A Primer in Hydraulic Systems Maintenance

Hydraulic systems are one of the most important elements of any piece of equipment, but they are often the most overlooked. In this article we're going to go beyond daily leak inspection, and take a more comprehensive approach to hydraulic systems maintenance.

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Whether you're working with motor graders, skid steers, track loaders, backhoes or excavators, the one thing that each of these machines has in common is a hydraulic system. From a maintenance perspective, hydraulic systems are often one of the most overlooked components of a machine, yet they are arguably the most important when it comes to getting the best performance out of a piece of equipment. As best practices suggest, most operators will do a daily walkaround inspection, and as long as there are no leaks and the oil level is good, that's the end of it. But if you want to protect your investment and keep your equipment performing at its best, a hydraulic system requires much more than that. In this article, we will focus on three key elements of any hydraulic system — oil, filtration and system integrity.

Oil

The mantra today is lowering operating costs. Some contractors will take this concept the wrong way and use the cheapest hydraulic oil in order to keep costs down—this can save a few bucks in the short term, but can cause serious harm to your hydraulic system over time. Will you see a failure right away? No, but using the right kind of hydraulic oil can be the difference between an axial piston pump (a very expensive component) lasting 10,000 hours instead of 5,000 hours.

Manufacturer's recommendations

Using the hydraulic oil listed in the operator's manual will ensure that the system is performing the way that the engineers and product development team intended. Also, different regions require different types of oil. Running a hydraulic system in Arizona will require oil with a different viscosity than running a machine up in Canada, so be sure to look at the manual for cold and hot weather recommendations.

Additives

Hydraulic oil comes in a lot of varieties, and each has a different viscosity and additive package. The additive package that goes into the oil is designed to deal with specific types of hydraulic systems. For example, an excavator running at 5,000 psi has different characteristics and requirements than a machine running at 2,500 psi. You have shear stability (an oil's resistance to reduction in viscosity under mechanical stress), temperature and water resistance characteristics, and all kinds of different considerations that go into the hydraulic oil. Therefore, the specific needs of any hydraulic system determine the type of additives required. There is no "one-size-fits-all' solution.

Storage and handling
The way you handle the hydraulic oil is just as important. Always make sure that it is kept in a sealed container in a dry area. Any time you open the container, you can potentially introduce contaminates into the oil—and its not just dust and particulate you have to worry about. Moisture in the ambient air can have an adverse effect on hydraulic oil over time. You may not see any difference right away, but over time the moisture can react with the different elements in the additive package and cause rust to form on spools, valves and other precision components of the system, which will cause poor performance and unnecessary wear in the long term.

Filtration
One of the biggest mistakes in the field is neglect of the hydraulic oil filter. The way that most systems are designed, it can be a bit of a procedure getting to the filter, since its usually incorporated into the tank so it's "out of sight, out of mind." A worn out filter is obviously not going to perform as well as a new one, so it is important to follow the manufacturer-recommended intervals for filter replacement.

When replacing the filter, it is also important to use the filter recommended by the manufacturer. Again, this component was chosen by the engineers and development team behind the machine to ensure that it is providing optimal performance, so any other filter, regardless of how similar it may look, isn't going to perform as well, and will allow contaminates into the system that will wear away at seals, spools and valves. All it takes is a small valve failure in a sophisticated hydraulic system to bring a million-dollar piece of equipment to its knees. Regardless of what type of machine you're using, no amount of quality and integrity can overcome poor maintenance.

System Integrity
We've talked about the basics in regards to the hydraulic oil and filtration, now let's talk about the system as a whole. The following considerations are all things to keep in mind when looking at the overall health of a hydraulic system.

Death by a thousand leaks
We all know that a single weeping cylinder isn't enough to justify pulling a machine off of a job site. However, over time, if leaks aren't addressed it will soon become one after another, and this will definitely have an impact on your machine's performance.

One thing to keep in mind is that every time you have a small leak, not only are you losing small amounts of oil from the system, you're also allowing moisture and dirt in. These machines are operated in dusty conditions, and if there is a point where the system is compromised, that contaminate will inevitably find its way in. A leaking system operating with low oil and added contaminates not only causes more unnecessary wear on your filters and other components, it also causes the machine to work harder, affecting operating temperatures and the overall performance of the machine.

Fluid sampling and analysis
This is another factor that is often overlooked. I've seen a lot of contractors who will only take a fluid sample at the time of failure, but that doesn't tell you anything. In order for fluid sampling to provide value, you have to do it consistently. If done on a regular basis, over time, your samples can give you an indication of problems that may be occurring and how they will affect you down the road, so you can handle things preemptively before a failure occurs. That's why it's important to check the operator's manual and follow the recommended fluid sampling intervals.

The biggest perceived drawback of this is the cost. An equipment owner may not want to spend the extra money on regular fluid analysis, but if it can help diagnose an issue so you can get it fixed before it gets worse, you're talking about significant savings compared to the downtime caused by an on-site equipment failure.

Operator behavior and duty cycles
Operator behavior has a significant effect on the overall health of a hydraulic system. A well-trained operator knows how to operate a machine smoothly, so they aren't powering the cylinders all the way until they bang against the stock, or bottoming out the pistons. Ultimately, those types of behaviors take their toll on the system. Think of it this way; if you have two runners and one of them runs smoothly with the proper technique, and the other runs full-bore with no consideration other than speed, hammering away at his joints — who do you think will go the distance?

It's the same when it comes to operating equipment. High-pressure spikes caused by reckless operation can wreak havoc on a machine, and causes unnecessary wear on hydraulic pins, cylinder pins, bushings and other components. Not to mention the pump system and release valve — if that release valve is going off again and again due to poor operating habits, that valve is going to eventually fail.

Another important consideration is duty cycles. For example, a machine used for loading logs in a forestry application is going to work the hydraulic system much differently than an excavator digging a trench on a pipeline job. Repetitive wear on a hydraulic system will be different for every application, so always keep that in mind when planning maintenance schedules.

Another simple, yet very important practice that gets overlooked all the time is the basic cleaning of a machine. Dust and dirt accumulate on this equipment daily, and if they aren't kept clean it is much more difficult for operators and technicians to diagnose leaks or other issues with hydraulic systems.

Attachments
Every time you hook up a different attachment to your machine, you are potentially introducing contaminates into an otherwise closed system. Always be sure that your

attachments are properly maintained, and that the couplers are thoroughly cleaned and looked after.

In addition to the couplers, make sure that the attachment itself has been used properly. A hydraulic breaker attachment — while designed to take (and dish out) quite a beating — has many components that can fail due to careless operation. A worn piston or compromised valve on a breaker will introduce dirt, debris and other contaminates into an otherwise healthy hydraulic system.

Scheduled Maintenance
In the real world, we can't always follow recommended maintenance schedules perfectly, but if you miss or are late with a scheduled service, it will benefit you in the long run to try to get back on track. It is very important to keep up with the maintenance schedule recommended by manufacturers in order to get the best performance out of your equipment.

It's also important to keep up with later services. Early maintenance intervals are typically kept up with in order to keep a new machine in good shape, but the later scheduled services are just as important, as they can really keep a machine performing at its best as it approaches the end of its life cycle.

As you can see, there is a lot more to hydraulic systems maintenance than just checking for leaks and topping off the oil every now and then. The hydraulic system is one of the most critical components of any machine, so make sure that it's not being overlooked. Following these basic concepts can extend the life of a machine, help prevent costly equipment failures and ultimately protect your investment and lower overall cost of ownership.