



Energy Technologies



Solutions for formulating advanced industrial gear oils

Cargill's comprehensive portfolio of solutions helps formulators create gear oils with long-lasting performance, reduced wear, and enhanced operational efficiency.

Advanced solutions for next-generation gearboxes

In today's industrial landscape, gear-driven equipment must perform reliably across a wide range of harsh environments. For operators, this means choosing a lubricant that not only protects gears but also ensures efficient power transfer—critical for minimizing downtime and maximizing productivity. However, selecting the right lubricant has become increasingly complex.

Modern gearboxes are evolving: they are more compact, built with lighter materials, and expected to deliver greater durability. To meet these rising demands, gear oils must be formulated with advanced, high-performance components that go beyond basic protection.

Cargill's portfolio of gear oil formulation solutions includes Priolube™ synthetic esters, Emkarox™ polyalkylene glycols (PAGs), and Vikolox™ acid scavengers - engineered to help equipment operate at peak performance while delivering added benefits such as enhanced protection, efficiency, and compliance.



Cargill™ gear oil solutions perform across industrial applications

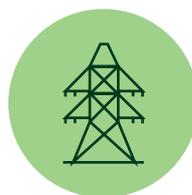
From manufacturing lines to marine vessels and mining operations, Cargill's portfolio helps formulators meet demanding performance, efficiency, and compliance requirements.



**Food, beverage
& pharmaceutical
manufacturing**



Marine equipment



Power generation



Mining

Benefits of Cargill™ solutions for gear oils



Reliable protection & extended equipment life:

Advanced wear and micro-pitting resistance help reduce gear damage, ensuring smoother operation and longer component lifespan.



Long-lasting performance & efficiency:

High thermal and oxidative stability extend lubricant service life, while the high viscosity index of esters minimizes viscosity change over wide temperature ranges.



Enhanced operational comfort:

Low-friction formulations can potentially reduce noise generation and support quieter, more comfortable equipment performance.



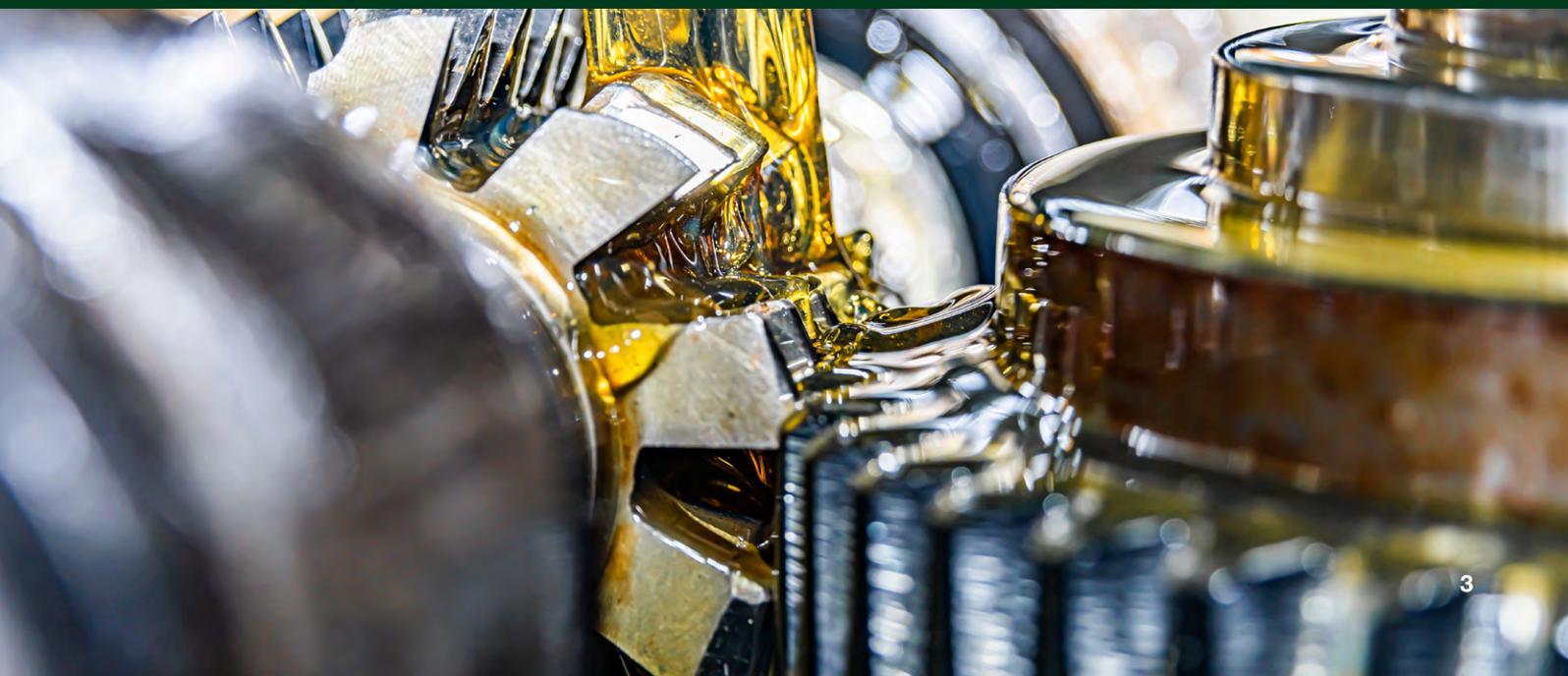
Improved material compatibility:

Combining esters with Polyalphaolefin (PAO) improves seal compatibility, enhances additive performance, and boosts gear protection—especially under demanding conditions.



Biodegradable & food-contact safe solutions:

We offer biodegradable, biobased, NSF HX-1-compliant and/or on the LuSC list (suitable to formulate EU Ecolabel lubricants) solutions that fulfill environmental standards and are safe for incidental food contact.



Cargill's product range

Function	Product Name	Chemistry	Key Specifications						Regulatory Compliance and Sustainability			
			Kinematic viscosity at 40°C (mm ² /s)	Kinematic viscosity at 100°C (mm ² /s)	Viscosity index	Pour point (°C)	Acid value (mgKOH/g)	10% Oxidative induction time at 140° C (min) (ASTM D8206)	NSF HX-1 (for use in incidental food contact)	LuSC list (EU Ecolabel)	Biodegradable OECD 301B (>60%)	Biobased carbon content (%) (ASTM D6866)
Base fluid: Ester	Priolube™ 1847	Complex ester	1040	90	167	-24	0.1	110	•	•	81	
	Priolube™ 1851	Complex ester	495	49	153	-36	0.1	101	•	•	95	
	Priolube™ 1856	Diester	12.5	3.3	140	-78	0.05	244	•	•		
	Priolube™ 1929	Complex ester	1700	125	175	-21	0.1	297				
	Priolube™ 1973	Polyol ester (saturated)	46	8	148	-44	0.05	181	•	•	87	
	Priolube™ 2020	Polyol ester (saturated)	20	4.5	143	-63	0.1					
	Priolube™ 2046	Complex ester	400	40	163	-36	0.1	251			85	
	Priolube™ 2087	Complex ester	320	35	150	-40	0.5	53	•	•	88	
	Priolube™ 2088	Complex ester	320	35	150	-40	0.15	78	•	•	94	
	Priolube™ 2500	Polyol ester (saturated)	90	13	143	-24	0.5		•	•	80	
	Priolube™ 2720	Polyol ester (saturated)	20.4	4.6	143	-51	0.05	305				
	Priolube™ 3970	Polyol ester (saturated)	20	4.4	140	-51	0.05	266	•	•	81	
	Priolube™ 3971	Polyol ester (saturated)	30	5.9	144	-3	0.05	345	•	•	85	
	Priolube™ 3982	Complex ester	5000	300	192	-30	0.04				88	
	Priolube™ 3985	Diester (unsaturated)	84	13	144	-50	0.07	45			70	
	Priolube™ 3986	Complex ester	47000	2000	278	6	0.1	87	•	•	85	
	Priolube™ 3987	Polyol ester (saturated)	145	18.2	140	-33	0.1	90	•	•	95	
Priolube™ 3997	Complex ester	40000	2000	290	6	0.04				82		
Priolube™ 3999	Polyol ester (unsaturated)	90	14	144	-27	0.05	38	•	•	87		
Base fluid: Polyalkylene glycol	Emkarox™ VG 1055W	Polyalkylene glycol, water soluble	1052	171	284	-24			•			
	Emkarox™ VG 146	Polyalkylene glycol, water insoluble	145	25	207	-45						
	Emkarox™ VG 380	Polyalkylene glycol, water insoluble	380	61	234	-33		22				
Additive: Acid scavenger	Vikolox™ 16	Epoxidized olefin	5.3	1.81		6		84.23				
	Vikolox™ 68	2-Ethylhexyl cyclohexene carboxylate epoxide	7.4	1.92		12		595.83				

Long-lasting performance & efficiency

Cargill's gear oil formulation technologies are engineered to deliver measurable improvements in lubricity and operational efficiency. MTM barrel-on-disc testing of ISO VG 150 gear oils formulated with Priolube™ 3997 ester and Group I bright stock (BS150) demonstrates that ester base fluids significantly enhance lubricity—even under extremely high loads. This data reinforces the value of esters in reducing friction and supporting smoother, more energy-efficient gear operation.

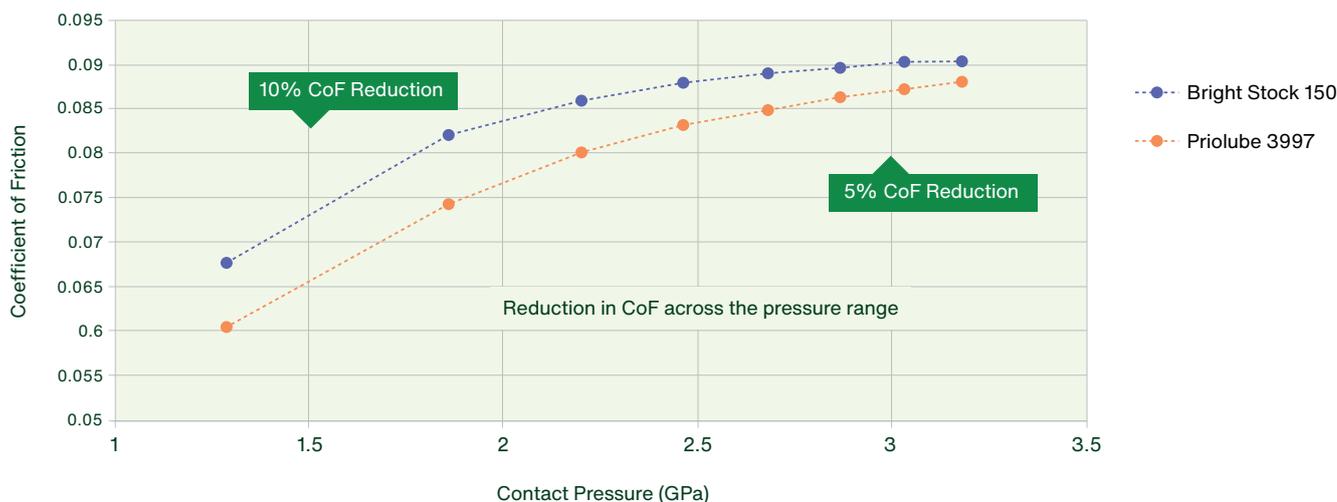


Figure 1. ISO VG 150 industrial gear oils tested on the MTM in a barrel on disc configuration at 100°C and 0.05 ms⁻¹ entrainment speed

Reliable protection & extended equipment life

Durability is critical in gear-driven systems, and Cargill's esters are proven to reduce gear surface damage. In micropitting tests using the PCS Micropitting Rig (MPR), an ISO VG 68 gear oil formulated with Priolube™ 1973 ester and Priolube™ 3987 ester showed a reduction of around 50% (from 40% to 20%) in micropitting surface area compared to a conventional PAO-based formulation. This result highlights the superior protective qualities of Cargill's esters—helping extend gear life and reduce maintenance needs.

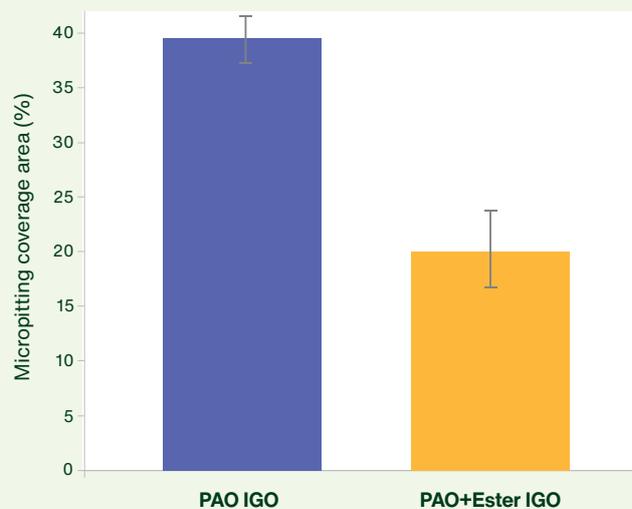


Figure 2: MPR central roller micropitting surface coverage after 100 x 10⁶ cycles at 1.8 GPa contact pressure



Let's solve what's next – *together*

Whether you're optimizing performance, improving processing, or tackling formulation challenges, our technical experts are here to help. Connect with us to explore tailored solutions that meet your specific needs.



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or email energy_technologies@cargill.com



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