

# Chain oils



Synthetic base fluids for  
high performance  
chain oil lubricants

**Cargill**<sup>®</sup>



## Premium performance chain oil lubricants

Chains are used for the transfer of power across a wide range of applications. The chain system requires lubrication to allow the free movement of chain components and to prevent excessive wear. Inadequate lubrication and the resulting wear can lead to a number of potentially detrimental effects including:

- Decreased lifespan of chain and sprockets
- Chain lengthening and erratic travel
- Increased power consumption to drive the chain
- Adhesion

We are a major supplier of synthetic lubricant base fluids for use in many chain oil applications including power transmission, control chains, lifting, conveyor or transportation systems and high temperature processing.

We recommend the use of our high performance range of esters and polyalkylene glycol (PAG) products, branded under the **Priolube™** and **Emkarox™** trade names.

### Technical performance benefits:

- Enhanced lubricity
- High stability
- Clean decomposition
- Water solubility



## High temperature chain oil esters

As a leading supplier of synthetic lubricant base fluids, we recommend Priolube 1889 for use in many high temperature chain oil applications including conveyor systems, food processing, plastic film stretching, fibre board manufacturing and ceramics.

Compared to conventional mineral oils, trimellitates and polyalphaolefins (PAOs) base stocks, Priolube high temperature chain oil esters can provide special performance characteristics including:

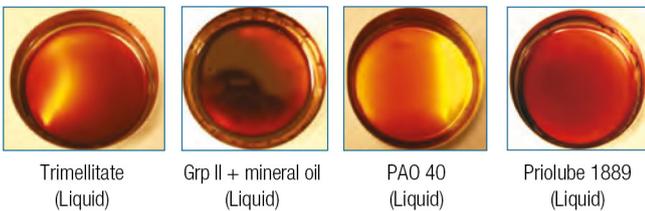
- High oxidative stability
- Low volatility below 250°C
- Low deposit formation upon decomposition
- Excellent lubricity

Correct lubrication of the chains is essential to prevent excessive wear, which can lead to chain lengthening and erratic travel, increased power consumption and a reduction in lubricant adhesion to the chains. Use of Priolube high temperature chain oil esters can provide the end user with a number of benefits, including:

- Financial savings due to reduced lubricant consumption
- Cost savings through reduced power consumption
- Improved productivity through reduced down-time for repairs
- Lower maintenance costs

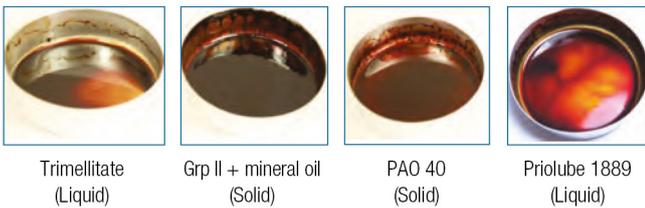
## Clean decomposition of chain oils

Images for chain oils after 3 hours at 260°C:

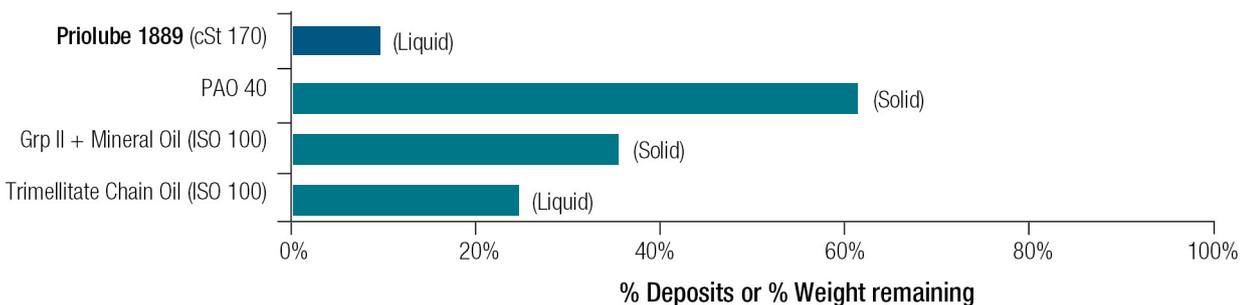


The pictures to the left show that PAO 40, mineral oil and trimellitate esters all turn very dark in colour and form solid and/or thick deposits. Solid deposits will inhibit lubrication and can lead to breakdown of the system. These solid deposits can be very difficult to remove. Priolube 1889 on the other hand, remains liquid with no deposit formations and would therefore maintain lubrication.

Images for chain oils after 8 hours at 260°C:



The following graph shows the amount of liquid or solid material remaining after 8 hours at 260°C. The data shows that over 60% of PAO 40 forms undesirable solids which will inhibit lubrication of the chain system. Mineral oil and trimellitate esters also leave behind a significant amount of solid and/or thick deposits which can lead to breakdown of the system. Priolube 1889 remains liquid and leaves minimal deposits on the system being lubricated.



## Incidental food contact lubricants

Lubricating equipment used in the food processing industry presents a unique challenge. The lubricant must first provide the basic desired technical performance:

- Reduced friction
- Wear prevention
- Corrosion protection
- Efficient power transfer

Lubricants must also then comply with acceptable industry standards on the use of approved base fluids and additives. Prior to February 1998 all lubricant formulation approvals in the US were administered by the USDA. To gain approval a lubricant manufacturer had to prove that all the ingredients in the formulation were allowable substances in accordance with the Guidelines of Security Code of Federal Regulations (FDA 21 CFR 178.3570 – Incidental food contact lubricants).



Nonfood Compounds  
Program Listed (HX-1)  
(Registration #148589, 148588, 148590)

Today, it is **NSF International** (NSF) that manages a lubricant registration program. New ingredients can be registered by NSF (base oils and additives) and NSF also manages a program for registering formulated lubricants. The program run by NSF does not specify or set limitations on the quantity of HX-1 ingredients that may be used in H1 incidental food contact lubricants.

The program is now generally accepted worldwide for the registration of incidental food contact lubricants.

## Incidental food contact esters

We recommend the use of our high performance range of Priolube™ esters for food grade chain oils where HX-1 registration is desired. Our food grade chain oil esters can provide special performance characteristics including:

- Safe for use in food operations
- High oxidative stability
- Low volatility below 230°C
- Low deposit formation upon decomposition
- Excellent lubricity

Correct lubrication of chains is essential to prevent excessive wear, which can lead to chain lengthening and erratic travel, increased power consumption and a reduction in lubricant adhesion to the chains. Use of our food grade chain oil esters can provide the end user with a number of benefits, including:

- Financial savings due to reduced lubricant consumption
- Cost savings due to reduced power consumption
- Improved productivity through reduced down-time for repairs
- Lower maintenance costs
- High renewability

## Esters

Product name	Kinematic viscosity at 40°C (mm <sup>2</sup> /s)	Kinematic viscosity at 100°C (mm <sup>2</sup> /s)	Viscosity index	Pour point (°C)	Flash point COC (°C)	Noack weight loss after 250°C/1hr (%)	Panel coker demerit rating at 275°C/22hrs in air	Biodegradability OECD 301B (>60%)	NSF HX-1	High temperature >250°C
Priolube 1847	1,040	85	163	-24	300	<1	-	●	-	-
Priolube 1851	495	49	153	-36	300	<1	-	●	-	-
Priolube 1856	12.5	3.3	140	-78	230	-	-	● <sup>2</sup>	● <sup>1</sup>	-
Priolube 1875	95	14	144	-40	280	1	-	-	-	-
Priolube 1889	170	17	107	-29	302	<1	-	-	-	●
Priolube 1929	1,700	125	175	-21	310	<1	-	-	-	-
Priolube 1936	26	5.3	139	-54	244	6	-	●	-	-
Priolube 1938	43	13.1	83	-30	280	1	-	-	-	●
Priolube 1939	335	20.2	62	-9	276	1	-	-	-	●
Priolube 1940	91	9.6	78	-36	261	2	-	-	-	●
Priolube 1941	52	8	124	-45	282	1	3.6	-	-	●
Priolube 1942	71	9.6	116	-48	273	1	5	-	-	●
Priolube 2046	400	40	163	-36	310	1	-	-	-	-
Priolube 2088	320	35	150	-40	260	<1	-	●	●	-
Priolube 2500	90	13	143	-24	280	<1	-	●	-	-
Priolube 3970	20	4.4	140	-51	250	3	0.66	●	●	-
Priolube 3971	30	5.9	144	-3	285	1	-	●	-	-
Priolube 3973	12.2	3.3	147	-60	219	-	-	●	-	-
Priolube 3986	47,000	2,000	278	6	325	<1	-	-	-	-
Priolube 3987	145	18	140	-33	320	1	-	●	-	-
Priolube LL-564	7	2.5	228	-46	189	-	-	● <sup>2</sup>	-	-

The data in this table represents typical properties

<sup>1</sup>In compliance with 21CFR FDA regulation (178.3570: lubricants for indirect food contact)

<sup>2</sup>Expected to be >60% based on structurally similar substances

## Water soluble polyalkylene glycols (PAGs)

Product name	Kinematic viscosity at 40°C (mm <sup>2</sup> /s)	Kinematic viscosity at 100°C (mm <sup>2</sup> /s)	Viscosity index	Pour point (°C)	Flash point COC (°C)	FDA approved <sup>1</sup>	NSF HX-1
Emkarox VG 132W	131	25	225	-42	230	●	-
Emkarox VG 130W	152	25	197	-32	232	-	-
Emkarox VG 330W	328	56	239	-30	228	-	-
Emkarox VG 681W	680	116	274	-30	230	●	-
Emkarox VG 1055W	1,052	171	284	-24	240	●	●
Emkarox HV 20 <sup>2</sup>	19,500	2,400	-	4	240	●	●
Emkarox HV 45 <sup>2</sup>	45,000	6,500	-	7	240	●	-

<sup>1</sup>In compliance with 21CFR FDA regulation (178.3570: lubricants for indirect food contact)

<sup>2</sup>Available in both neat and aqueous diluted form

## Water insoluble polyalkylene glycols (PAGs)

Product name	Kinematic viscosity at 40°C (mm <sup>2</sup> /s)	Kinematic viscosity at 100°C (mm <sup>2</sup> /s)	Viscosity index	Pour point (°C)	Flash point COC (°C)	FDA approved <sup>1</sup>
Emkarox VG 126	125	23	204	36	225	●
Emkarox VG 180	180	30	211	-36	225	●
Emkarox VG 222	221	38	215	-36	225	●
Emkarox VG 380	380	61	234	-33	230	●
Emkarox VG 444	447	72	242	-36	228	●
Emkarox HV 462	460	75	244	-27	230	●

<sup>1</sup>In compliance with 21CFR FDA regulation (178.3570: lubricants for indirect food contact)

<sup>2</sup>Available in both neat and aqueous diluted form

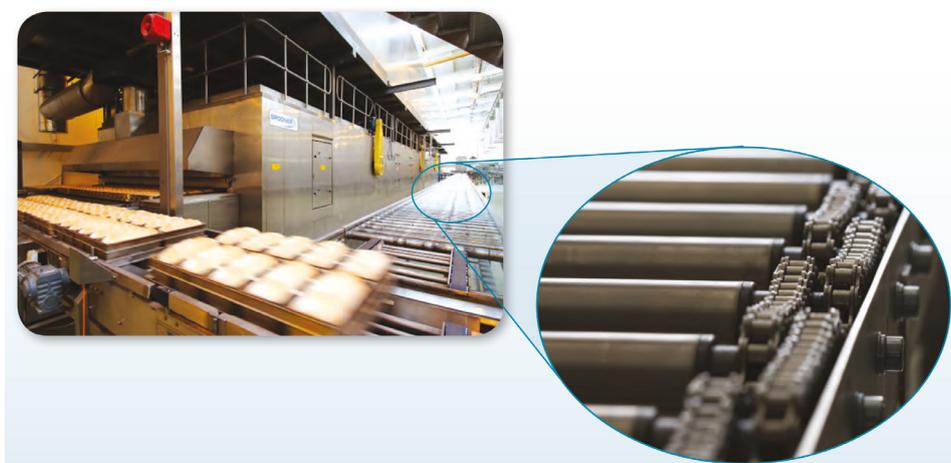


Figure 1. Industrial bakery with magnified conveyor belt showing the chains where chain oils would be applied.



## Who are we?

The Energy Technologies business in Cargill Bioindustrial creates, makes and sells specialty chemicals and additives for the global energy market. Working in close collaboration with our customers, we apply sustainable concepts and deep scientific expertise so that together we can efficiently power the world of tomorrow.

At our core, we are experts in synthetic ester and polyalkylene glycol chemistries, taking products from lab scale through to full manufacturing. Investing in the development of new chemistries allows us to support our customers in meeting new industry challenges.

For those who dare to imagine a brighter future, we establish long lasting relationships and create bespoke industry solutions through our integrated research & development and global manufacturing capabilities. Being both global and local, you have direct access to our network of technical experts. We look forward to talking to you.

## Further information

Cargill Bioindustrial sales and distribution are coordinated through an extensive worldwide network of technical and commercial experts. For further information or guidance please contact us:

**[energy\\_technologies@cargill.com](mailto:energy_technologies@cargill.com)**

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