The Challenge of Wear in Friction

Phenolic Resins for Wear-Resistant Friction Elements

ASK Chemicals introduces a novel technology of wear-resistant phenolic resins. The new resins show superior wear and heat resistance – improving friction in brake pads for a variety of vehicles.
One of the greatest challenges faced by the automotive industry is optimizing or achieving high(er) wear resistance in friction products. It is a performance factor that is increasingly requested in several friction applications, for example in disc brake pads for SUVs or light commercial vehicles.
Wear can be attributed to:

- Thermal degradation of the organic binders
- Debonding of friction materials from the matrix
- Fast removal of the interfacial layer
- Excessive abrasion effect

With the ever-increasing demand for lightweight, smaller, and more durable friction elements, formulators are searching for raw materials that will enhance performance. Our new phenolic resins have exceptional performance in friction elements because of their superior wear-resistance.

Resin Properties and Characteristics

Resin grades can be tailor-made to the required specifications, varying in flow, cure time, hexamine content and granulometry. These resins can be modified or unmodified phenolic resins.
The resins must be stored away from heat sources and moisture.

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Formulatory Guidelines

Wear-resistant resins are ideal for use in, but not limited to

- Disc brake pads for light vehicles and SUV's
- Disc brake pads for high-speed cars
- Disc brake pads for buses
- Disc brake pads and linings for commercial vehicles
- Disc brake pads for use in mountainous areas
- Clutch facings for manual transmissions, based on the dry fabrication process
- Dry double clutch facings for automatic transmissions

These resins present superior performance in the following formulations

- Ceramic
- NAO
- Metallic
- Copper-free

Starting Formulation

The following starting formulation is indicative only, and is not adapted for commercial production.

Low-metallic Disc Brake Pad for Light Vehicle

Steel Wool	12
Wollastonite	21
Mineral Fibers	12
Calcium Carbonate	30
Graphite Coarse Synthetic	4
Friction Dust	5
Barium Sulphate	10
Phenolic Resin	6

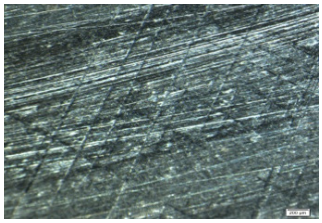
Krauss Comparison

Typical disc brake pads based on the above formulation were subjected to Krauss testing at 150°C and 350°C, comparing the performance using phenolic resin with and without the new technology.

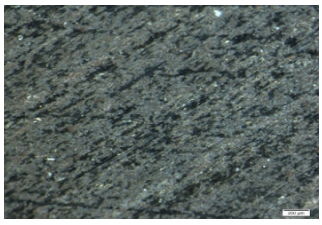
At 150°C the new technology showed a 40% improvement in wear-resistance. At 350°C the improvement in wear-resistance was 66%.

Surface Characterization

Microscope photos of the brake pad surfaces were compared based on phenolic resin with and without the new technology.



The bottom photo with the new technology shows a much smoother surface with less degradation of the binder and less de-bonding of abrasive particles.



What this means for you

If your objective is to achieve large improvements in wear resistance, the new specialized binder will improve performance.

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