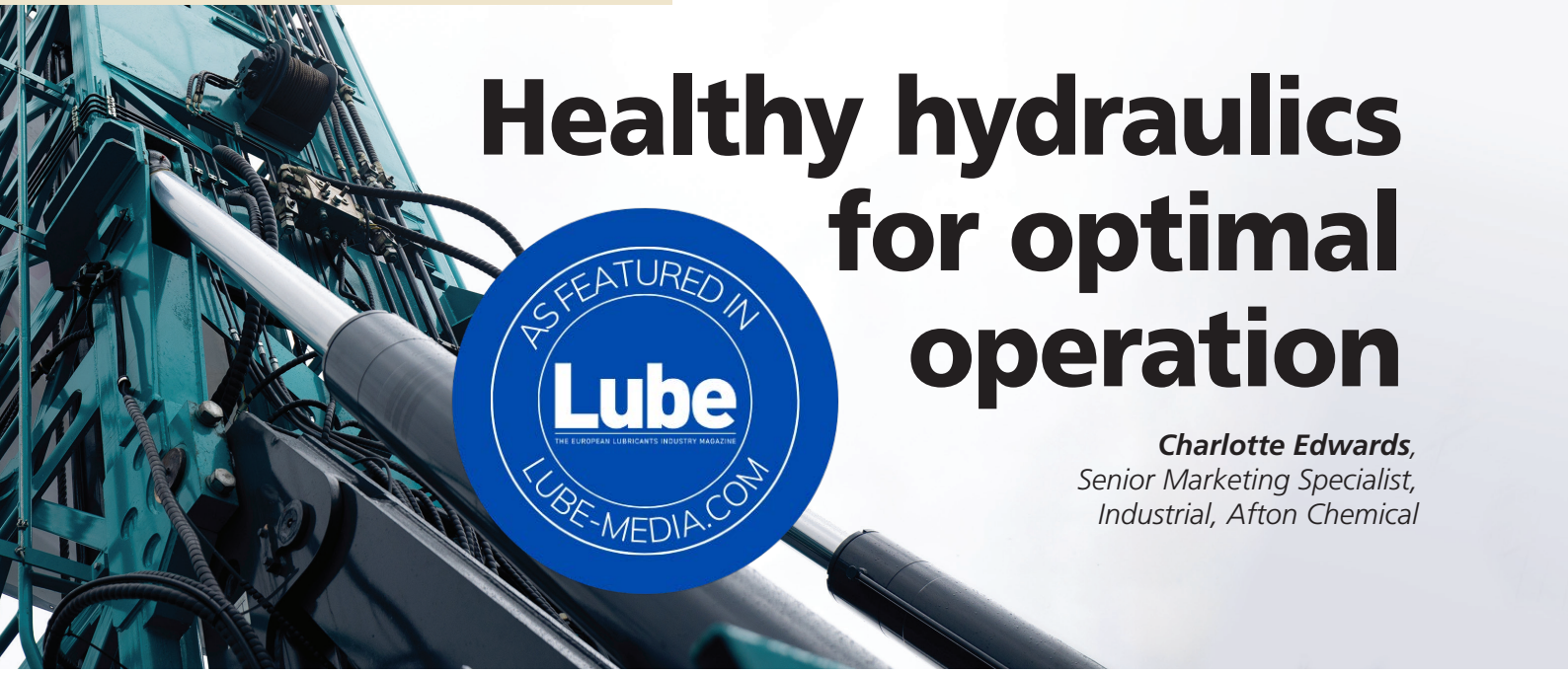


# Healthy hydraulics for optimal operation

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*Hydraulic fluid is the lifeblood of countless applications, circulated by a pump not dissimilar to a beating heart. Whether that heart powers a centrifuge spinning at 3000 revolutions per minute, or a mining truck relied upon to deliver 240 hours of work each month, the same desire is repeated by hydraulic equipment-OEMs and users around the world: optimal operational performance. Just as blood carries oxygen and other elements needed for healthy function to the heart and body, a hydraulic fluid is vital for any hydraulic system to perform optimally.*

Hydraulic fluid enables an incredible range of machinery to function by transmitting power effectively from the pump to components. To minimise the total cost of owning and operating such equipment, the fluid must do this in a consistent way that supports reliability, durability and efficiency, whatever the application.

**How is optimal operation defined?**

Across all industrial sectors, end-users define optimal operation using similar language. They need their hydraulic equipment to work smoothly and efficiently, with continuous availability, over the long term. Failure rates must be low, with minimal downtime between scheduled maintenance windows. Equipment must have the ability to operate a broad temperature range whilst maintaining fluid cleanliness and maximising oil drain intervals. Machines must be protected from damage and remain able to deliver expected outputs efficiently, using minimal energy or fuel.

This end-user desire for optimal operation is largely aligned with hydraulic OEMs, whose priority is to ensure their equipment operates as specified throughout its lifetime. Finished hydraulic fluid must therefore possess an appropriate technical performance profile that can be maintained throughout its working life.

**Fluid performance requirements**

Hydraulic fluid is optimised by strengthening base oil characteristics to achieve an appropriate performance profile. The way additive chemistries are selected and blended to create this finished fluid is shaped by many factors, including advances in hydraulic system hardware and evolving environmental, health and safety regulations. However, the number one factor remains: end-users in different sectors seek to extract optimum value from machinery and fluid. The following requirements are common to all hydraulic fluids, although the importance that each is assigned to achieve the right performance balance may vary between sectors and applications.

### Wear protection

With the majority of hydraulic machinery being owned, the number one end-user priority is protecting components from wear to ensure reliable operation over the long term. Excellent anti-wear performance is achieved through additives that create a sacrificial layer on the metal surfaces of bearings and precision parts such as pistons and cylinders.

### Thermal properties

As well as dissipating heat effectively the fluid must be thermally stable and possess excellent oxidation control, to ensure its specified performance can be maintained between planned drain intervals. Prolonged high temperatures can cause a series of oxidative changes that can culminate in machine damage or failure.

### Viscosity retention

Hydraulic systems are designed with precise tolerances between parts. For optimal efficiency, original equipment manufacturers (OEMs) recommend a viscosity that works with those tolerances, and this must be retained. Should viscosity drop, oil pressure will fall, in turn causing a chain reaction of increased friction, heat, wear and oxidation.

### Cleanliness

Easy removal of contaminants from hydraulic fluid is essential for maintaining optimal performance, whether separating water and entrained air for easier removal or filtering out dust particles from the external environment and internally generated wear particles.

### Compatibility

Fluid compatibility with elastomer seal materials is needed to minimise the risk of leaks caused by changes in seal size or elasticity, while compatibility with metals helps to minimise corrosion.

### Varied user needs

Afton communicates with mobile and stationary hydraulic equipment users from different sectors around the world to ensure their primary fluid needs can be met. For example, in the offshore oil and gas sector, maintaining a stable operating temperature between 70°C and 80°C is particularly important. Exceeding this limit for any significant length of time is not only indicative of an issue with the system, it increases the likelihood that the fluid could lose viscosity and degrade faster.

In agriculture, end-users prize seal materials compatibility for environmental and economic reasons. Fluid leakage into local surroundings is not only environmentally unwelcome, it also increases maintenance costs. In addition to the cost of oil top-up to achieve a desired drain, there is also the bigger impact cost of breakdown and repair. This is particularly pronounced in agriculture, where specific deadlines need to be achieved. End users do not want to face the productivity loss due to their equipment breaking down or the likelihood of potentially costly top-ups just to maintain desired drain intervals.

### Testing for optimal operation

Both industry and OEM specifications reflect the extensive performance needs of hydraulic fluids listed above; and these specifications are far more than simply a tick list of requirements. However, how each aspect of performance is prioritised and tested for differs between OEMs and industry bodies. Specifications from pump manufacturers Bosch Rexroth and Parker Denison are widely viewed as the gold standard for optimal operation in the field. Their fluid approvals have a magnified focus on wear performance and oxidation control to help meet the diverse needs of the equipment, applications and sectors that their pumps are supplied into.

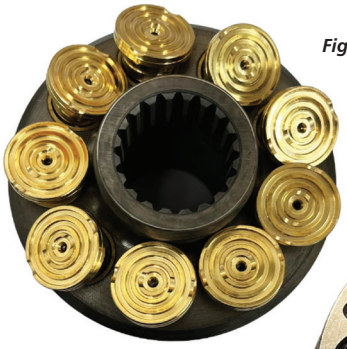


***Figure 1:*** *BR pump.*

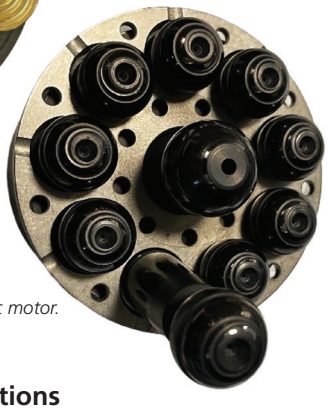


***Figure 2:*** *Bosch Rexroth A6 hydraulic motor.*

### Following recommendations

End-users appreciate that OEM-approved hydraulic fluids are designed and tested extensively to ensure they support optimal operation and avoid unplanned downtime. The majority of owners and operators tell Afton that they trust OEM fluid recommendations and follow OEM drain intervals closely, many never deviating from this throughout their equipment's

lifetime. OEM fluid approvals are viewed positively and brands seen as a guarantee of quality; those who may be open to alternative options are more likely to consider these only once their equipment falls out of warranty.

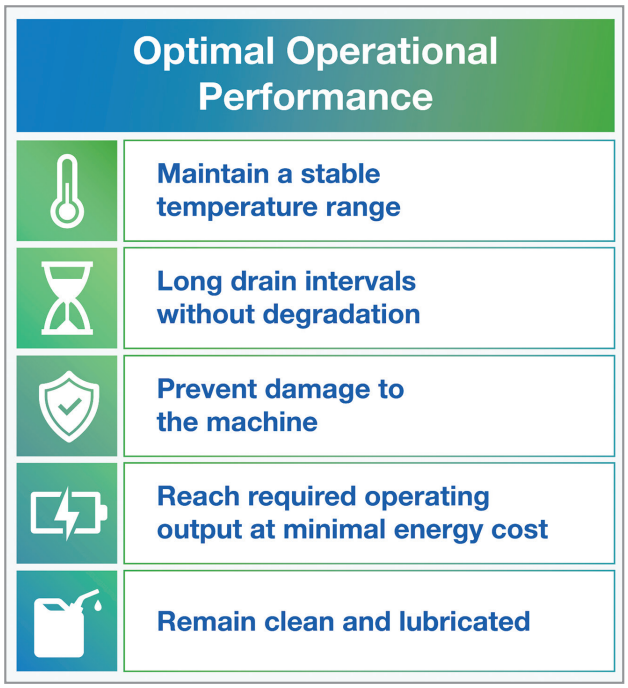



***Figure 3:*** *Defining Optimal Operational Performance.*

Some operators will validate a branded fluid in their machines by analysing fluid condition at intervals when first using that oil. Most will monitor ongoing fluid pressure and temperature as a minimum, to confirm that operation remains optimal. By the time a noisy pump, system vibration or fluid leakage is evident to observers, issues have already escalated and productivity will likely be affected.

**Never miss a beat**

It is no exaggeration to describe hydraulic fluid as the lifeblood of any hydraulic system; it is the most critical component for ensuring that vital machinery never misses a beat. A fluid that resists oxidation, maintains its viscosity and supports in the removal of unwanted contaminants will prevent costly breakdowns and mitigate costly repairs. As hardware and regulatory requirements evolve, there is real power in additive suppliers working not just with OEM partners and oil companies but also end-users, to ensure hydraulic fluids are designed, tested and proven to deliver optimal operational performance.

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