EVONIK INDUSTRIES

Resource-efficient hydraulic fluid solutions for industrial applications

DynaVIS
More Power • Less Fuel

Evonik. Power to create.

Advanced solutions for hydraulic systems worldwide

The Oil Additives specialists at Evonik create unique, resource-efficient solutions for premium hydraulic fluids that meet tomorrow's challenges. Get an edge with lubricant additive know-how that outpaces the competition and boosts efficiency to help you create more with less input.

Evonik is a global leader in developing, manufacturing and supplying technologies and products for the lubricant, fuel and refinery process markets. Evonik's technologies, products and technical services help lubricant formulators, marketers and OEMs boost efficiency by enhancing fuel economy, improving equipment performance and raising productivity. Evonik has a broad line of products that are developed using a proprietary polyalkyl methacrylate (PAMA) technology that can be custom-tailored to meet a wide range of specifications.

A commitment to reducing energy consumption and extending hydraulic fluid service life requires know-how and innovation. With proven solutions, customers can rely on the Oil Additives specialists at Evonik for global supply security and local technical support worldwide. Evonik helps formulators get an edge in offering the most advanced solutions to their customers.

Superior benefits for hydraulic fluids

- Sustainable increases in productivity and reductions in energy consumption
- Performance approved by OEMs
- Business continuity from a highly reliable global supply chain
- Local service and technical support
- Proven PAMA technology providing both excellent low-temperature properties and a high Viscosity Index

About Evonik's DYNAVIS® technology

Hydraulic fluids formulated to Evonik's DYNAVIS® technology performance standard improve hydraulic pump operation in several substantial and measurable ways. Based on years of intensive R&D and meticulously-designed field tests, hydraulic equipment operating with DYNAVIS® formulated fluids have credibly demonstrated their potential to achieve:

- Up to 30% more hydraulic power under full-load conditions[1]
- Up to 30% lower energy consumption to complete the same amount of work[1]
- Faster response to operator control
- More stable oil temperature

[1]Typical savings achieved using a DYNAVIS® formulated hydraulic fluid will range from 5%-10% when compared to a conventional monograde fluid of the same ISO viscosity class; however, field tests have recorded gains of as high as 30% in off-highway construction equipment.

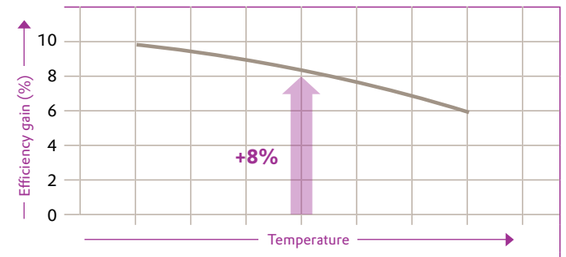
Custom solutions for every hydraulic application

The Oil Additives specialists at Evonik offer advanced technologies for hydraulic fluids. Evonik product lines include VISCOPLEX® Viscosity Index Improvers (VIIs,) Pour Point Depressants (PPDs,) defoamers and environmentally-friendly lubricant additives. Evonik has decades of experience in efficiency testing in all types of hydraulic systems and pumps, including piston, vane and gear.

Applications and examples:

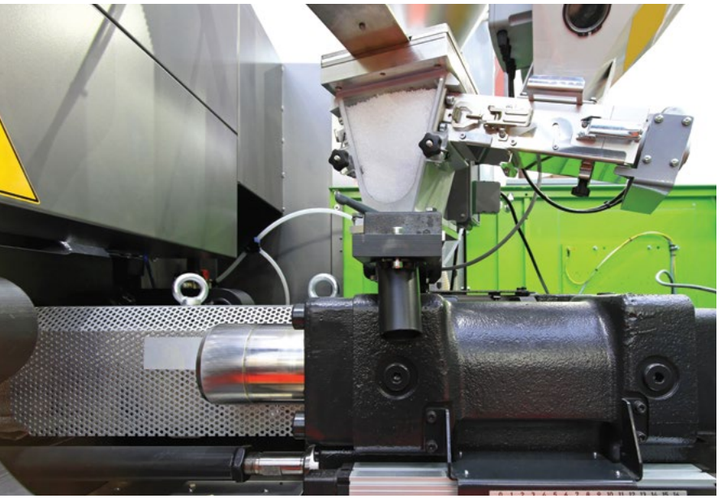
- Industrial – injection molding
- Mobile – agriculture, construction and heavy machinery
- Automotive – shock absorbers and power steering fluids
- Aviation – fire-resistant fluids
- Marine – transfer pumps

Monograde hydraulic fluids vs. multigrade hydraulic fluids with DYNAVIS® technology - in fully automated industrial processes



	Reference	Test fluid
ISO VG	46	32
VI	100	186
KV100 * /cSt	6,71	6,80

* Kinematic viscosity after sonic shear, according to ASTM D5621 (40 min)



Unsurpassed research and development capabilities

Testing in the lab and in the field

Evonik offers a wide range of hydraulic fluid additive technologies and products to meet formulation challenges worldwide, all supported by one of the industry's most knowledgeable and experienced staffs. Evonik is recognized for its skills in evaluating customers' specific formulations and performing rigorous laboratory testing with a variety of advanced equipment. With Evonik's ongoing discovery of next-generation technologies, the Oil Additives Team develops customized viscometric solutions, creating additional value and offering new opportunities for hydraulic fluids.

Test capabilities include:

- State-of-the-art laboratory testing
  - Shear stability testing
  - Pump testing (piston, vane, gear)
  - Efficiency testing
  - Denison HF-0 tests
- OEM equipment field testing

Tribology measurement capabilities include:

- Mini Traction Machine (MTM)
- Tribometer
- Rheometer

Evonik's hydraulic fluid technologies and products demonstrate outstanding performance in laboratory and test rigs. In field tests, they also outperform, even under the most severe conditions encountered in challenging operating environments.

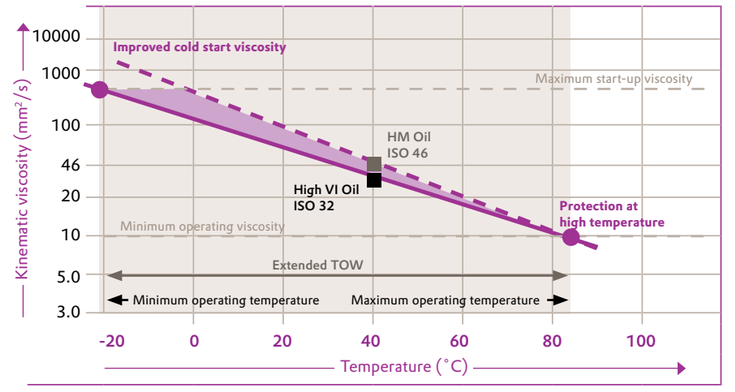
DYNAVIS® technology boosts efficiency and performance

Modern hydraulic systems must perform in difficult environments, and users expect high-energy efficiency in all operating conditions. The range of industrial applications includes continuously operated stationary machinery like injection molding, metalworking, cutting and metal forming equipment, as well as controllers, elevators and pumps. Most processes are automated and run 24/7.

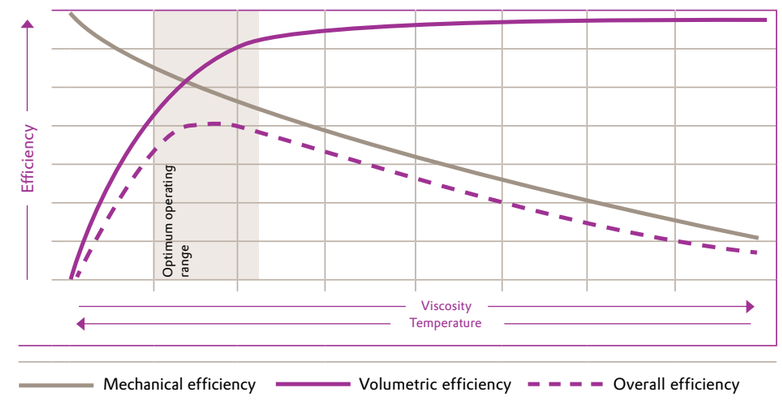
Rigorous testing throughout the development process ensures Evonik technologies and products reliably perform, even under the most severe conditions. DYNAVIS® technology combines excellent low-temperature performance with optimized filterability and demulsibility properties, while meeting severe shear stability requirements.

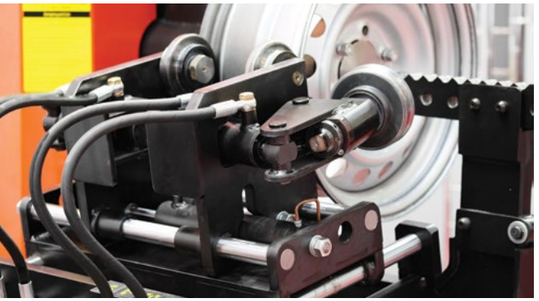
With detailed thermodynamic modeling in Evonik R&D departments, development continues with a regimen of pump tests, followed by a series of field tests. These tests, combined with Evonik's partnerships with leading formulators and OEMs, ensure the Evonik innovation pipeline is filled with resource-efficient, future-proof solutions that meet tomorrow's challenges and global performance requirements.

Efficiency benefits of DYNAVIS®-formulated hydraulic fluids with lower viscosity grade and high viscosity index



Optimum efficiency over an extended operating range with DYNAVIS®-formulated hydraulic fluids





Powering global progress

Evonik's oil additives for energy-efficient hydraulic fluids

Viscosity modifiers for hydraulic fluids meeting the DYNAVIS® technology performance standard

	PSSI US	PSSI KRL	Comments
VISCOPLEX® 8-100	9	19	For Grp I base stocks; with PPD activity
VISCOPLEX® 8-112	8	16	For Grp II/III base stocks
VISCOPLEX® 8-150	12	29	For Grp I/II/III base stocks; with PPD activity
VISCOPLEX® 8-200	19	39	For Grp I base stocks; with PPD activity
VISCOPLEX® 8-219	16	39	For Grp II/III base stocks

PSSI KRL = Shear stability index according to CEC L-45-A-99 (tapered roller bearing, 20 hrs)
PSSI US = Shear stability index according to ASTM D 5621 (sonic shear, 40 min)
Values may vary depending on the formulation

Viscosity modifiers for specialty hydraulic fluids

	PSSI US	PSSI KRL	Comments
VISCOPLEX® 7-302	36	51	For superior pour point and excellent low-temperature viscosity
VISCOPLEX® 7-305	33	61	For naphthenic, paraffinic, and synthetic aircraft & shock absorber fluids
VISCOPLEX® 7-310	36	50	For naphthenic, paraffinic, and synthetic aircraft & shock absorber fluids
VISCOPLEX® 7-510	42	66	For naphthenic, paraffinic, and synthetic fluids

Based on Evonik's VISCOPLEX® product range, it is possible to formulate energy efficient hydraulic fluids in compliance with all industry standards as well as the DYNAVIS® performance standards. Evonik's specialists are ready to help you achieve the maximum energy savings in industrial equipment.

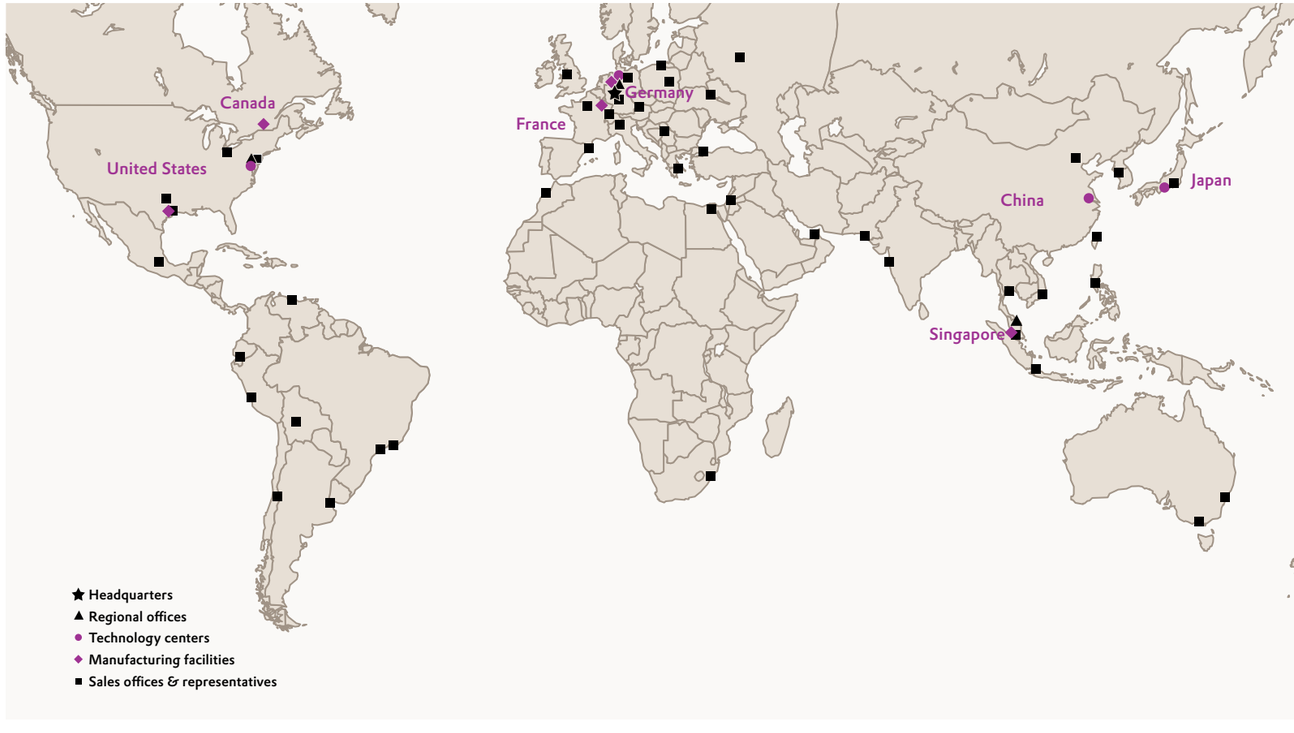
Creating resource-efficient hydraulic fluids

With know-how that helps customers create more from less input, the Oil Additives specialists at Evonik continuously innovate to contribute to a growing portfolio of energy-efficient and environmentally-friendly formulation solutions.

Energy-efficient HF formulations from Evonik reduce fuel consumption and carbon emissions. Evonik's close collaboration with industry-leading companies worldwide supports the development of forward-looking technologies that are an integral part of tomorrow's energy solutions.

The Oil Additives specialists at Evonik, available worldwide

The Oil Additives Team at Evonik promise timely and personalized support from their local specialists around the world. With more than 70 years of industry experience, Evonik's Oil Additives Team offers customers a unique combination of lubrication knowledge, formulation assistance and customized solutions.



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