



# 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<sup>(1)</sup>, EHB systems work in a vacuum-free environment, which is a benefit in EV applications.

## The application

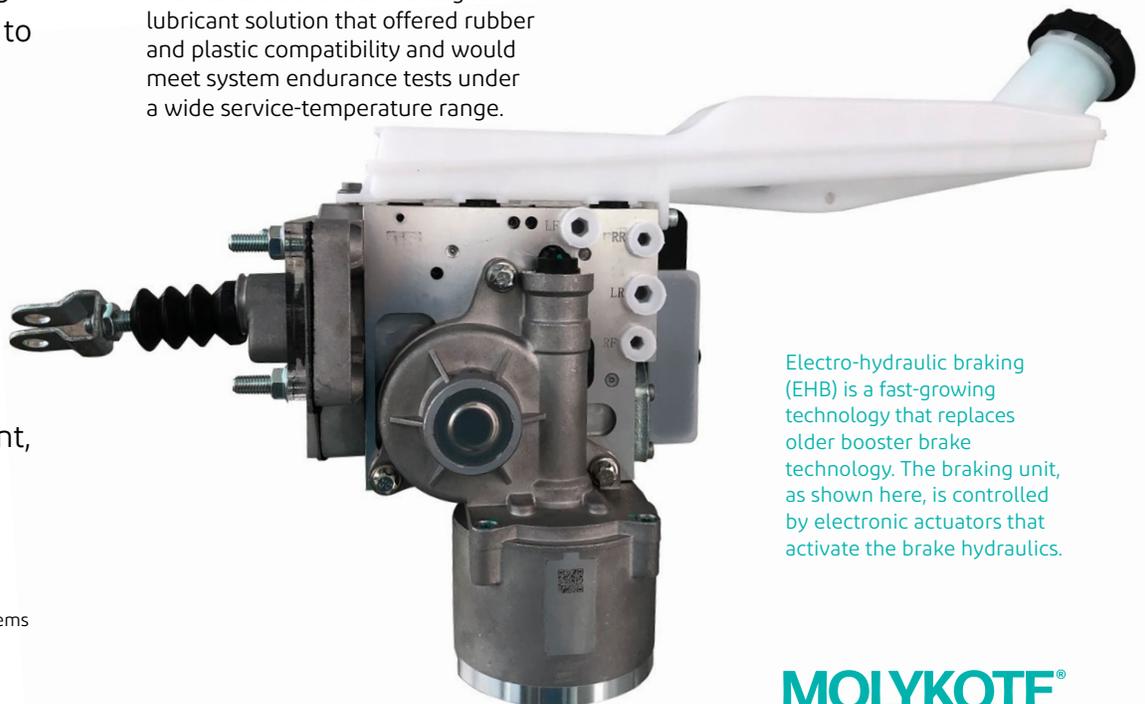
Bethel Automotive Safety Systems, Co., Ltd., a global brake system manufacturer headquartered in China, began developing its wire control brake system (WCBS) – a new one-box EHB system. The system, which is combined with a backup electronic parking brake as a failsafe, has the benefit of being smaller 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.

<sup>(1)</sup>China Automotive Steering & Brake Systems Summit 2021.

**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 <sup>(2)</sup>	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

<sup>(2)</sup>DIN: Deutsche Industrie Norm. ISO: International Standardization Organization. IP: Institute of Petroleum. CTM: Corporate Test Method; copies of CTMs are available on request.

## Learn more: Contact us

To learn more about the advantages of MOLYKOTE® G-5025 Grease for automotive applications or other tough lubrication challenges, contact your MOLYKOTE® technical representative or visit [molykote.com](http://molykote.com).

### Asia Pacific

Bangkok, Thailand  
66 2 6594000

Melbourne, Australia  
+61 3 9935 5666

Mumbai, India  
+18004190899

Seoul, South Korea  
82 2 2222 5200

Shanghai, China  
400 885 1888  
400 661 2629

Tokyo, Japan  
+81362058900

### Europe, Middle

#### East, Africa (EMEA)

Mechelen, Belgium  
+800 3876 6838

### Latin America

Barueri, Brazil  
+55 (11) 0800 171715

Buenos Aires, Argentina  
+0800 333 8766

Mexico City, Mexico  
+01800 849 7514

### North America

Midland, Michigan, USA  
& Wilmington, Delaware, USA  
+1 833 338 7668 (U.S.)  
+1 800 387 2122 (Canada)



DuPont™, the DuPont Oval Logo, and all trademarks and service marks denoted with ™, SM or ® are owned by affiliates of DuPont de Nemours, Inc. unless otherwise noted.  
© 2021 DuPont.

The information set forth herein is furnished free of charge and is based on technical data that DuPont believes to be reliable and falls within the normal range of properties. It is intended for use by persons having technical skill, at their own discretion and risk. This data should not be used to establish specification limits nor used alone as the basis of design. Handling precaution information is given with the understanding that those using it will satisfy themselves that their particular conditions of use present no health or safety hazards. Since conditions of product use and disposal are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. As with any product, evaluation under end use conditions prior to specification is essential. Nothing herein is to be taken as a license to operate or a recommendation to infringe on patents.