



A "Total System Cleanliness Approach" Excavators in the construction industry



More than 45% of the World's construction machines are hydraulic excavators. Most of these vehicles are powered by a combustion engine, however unlike conventional automobiles, the generated power of the engine is also used to drive hydraulic-pumps, which provide a flow of hydraulic oil throughout the system.

Hydraulics is the science of transmitting force and/or motion through the medium of a confined liquid, producing power by exerting force on the same liquid. Pumps are installed to propel this liquid, known as hydraulic-oil, around the circuit and, at times pressurize it.

Valve-blocks are used to control the flow and the direction of the oil to those areas of the vehicle from which movement is required.

The main components of an excavator, such as the boom, dipper-arm, bucket and swing-motor are all moved by hydraulic rams (pistons), which convert the fluid power of the hydraulic-oil into linear-force and motion.

The complexity of the hydraulic circuits on board an excavator and the harsh working environment they are built to endure, means that the reliability of such systems is of primary importance to the fleet operator and/or the user.

Feedback from hydraulic-system operators indicates that the reliability of the vehicle and its' hydraulic system depends on many factors, not the least of these is pressure, flow, temperature, oil-viscosity and particulate contamination.

70 to 90% of hydraulic-system failures can be attributed to contaminated hydraulic-oil, which in turn leads to >80% of wear-problems and particulate induced problems of abrasion, erosion and fatigue.

Hydraulic circuit contaminants affect the performance and lifetime of hydraulic equipment, leading to one of three-types of system failure:

- Degradation - caused by particles corresponding in size to the clearance-dimensions of valve-channels, interacting with valve surfaces, causing abrasive-wear and corrosion issues.
- Intermittent - contamination causes temporary resistance in the valve-spool or prevents the poppet-valve from moving. Although these particles are likely to be washed away by the repetitive movement of the spool, only by completely removing the contamination will ensure the failure will not be repeated.
- Catastrophic - contamination, takes place suddenly and unexpected when larger particles or a larger collection of smaller particles cause complete seizure of moving parts.

There are many different types of contaminants that can lead to system-failure, of which moisture is probably the most common. In general, there are three main sources of contamination in hydraulic systems:

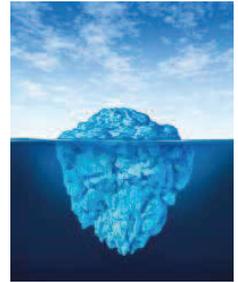
- **Built-in contamination** - known as "primary contamination," originates from the manufacturer's assembly and testing of hydraulic components or from the assembly process of the entire vehicle on the production line.
- **Ingress contamination** - often occurs due to insufficient sealing of hydraulic systems, such as rams (pistons), or insufficient atmospheric air filtration at the breather-cap on the oil-reservoir. Contamination can also be introduced during maintenance, especially during the hydraulic-oil re-filling process.
- **Generated contamination** - also known as abrasion, caused by contact of internal component surfaces with contamination during use.

Take a Total System Cleanliness approach

The "tangible-costs" of contamination control are represented by the initial installation of hydraulic-filtration and subsequently by the timely replacement of filter-elements, when they start to show signs of excessive contamination take-up and become uneconomical to leave in-situ. These costs typically represent only 3% of the total cost of untamed contamination!

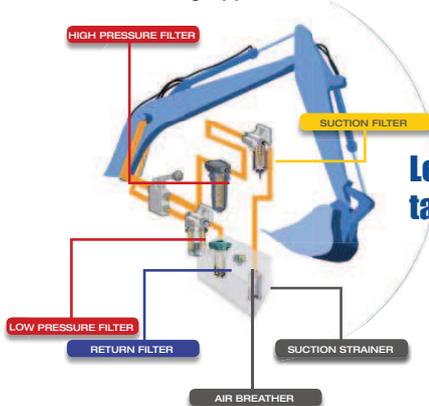
The solution is to keep your head above the water-line by taking a "prevention is better than cure" approach, avoiding the following issues, directly attributable to contamination:

- Premature component repair and replacement
- Equipment downtime and lost production
- Excessive, unplanned maintenance
- Reduced hydraulic-fluid lifetime
- Unreliable vehicle performance
- Wasted time, energy and money



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