Initiatives in Development

- MSDS evaluations of materials
- Response to ELV directive
- Reduction of environmentally hazardous substances
- Reduction of VOCs
- Response to REACH regulations
- Response to the North American chemical substance regulations
- Response to laws and regulations in every country

Development and Promotion of Copper-Free Friction Materials

In the U.S. states of Washington and California, state laws have been enforced regarding restrictions on chemicals contained in automotive brake friction materials to prevent the impact of emissions of such substances on river and marine ecosystems. In the state of California, restrictions on copper will be enforced from 2021, and from 2025 onward, it will be illegal to fit new vehicles with friction materials containing 0.5% or more of copper. Conventional friction materials have used copper to ensure safe and effective performance at high temperature. Akebono developed copper-free friction materials and started to market them for aftermarket products in 2007 and supply them as OEM parts to automakers since 2014. By combining multiple component materials, Akebono achieved the same performance as copper contained pads while keeping the cost at the same level.

Around 80%* of Akebono brand aftermarket brake pads have a copper content that is lower than the 2025 standard for the state of California. Furthermore, we are also working to quickly develop antimony-free materials, as these could potentially be targeted under future regulations.

Akebono will continue to comply steadily with laws, including Washington state laws going forward.

copper-free brake pad

*Shipment volume basis

MR Fluid Brakes that Emit No Brake Dust

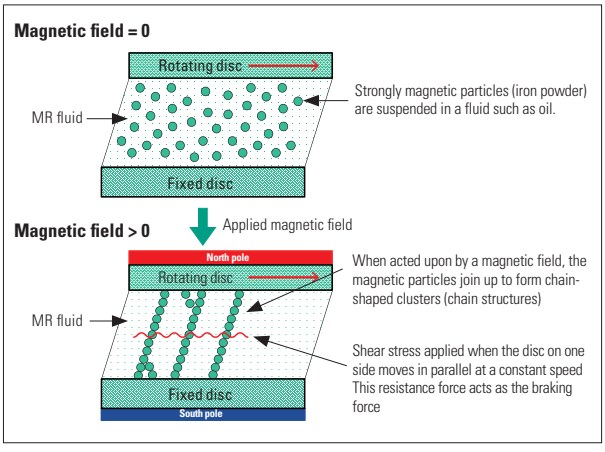
At Akebono Research & Development Centre, we are conducting research and development into magneto rheological (MR) fluid brakes that will eliminate brake dust. The brakes are being developed in response to the electrification of vehicles and out of consideration for the global environment.

A functional material that has been researched since the 1960s, MR fluid has the characteristic that it changes from a liquid to a semi-solid state in reaction to magnetism. When a magnetic field is applied, the strongly magnetic particles (iron powder) several microns in diameter suspended in the fluid align with the direction of the magnetic field, forming chain-shaped particle clusters that change the fluid to a semi solid state.

MR fluid brakes are constructed with a space filled with MR fluid between a disc fixed to the vehicle and a disc that rotates together with the wheel hub bearing. When electricity is passed through a magnetic coil mounted inside the brake, a magnetic field is generated in an orthogonal direction to the discs, causing chain-shaped particle clusters to form between the fixed disc and the rotating disc. As the rotating disc continues to rotate, the chain-shaped particle clusters are broken by shear stress, and then form connections to the neighboring cluster, before being broken again in a repeated cycle that generates a resistance force on the rotating disk. This resistance force is the braking force.

Using MR fluid for brakes can reduce the emission of environmentally damaging substances by eliminating abrasion powder because the brakes do not wear. Moreover, MR fluid responds to a magnetic field in less than a micro second, enabling sensitive and stable braking. Since the voltage (excited magnetic force) is electronically controlled, users can select their preferred brake feel from among several preset patterns.

Akebono started research and development on ultra-compact mobility three years ago, completing its prototype product in March 2015. We will continue experimental work and improving MR fluid brakes as a smart brake suitable for smart cities and smart mobility, aiming for implementation in 2020.



MR Fluid Brake Principle

MR fluid brake (prototype) and ultra-compact mobility vehicle fitted with it