Sunroof guide lubrication with MOLYKOTE® specialty PAO grease

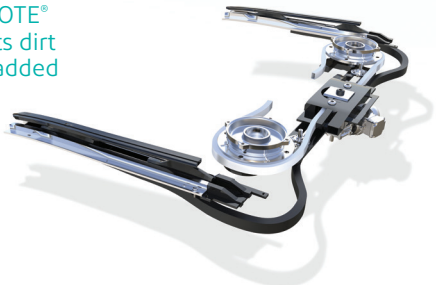
Case study: Application-matched technology for global Tier 1 supplier enables development of MOLYKOTE® G-1033 Grease

To ensure smooth, reliable and quiet operation of sliding sunroofs and panoramic roofs in all climates worldwide, an international Tier 1 automotive supplier relies on an application-matched MOLYKOTE® specialty polyalphaolefin (PAO) lubricant. For many years, the performance of MOLYKOTE® brand *Smart Lubrication*™ solutions has been proven in meeting requirements of numerous global and regional vehicle OEM customers, helping to maximize the comfort, convenience and safety of sliding-roof operation.

Today, the same proven PAO lubricant technology featured in this case study is commercially available as MOLYKOTE® G-1033 Grease.

Typical lubrication points for sliding-roof designs, including sunroofs and panoramic roofs.

Translucent MOLYKOTE® G-1033 Grease resists dirt buildup to provide added cleanliness and extended service life on sliding-roof guides.



Customer
A market-leading Tier 1 automotive supplier with extensive global design, engineering and manufacturing capabilities produces innovative sliding sunroofs and panoramic roofs for many OEM brands, meeting requirements to maximize value-added comfort, convenience and safety.

Challenge
To meet performance specifications of many global and regional vehicle OEM customers, this Tier 1 supplier needed an effective, application-matched lubricant that outperformed available options at low temperatures and ensured safer and more reliable opening and closing of its sliding-roof designs.

Solution
The sunroof manufacturer collaborated with MOLYKOTE® – and the brand's trusted expertise, problem-solving capabilities and broad technical support – to develop an advanced specialty PAO lubricant for use on sliding-roof guides to ensure smooth, reliable and quiet operation across a wide temperature range.

MOLYKOTE®

The opportunity

In developing early designs of tilt-up and sliding sunroofs for its home market and possible export, this automotive component manufacturer demonstrated a strong commitment to ensuring the highest-quality technology. White lithium greases were well-known, trusted and relatively economical lubricants for applications with sliding surfaces under heavy loads. However, none of the available options exactly met all of the performance specifications set by the sunroof design and engineering teams.

Trust in the MOLYKOTE® brand – and our specialty lubrication expertise, problem-solving capabilities for specific applications, broad technical support and ability to meet global supply requirements – led this global Tier 1 supplier to seek our help.

The challenge

An application-matched lubrication technology that could deliver consistently low friction was needed to ensure proper opening and closing forces across a range of sliding-roof designs. Low-temperature performance was a critical design parameter. And other key requirements added to the development challenge: The *Smart Lubrication*™ solution also needed to address priorities such as a clean appearance, reduced noise, safety for vehicle occupants, compatibility with plastic materials, durability for extended service, and design flexibility for larger and more complex sliding roofs in the future.

Close collaboration between the sunroof design engineers and MOLYKOTE® application engineering and technical support (AETS) specialists – in our development and testing labs as well as in sunroof production plants for different markets – was essential.

The solution

The specific MOLYKOTE® PAO grease first developed for basic sunroof designs has grown in step with the manufacturer. Starting in the manufacturer's home market and then expanding into other geographies, this proven technology has been leveraged to create MOLYKOTE® G-1033 Grease, a product that – like the technology developed for the manufacturer – is maximizing functionality and comfort in all types of sunroofs, including popular panoramic roofs.

For more than two decades, as sliding roofs became an integral part of today's vehicles in many regions, the MOLYKOTE® synthetic PAO lubricant technology has delivered key advantages and benefits:

- Superior performance with excellent lubrication and noise-damping capabilities
- Enhanced comfort with reduced noise, judder and vibration during sliding-roof opening and closing
- Consistent smoothness and reliability at temperatures from -45°C to 120°C (-49°F to 248°F)
- Increased safety by promoting a faster response to potential obstructions
- Good lightweighting potential with less friction and wear on different metals and resins
- Added cleanliness with low bleed, less oil separation and resistance to dirt buildup
- Extended service life with resistance to water washout, evaporation and corrosion

These same key advantages are available via MOLYKOTE® G-1033 Grease, which is being adopted in sunroofs and other sliding applications.

Comparative performance testing

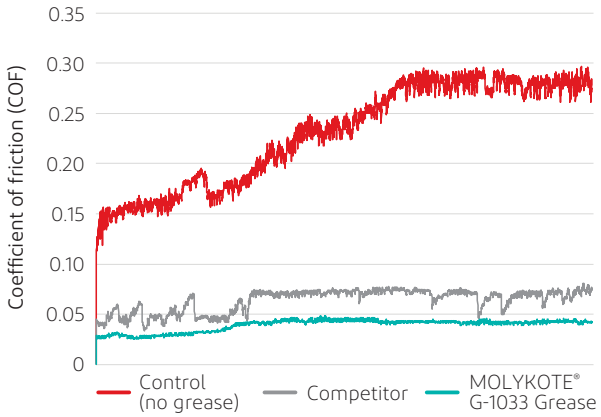


Figure 1. Coefficient of friction (COF) between TPEE and PP **at ambient temperature**, comparing MOLYKOTE® G-1033 Grease, a competitive material and a control with no lubricant

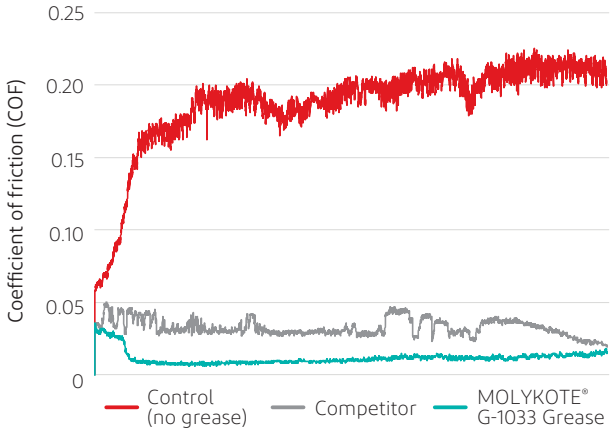


Figure 2. Coefficient of friction (COF) between TPEE and PP **at 85°C**, comparing MOLYKOTE® G-1033 Grease, a competitive material and a control with no lubricant

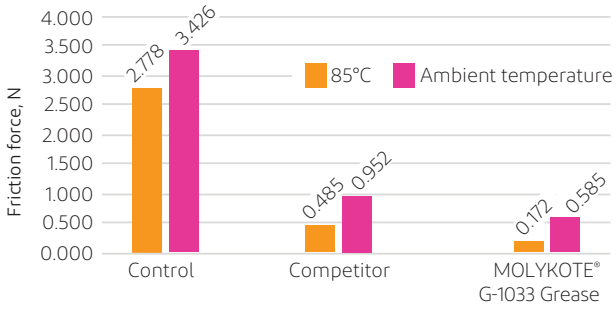


Figure 3. Average friction force between TPEE and PP, comparing MOLYKOTE® G-1033 Grease and a competitive material against a control with no lubricant

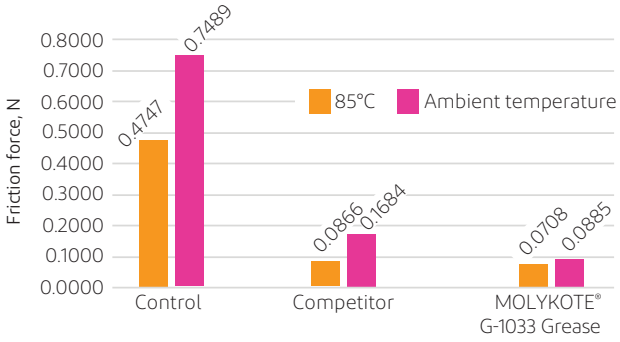


Figure 4. Standard deviation of friction force between TPEE and PP, comparing MOLYKOTE® G-1033 Grease and a competitive material against a control with no lubricant

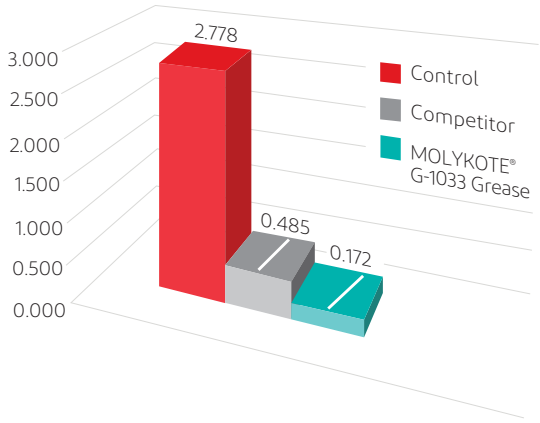


Figure 5. Mean friction force **at 85°C**, comparing MOLYKOTE® G-1033 Grease, a competitive material and a control with no lubricant

Specialty PAO grease for sunroof and panoramic roof applications

With its proven, effective formulation of PAO oil thickened with lithium soap, MOLYKOTE® G-1033 Grease offers consistently low friction for high-performance lubrication of sunroofs and panoramic roofs. The grease delivers key advantages and benefits for meeting vehicle OEM performance specifications for all types of sliding-roof designs.

Typical properties

Specification Writers: These values are not intended for use in preparing specifications. Please contact your local MOLYKOTE® Sales Application Engineer or MOLYKOTE® Customer Service before writing specifications on this product.

Test method[1]	Property	MOLYKOTE® G-1033 Grease
	Appearance	White
JIS K 2220	Penetration (worked 60 strokes)	280
	Service temperature range	-45 to 120°C
	Dropping point	210°C
JIS K 2220	Bleed (24 hours at 100°C)	2.4%
JIS K 2220	Evaporation (22 hours at 99°C)	0.2%
	Copper corrosion (24 hours at 100°C)	1b
	Water washout (1 hour at 38°C)	3.1%
ASTM D2266	Four-ball wear scar (1,200 rpm, 392 N, 1 hour)	0.58 mm
JIS K 2220	Low-temperature torque (-40°C) – Starting torque – Running torque	 90 mN•m 30 mN•m

[1]ASTM: American Society for Testing and Materials; JIS: Japanese Industrial Standard.

Learn more: Contact us

To learn more about using MOLYKOTE® G-1033 Grease for guide lubrication on sunroofs and panoramic roofs – or about driving vehicle design innovation with other high-performance specialty lubricants – contact your MOLYKOTE® technical representative or visit **molykote.com**.

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