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SUCK IT AND SEE

A fresh approach to hydraulics filtration can reduce manufacturing and operating costs and increase the life expectancy of mobile equipment



Suction and return filter



Hydrostatic drives and open-circuit hydraulic working systems have long been a common feature in mobile plant and equipment. Traditionally, these are configured so that they both share the same oil, with a suction filter positioned upstream of the feed pump, and a return-line filter mounted after the hydraulic working system, with a third pressure in-line filter mounted after the charge pump of the hydrostatic drive. This pump is often protected by a fine-mesh suction filter.

Although this configuration ensures that the oil is filtered effectively to remove contamination, maintain the physical properties of the oil and improve the operating efficiency and life of the mobile equipment, it also adds to the cost and complexity of construction.

This is the modern way

This approach to filtration is at odds with the modern trend of reducing the weight and size of mobile equipment, and to improve performance and reliability while minimising initial manufacturing costs and subsequent servicing and operating costs. The use of multiple filters can also make system start-up difficult when suction filters are connected in sequence

using long pipes, as the high viscosity of oil at low temperatures can notably increase the flow resistance of filter elements; similarly, larger oil tanks are generally required to allow the oil to stabilise and cool, leading to an increase in the total weight and size of the system.

Designers of hydraulic systems have therefore developed ever-more effective filtration solutions, many of which use a new generation of suction-return-flow, or suction and return filters, where a closed-loop hydrostatic drive and a working hydraulic circuit can be configured so that the return oil from the working system and the suction oil of the closed-loop circuit can be filtered by a single unit, with an integrated back-pressure valve in the filter enabling clean, pressurised oil to be fed directly to the hydrostatic drive. This notably reduces capital and operating costs and, as long as the filter is correctly specified, can improve the overall efficiency of the filtration system and extend service intervals.

In a typical arrangement, such as those used in telehandlers or wheeled loaders, a suction and return filter is fed with used oil from the main return oil line of the open hydraulic operating system

and is then used to pass filtered oil to the suction port of the pump in the closed-loop hydrostatic drive system. The return line of the open circuit and the suction line of the hydrostatic drive are connected to the filter head, which acts as a manifold to make connection and installation quick, simple and space saving.

The importance of valve positioning

It should be noted that any system that uses hydraulic cylinders will have an inconsistent level of flow in the return line, with fluctuations being potentially greater where load-sensing devices are used; the flow required from the hydrostatic drive will also vary as hydraulic components cycle. It is therefore important to consider the fluctuations in both the volume of oil being fed through the return line and the levels of demand from the hydrostatic loop, to prevent a shortage in the flow of filtered oil to the hydrostatic drive. Although oil can be drawn from the tank into the filter through an anti-cavitation valve, its quality may have a major effect on the functionality and reliability of the drive – consideration must therefore be given to the cleanliness of the oil and the level of air present in the fluid, as high air content will affect its compressibility and the efficiency of the operating system.

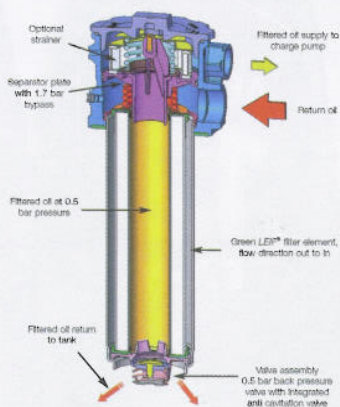
In most filters, a bypass valve is used to prevent excessive pressure drop across the filter element, but this is often positioned so that the bypass allows oil directly into the tank, leading to oil foaming. Depending on the time available for the oil to be de-aerated, oil with high air content can be sucked through the anti-cavitation valve (also known as the emergency suction valve) into the hydrostatic drive.

Another solution is to mount the bypass valve in series with the back-pressure valve, with the latter being used to ensure pressurisation of the filtered oil at the suction line. Positioning the valves in parallel is not recommended, as it is difficult to guarantee consistent pressurisation; there is also the risk of pump cavitation, where dissolved air in the oil can lead to increased operating noise, system wear and fluctuations in the fluid compressibility.

As an anti-cavitation valve allows oil to bypass the main filter element, it will generally need at least a coarse filter. Ideally, the bypass fluid and the oil sucked through the anti-cavitation valve should

always be filtered using a strainer, which should be fitted inside the filter head for easy inspection during routine servicing.

As the working hydraulic circuit and the hydrostatic drive are connected via the suction and return filter, the volume of oil in the tank can be reduced. In many applications, this allows smaller, often custom-shaped tanks to be used, reducing the space required and, where tanks are mounted externally, allowing the aesthetics to be enhanced. However, smaller tank sizes, especially plastic kinds, can adversely affect the rate at which oil cools, leading to it exceeding its maximum operating temperature, rapidly degrading, and losing its ability to lubricate, protect parts from corrosion and transfer energy. It is therefore important that the system is specified to ensure that oil remains within its operating temperature limits, by sizing tanks correctly and choosing the most appropriate materials of construction.



A final thought

A final point to consider is that the latest suction and return filters can now incorporate specially designed elements with reusable metal sleeves, so that only the contaminated filter media need to be changed. This helps reduce waste disposal costs, often by up to 50%. Also, choosing

patented replacement parts from one of the leading premium brand suppliers will ensure that filtration quality is guaranteed and, as a consequence, mobile equipment units continue to function with maximum efficiency and with a long service life.

Suction and return filters offer mobile equipment manufacturers and end users a simple and extremely cost-effective method of reducing construction and maintenance costs. In addition, correctly specified and fitted, they provide the opportunity to improve system reliability, performance and, just as importantly, operating life. **ivT**

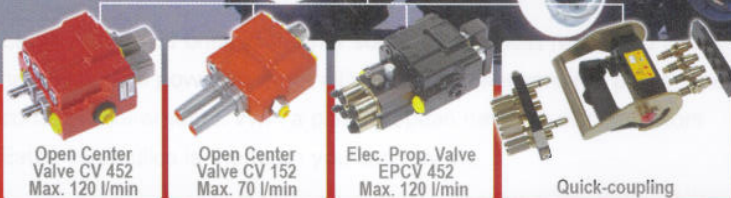
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