

Magnetorheological fluids

General features

Magnetorheological fluids (MRF) are suspensions of magnetizable Particles (iron) dispersed in a carrier liquid (mineral or synthetic hydrocarbon oil, silicone oil, etc.) with additives. In a magnetic field, the MRF undergoes a reversible transition from a pourable liquid to a stiff paste.

Applications

- Adaptive vibration damping
- Transmission of torque e. g. clutches and brakes
- Regulation of motion
- Haptic human-machine interfaces
- Fixation of work pieces

Properties

- Viscosity without magnetic field between 60 and 4000 mPa*s (temperature 25 °C and shear rate 1000 s⁻¹)
- Available shear stress in magnetic field (700 mT) up to 90 kPa
- Increase factor of shear stress up to 2400 (magnetic flux density 700 mT and shear rate 100 s⁻¹)
- Sedimentation stability up to 98% (supernatant)
- Operating temperature range between -60 and 200 °C depending on MRF composition
- Properties can be tailored by MRF composition according to requirements.

Characterization methods

- Rheological measurements such as viscosity, shear stress increase in the magnetic field etc. are carried out with a rheometer equipped with an magnetic field generating device.
- Examination of the settling degree upon prolonged standing (3 months)