradation.** Fine metallic particles act as a catalyst promoting the chemical breakdown of the fluid.

If not properly controlled, the presence of dirt can initiate more of the following undesirable conditions:

- **Internal leakage.** Lowering the efficiency of pumps, motors, and cylinders, wasting power and increasing heat. Valves don't regulate flow and pressure accurately.
- **Corrosion.** Damage to delicate component parts from fluid degradation.
- **Sticking parts.** Causing erratic or intermittent component operation.

REMEMBER these two critical factors:

1. Dirt levels affect system performance.

2. Filters control dirt levels.

Unless measures are taken to remove certain amounts of contaminant particles in hydraulic fluid, the dirt levels will continue to rise until a component and the entire system fails.

What is the cure?

In this case, the cure is simple – FILTERS! Quality filters designed and manufactured by a quality filter manufacturer is what's needed. That is why you should rely on Ohio Fabricators Company (OFCO), a filter manufacturer who has been manufacturing filters in the U.S. for almost 80 years with dependable and reliable customer service. OFCO manufactures one thing and one thing only, filters! They are filter specialists and the standard of measure when it comes to designing, manufacturing, and selling products.

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What do we know about this guy, the enemy?

Dirt particles that cause trouble in a hydraulic system are extremely small. Typically, 98 percent of hydraulic fluid is composed of particles so small we cannot see them without magnification. The human eye cannot see anything smaller than 40 micron. Fluid samples from operating systems show us that as the size of the particle decreases, its quantity increases. In other words, the smaller the particles, the more there are in a given volume of fluid. Filters are the only available means of controlling small particles. However, before we can begin to eliminate hazardous dirt levels and contaminants, it is first necessary to understand the source.

How does dirt get into a closed system?

Since hydraulic systems are closed, and the same fluid is continually recirculated, you may wonder how dirt gets in. As an aid to understanding this basic problem, let's examine some of the most common sources of contaminants that contribute to the higher levels of dirt in a fluid power system.

- **Built-in dirt.** Specifically, core sand, weld splatter, metal chips, even lint and abrasive dust are all considered contaminants. These are all created when the unit is manufactured.
- **Introduced contaminants.** These are particles that enter through the seals, fluid filter tubes, and breather caps, or when the system is open for component repair or replacement. Also, when fluid is added to the system to replenish the reservoir supply, it will contain particle contaminants. A hint here is to ensure that when new fluid is introduced into a system from an outside source, make sure it is filtered.
- **Internally generated particles.** Wear from system components also contribute to the presence of contamination. Friction of moving parts gradually produces small particles of metal and sealing materials, continuously adding to the particle count in the fluid.
- **Fluid breakdown.** When chemical reactions occur within the fluid itself, the result is usually in the form of sludge and acids. Although not generally abrasive, sludge comes from resinous coatings on moving parts and slows movement and clogs passages.

Let's say you have a 20 gpm pump. The fluid is clean and the pump is doing its job producing 20 gpm flow with no problems. However, contamination loading builds up on the suction strainer thus restricting flow to the pump. There is now a higher pressure drop than what we would want in order to operate at peak efficiency. The pump will still function, but because of degradation, it operates with 50 percent less efficiency because of the excessive heat build-up which means other problems are soon to follow.

REMEMBER to maintain longer system life and higher performance, optimum cleanliness levels must be maintained.

Don't overdo it. There is an optimum level of cleanliness in all hydraulic systems; a level where increased filtration does not significantly reduce component wear. Keep economics in mind. You don't want to overdo it, but you don't want to "under" filter, either. Determine the acceptable dirt level, choose the correct filter combination and maintain the level of dirt below the limit. Another fact to remember; It is not how clean you can get your fluid, but how dirty can it be while still maintaining the system at peak efficiency?

There should be a proactive, regularly scheduled maintenance program, too. Remember, keep economics in mind. Don't wait for strange noises coming from the system before service is performed. It may be too late.

How to select filters and strainers. Many factors must be considered before filter selection can be made. Determine what will work best in your application to protect the pump by knowing the following…

- Type of fluid
- Pump flow rate
- System pressure
- Mesh size
- System operating temperature
- Chemical compatibility

The pump is the most critical component in any system because if it goes down, the system goes down. Therefore, controlling levels of contamination begins on the inlet line and protecting the pump. Contact us anytime. We are here to help ensure your system's pump stays operating at its maximum performance level.