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ENGINEERING SERVICES

Hydraulic Equipment Reliability

By Brendan Casey, HydraulicSupermarket.com

One of the attendees of a seminar I presented, a maintenance manager for a large open-cut mining operation, recently mentioned he was considering upgrading the filtration on a fleet of hydraulic mining shovels in an attempt to achieve a higher level of fluid cleanliness.

Documented evidence suggests that increasing hydraulic fluid cleanliness increases the service life of hydraulic components. Pondering the question of whether such an initiative would yield an acceptable return on the investment required, which depends on a number of variables, steered me toward a bigger issue.

Understanding the Bigger Picture
The maintenance principles described in my books, *Insider Secrets to Hydraulics* and *Preventing Hydraulics Failures,* involve equipping people with the knowledge needed to optimize the reliability and service life of the hydraulic equipment they are using right now. It's rarely helpful to tell someone what they should have done yesterday. With this in mind, one exercise I perform with my seminar students is a maintenance and reliability audit on an existing hydraulic machine.

Even though equipment design and maintenance are often viewed in isolation, in reality, certain aspects of hydraulic machine design have an impact on the machine's operating cost and reliability, and ultimately, its life-of-machine cost.

Beginning with the End
Over lunch, the same maintenance manager mentioned that his mine is also considering replacing its aging fleet of hydraulic shovels. And it occurred to me, the best time to carry out a maintenance and reliability audit is before the equipment is purchased.

By beginning with the end in mind, the maintenance and reliability outcomes are obtained before the machine is even delivered. For example:

The contamination control targets can be specified based on reliability objectives for the equipment. Make sure to instruct the manufacturer to deliver the machine appropriately equipped to achieve these targets.

Based on the weight and viscosity index of the hydraulic oil being used, the user can determine the minimum viscosity and therefore the maximum temperature in which the machine can effectively run. Request that the manufacturer deliver the machine equipped with the necessary cooling capacity based on the location's typical ambient temperatures rather than accepting hydraulic system operating temperatures dictated by the machine's design cooling capacity, which is the norm.

Don't overlook the viscosity/temperature issue - it is very important. As I explained in my column in the July-August issue, lubrication failure resulting from low fluid viscosity is one of the biggest causes of premature failure in hydraulic components. If users are not on top of this issue, the costs could be outrageous.

Impacting Reliability
Other requirements that have an impact on reliability include:

- specifying flooded inlets for hydraulic pumps
- not installing depth filters or screens on pump intake lines or depth filters on piston pumps and motor case drain lines

For example, consider the oil temperature/viscosity issue. Say I am about to purchase a 25-ton hydraulic excavator. This machine is fitted with brand X hydraulic pumps and motors. According to the pump manufacturer, optimum performance and service life will be achieved by maintaining oil viscosity in the range of 25 to 36 centistokes. Because of the location, I expect to use an ISO VG68-weight hydraulic oil and the brand of oil I'm already buying under contract has a viscosity index of 95.

Therefore, the pump manufacturer is indirectly telling me that if my new excavator runs hotter than 158°F (70°C), the performance and service life of the pumps and motors will be less than optimum. Additionally, with 158°F (70°C) as the maximum operating temperature, the oil, seals, hoses and additional components in the hydraulic system will last longer.

The OEM's Accountability
So being the sophisticated hydraulic equipment user that I am, before ordering the machine I say to the OEM: "I expect ambient temperatures at my location as high as 113°F (45°C) and under normal conditions (no abnormal heat load in the system) this machine should run no hotter than 158°F (70°C). If you deliver it to the site and it runs at 185°F (85°C) on a 113°F (45°C) day, then I'll expect the problem to be corrected at your cost."

Clearly this is not in the interest of the OEM and will likely cut into his after-sale revenue.

So the next time you purchase hydraulic equipment, begin with the end in mind. Define the maintenance and reliability objectives in advance and make them an integral part of the equipment selection process.

ABOUT THE AUTHOR: Brendan Casey has more than 25 years experience in the maintenance, repair and overhaul of mobile and industrial hydraulic equipment. For more information on reducing the operating cost and increasing the up-time of your hydraulic equipment, visit his web site: http://www.HydraulicSupermarket.com