MOLYKOTE® G-5025 Grease outperforms competing lubricant in new brake system

Case study: Rubber- and plastic-compatible grease met endurance-testing needs across wide temperature range as low as -40°C

With the global push toward the adoption of electric vehicles (EVs), automotive OEMs are looking for ways to adapt their technology for complete vehicle electrification, including the braking system. Electro-hydraulic braking (EHB) – a stepping stone to fully electromechanical brake-by-wire systems of the future – replaces vacuum booster brake technology. Expected to grow by 30% market share by 2025[1], EHB systems work in a vacuum-free environment, which is a benefit in EV applications.

[1]China Automotive Steering & Brake Systems Summit 2021.

The application

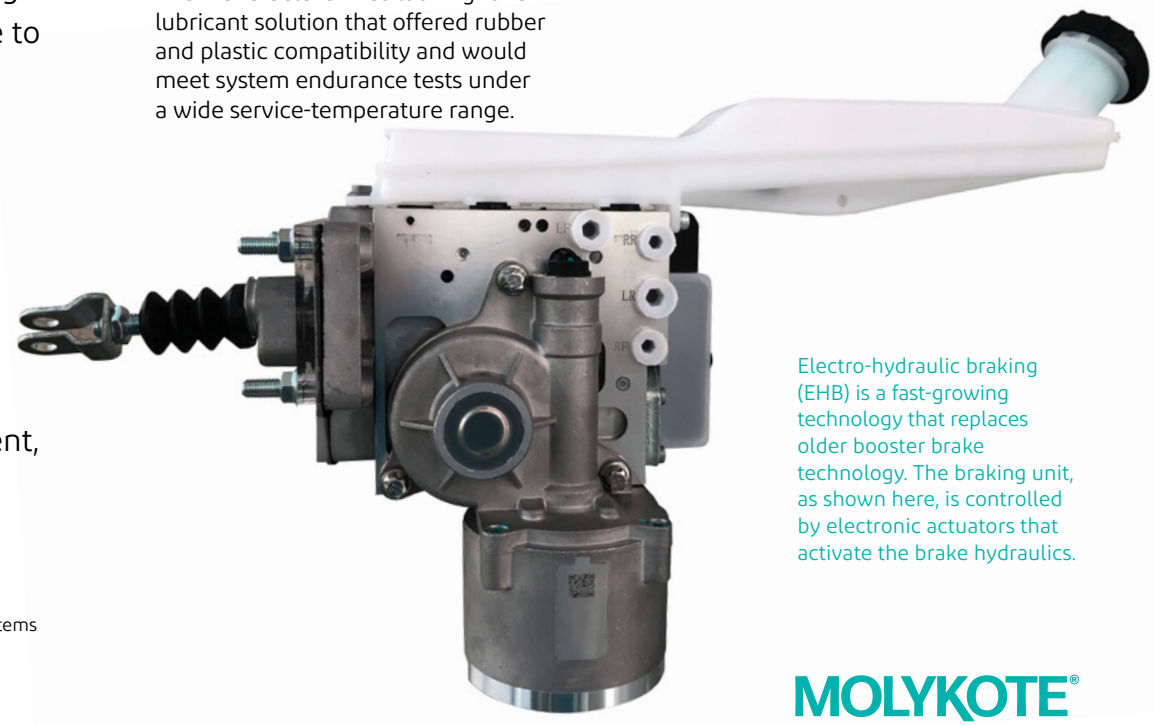
Bethel Automotive Safety Systems, Co., Ltd., a global brake system manufacturer headquartered in China, began developing its wire control brake system (WCBS) – a new one-box EHB system. The system, which is combined with a backup electronic parking brake as a failsafe, has the benefit of being smaller and lighter – with fewer parts than traditional booster brakes and two-box EHB systems – and can be used in both new EVs and traditional combustion-engine vehicles.

The manufacturer was looking for a lubricant solution that offered rubber and plastic compatibility and would meet system endurance tests under a wide service-temperature range.

The challenge

Initially, a competitor's polyalkylene glycol (PAG) lubricant had been selected for the application, but it wasn't able to meet the challenging requirements.

The competitor's lubricant worked well in temperatures as low as -30°C, but the brake system showed reduced output pressure when compared to the lubricant's room temperature performance. According to the manufacturer, energy loss in lithium-ion batteries is a significant concern, especially in the winter.



Electro-hydraulic braking (EHB) is a fast-growing technology that replaces older booster brake technology. The braking unit, as shown here, is controlled by electronic actuators that activate the brake hydraulics.

MOLYKOTE®

The solution

The MOLYKOTE® Specialty Lubricants team collaborated with Bethel's EHB system project manager to understand the project's technical requirements and recommend a solution. The lubricant would need to endure millions of load cycles under service temperatures that ranged from -40°C to +120°C. MOLYKOTE® lab testing showed that one particular lubricant – MOLYKOTE® G-5025 Grease – was compatible with various rubber/elastomer substrates (e.g., EPDM) and plastics, so the team believed it would deliver the reliable protection the application required.

Lab comparisons performed in the DuPont lab showed that MOLYKOTE® G-5025 Grease could deliver much lower torque than the competitor's product at the extreme low temperatures and encouraged the manufacturer to try it in a road test. When put to the test, the MOLYKOTE® grease reduced the pressure gap, which met the manufacturer's expectations.

The EHB system's output pressure was more stable across temperature changes with MOLYKOTE® G-5025 Grease than it had been with the competitor's product. The grease helped the brake unit operate safely and reduced energy consumption – especially in low temperatures – by reducing starting and running torque as demonstrated in the table below. After a clear demonstration of the operating effectiveness of the MOLYKOTE® Specialty Lubricant, MOLYKOTE® G-5025 Grease was specified successfully.

Low temperature (-40°C)	Competitor's grease	MOLYKOTE® G-5025 Grease
Starting torque	891.3 mN.m	110 mN.m
Running torque, 20 min	169.8 mN.m	23.2 mN.m

Reliable plastic-compatible lubrication and low-temperature performance

MOLYKOTE® G-5025 Grease was developed for the lubrication of over-running clutches in starter motors, but it has been shown to be a high-performance lubricant across wide temperature ranges – not just in starter motors, but in other automotive applications with demanding durability requirements. It shows good anti-wear properties and offers resistance to oxidation and moisture that can lead to extended component life.

In addition to the specific customer application featured in this case study, MOLYKOTE® G-5025 Grease also has now been specified for similar applications by other key market players.

Typical properties of MOLYKOTE® G-5025 Grease

Specification writers: These values are not intended for use in preparing specifications. Please contact your local MOLYKOTE® sales representative prior to writing specifications on this product.

Standard[2]	Test	Result
	Color	Yellow
DIN 51818	NLGI class	1-2
DIN ISO 2137	Worked penetration	295-325 mm/10
IP 396-02	Dropping point	248°C
CTM 0033A	Bleed (150°C, 24 hr)	2.68%
CTM 0033A	Evaporation (150°C, 24 hr)	3.62%
DIN 51805	Flow pressure @ -40°C	< 500 mbar
DIN 51802	Emcor (7 d, distilled water)	0
	Four-ball-tester:	
DIN 51 350 pt.5	Wear scar (1,000 N, 60 sec)	1.0 mm
DIN 51 350 pt.4	Weld load	4,400 N
	Service temperature range	-40°C to +180°C

[2]DIN: Deutsche Industrie Norm. ISO: International Standardization Organization. IP: Institute of Petroleum. CTM: Corporate Test Method; copies of CTMs are available on request.

About MOLYKOTE® Specialty Lubricants

For more than 70 years, customers around the world have trusted the MOLYKOTE® brand for performance and expertise to solve or prevent virtually any lubrication problem and to save energy. Available through a global network of more than 3,000 channel partners, MOLYKOTE® brand lubricants – which include well over 500 anti-friction coatings, compounds, dispersions, greases, oils and fluids, and pastes – serve the automotive market and industrial/maintenance, repair and overhaul (MRO) markets. To learn more about our extensive product and service offering or to locate a distributor, visit **molykote.com**.

Contact us

MOLYKOTE® has Contact Centers around the globe. Find the phone number for the center nearest you at **www.dupont.com/molykotecontact**.

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