

Dynavis® Hydraulic Fluid Additive System Increases Fuel Economy and Equipment Productivity

Operating hydraulic equipment efficiently involves doing the most work in the least time for the lowest cost, while maintaining safety and performance. Hydraulic equipment manufacturers are developing innovative approaches to increasing efficiency and fuel economy in off-road vehicles, driven in part by concerns over air pollution and CO₂ emissions. Lubricant manufacturers are playing a key role, by offering products designed to boost performance and efficiency while reducing operating costs.

In 2007, ICIS recognized a groundbreaking new concept called Maximum Efficiency Hydraulic Fluid (MEHF) as an "Innovation with the Greatest Beneficial Environmental Impact." RohMax Oil Additives has spent the past several years developing MEHF and researching its potential applications. The process began with mathematical modeling of the thermodynamics of hydraulic circuits. RohMax then tested MEHF's potential in experiments with a variety of gear, vane and piston pumps in the lab,¹ and demonstrated its benefits during full-scale tests on off-road equipment.

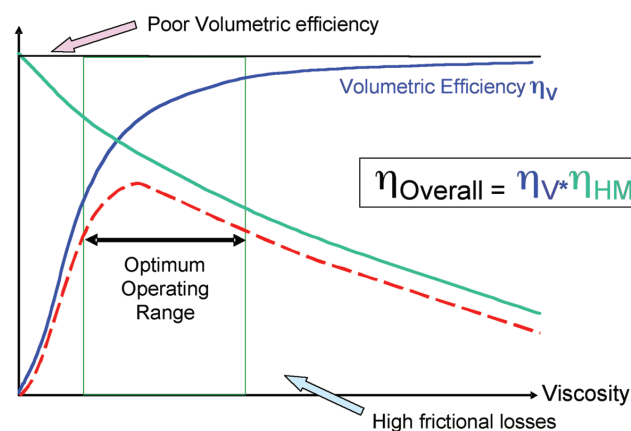
The end result of these tests is RohMax's Dynavis®, a complete additive solution that lets hydraulic fluid formulators deliver MEHF-level performance to their customers and end users. What follows is a brief description of the technology behind Dynavis®, followed by a review of a field test of the product.

The MEHF Concept

Two factors determine the overall efficiency of a hydraulic pump or motor: its mechanical efficiency and its volumetric efficiency.² Each factor is a function of the viscosity of the hydraulic fluid, but they react oppositely to changes in viscosity. Figure 1 illustrates this difference. When viscosity (or resistance to flow) is higher, mechanical efficiency decreases, because the pump has to work harder simply to move the fluid through the system. But higher viscosity actually increases volumetric efficiency, since thicker oil reduces wasteful leakage in the recycle pathways inside pumps and motors, where excess fluid lubricates the sliding surfaces of pumps. When less viscous fluid flows through these recycle pathways, the increase in leakage decreases volumetric efficiency and, as a result, the output of the pump.³

Figure 1

Effects of Viscosity on Overall Pump Efficiency



The most effective hydraulic fluids are thin enough to allow the most efficient flow, and thick enough to pump with the greatest efficiency. Viscosity changes with temperature, so an efficient hydraulic fluid must maintain optimal performance at a wide range of temperatures, from cold equipment start-up to the heat that builds up during extended periods of operation.⁴

MEHF fluids are designed to increase efficiency regardless of temperature. Like conventional multi-grade hydraulic fluids, MEHF fluids at cold temperatures allow equipment to start at lower temperatures, which can eliminate the need for heaters and ensure smoother operation in the cold. But MEHF fluids can also reduce the loss of viscosity at higher temperatures that can occur with conventional hydraulic fluids. Well-designed, multi-grade MEHF fluids can therefore increase efficiency throughout the range of operating temperatures.

What Are Dynavis® Additives?

The Dynavis® additive system has been specifically designed to formulate Maximum Efficiency Hydraulic Fluids (MEHFs). Dynavis® incorporates anti-wear, antioxidant, and corrosion inhibition (AW/AO/CI) packages, along with shear stable Viscosity Index Improvers (VIIs). These ingredients are optimized to work together to deliver increased fuel efficiency and produc-