CALTEX GREASE TOOLKIT

Finding the right premium grease

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Selecting the right grease for the job plays a major role in helping provide your vehicles and equipment maximum protection and performance. The Caltex Grease Toolkit is a great resource when it comes to learning more about the importance of grease, the essential considerations, and the product options available.

The grease toolkit provides a variety of educational materials and product alternatives focused around selecting the best grease for your industry segment, parts application, and operating condition.

Once you've selected the appropriate grease for your application, we'll even advise you how to get started and share information about proper greasing procedures. A smooth operation is vital to ensuring your equipment operates reliably and efficiently; maximising uptime, minimising downtime and optimising operating costs

FINDING THE RIGHT PREMIUM GREASE

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CALTEX FAMILY OF GREASES

Caltex is an industry leader in heavy-duty lubricant products including Delo® Premium Grease. Delo® has a history of delivering industry leading, durability, reliability and efficiency.

We understand it's vital to maintain your vehicles and equipment in the best possible condition while optimising efficiency. At Caltex we are on a journey, always putting more in to what we do to help you get more out of what you do. Working to help you go further, your engines, your equipment and your business.

Caltex greases are technically advanced, formulated to provide high performance and long-life protection on- and off-road. No matter what your vehicle or equipment encounters Caltex greases are an excellent safeguard against potential parts failure.

CALTEX GREASES AVAILABLE

Lithium	Lithium Complex	Polyurea	Calcium	Other
Ultra-Duty Grease EP	Delo® Starplex® EP	Black Pearl Grease EP	Texclad	Talcor Break Out Blue
Multifak EP	Delo® Grease ESI® EP	Caltex SRI Grease		Talcor OGP-6
Multifak Premium 3	Delo® Grease ESI HD Moly 5% EP			
Talcor Super HD				
Multifak Moly EP				

WHAT IS A GREASE?

There are three components that form lubricating grease:

- Base oil
- Thickener
- Additives

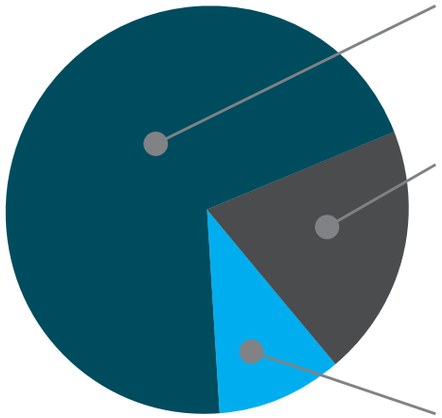
FUNCTION AND PURPOSE

The main function of grease is to remain in contact with and lubricate moving surfaces. Its main requirement is it retains its properties under applications and conditions just enough to prevent metal-to-metal contact.

The purpose of grease is to:

- Lubricate contact surfaces
- Reduce friction and wear
- Protect against rust and corrosion
- Act as a sealant to keep out contaminants
- Minimise re-lube intervals
- Minimise leaks
- Lubricate extreme applications where oil doesn't work

GENERAL COMPOSITION



Base Oil – 70-90%

Provides the main lubrication function to equipment components.

Thickener – 5-20%

Acts as a "sponge" for base oil and additives providing consistency to the grease.

Enhances performance properties of the lubricant.

Additives – 1-10%

Enhance base oil performance.

CONSIDERATIONS WHEN SELECTING A GREASE

Consistency • Viscosity • Heat Resistance

Consistency

NLGI is a grease classification assigned by the National Lubricating Grease Institute.

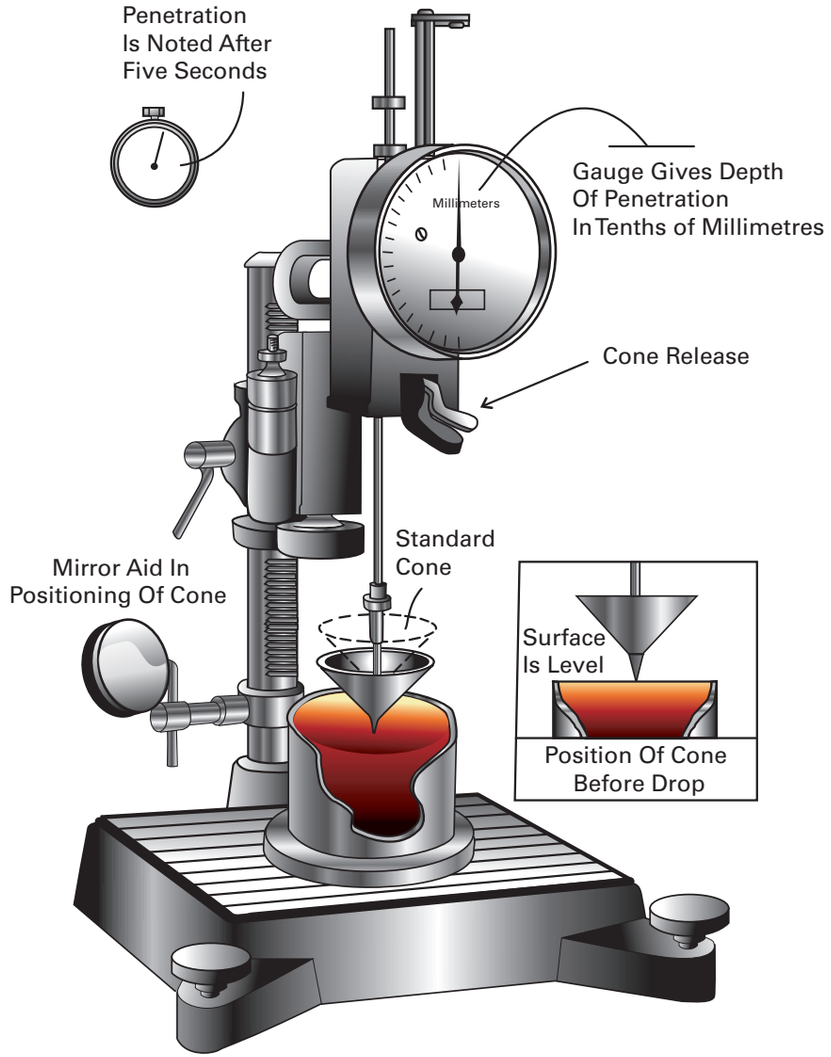
The measure of consistency is called penetration.

Lower NLGI Grade Number = Softer/Fluid Grease

Higher NLGI Grade Number = Harder/Stiffer Grease

	Number	Worked Penetration, P_{60}
Fluid (000 through 1)	000	445-475
	00	400-430
	0	355-385
	1	310-340
Common Use (2)	2	265-295
Solid (3-6)	3	220-250
	4	175-205
	5	130-160
	6	85-115

Worked Penetration for a grease is achieved when a grease is churned 60 round-trip strokes in a standard worker (a standard piece of grease equipment to work grease to simulate real world grease activity) at 77° F (25° C).



Penetrometer Instrument Illustration

Viscosity

Viscosity is the most important characteristic of grease. Like other lubricants, base oil primarily provides the lubricant film, but it's the thickener that holds it together. Film thickness is a result of viscosity. When increasing the speed of rotation, the viscosity will need to increase to provide a more protective film thickness and create a greater resistance to flow.

- ISO viscosity grade 100, motors, high-speed
- ISO viscosity grade 220, most applications
- ISO viscosity grade 320, higher loads, medium speeds
- ISO viscosity grade 460+, highest loads, slowest speeds

Heat Resistance

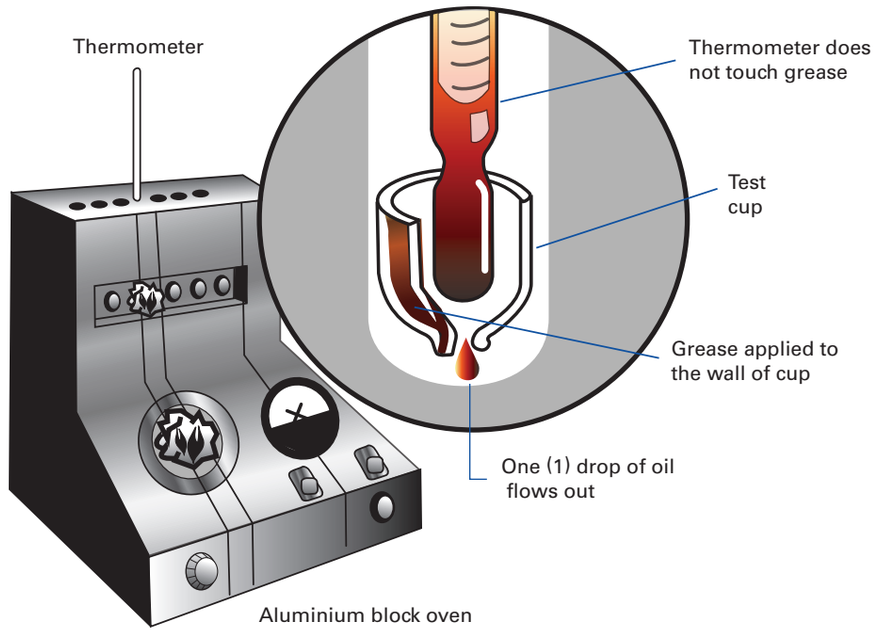
It's important to know how well a grease will hold up during performance. What is the point at which the grease transforms from a semi-solid to a liquid losing its protective qualities? The Dropping Point Measurement is the indicator of a grease's resistance to heat and the point where consistency is lost. The maximum operating temperature is below the Dropping Point.

The ASTM has developed the process as a measurement and benchmark for quality control.

The NLGI Service Categories will also help determine what greases are suitable for certain applications ensuring the grease requirement exceeds the operating temperature of equipment to maintain its integrity.

Dropping Point Measurement

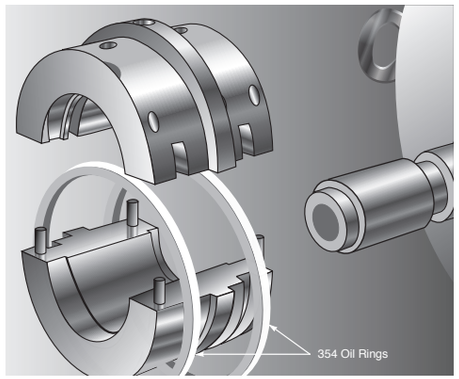
- Apply grease to wall of test cup.
- Select oven temperature as defined in ASTM D 2265.
- Measure the "dropping point" of the grease when one (1) drop of oil falls from the test cup.

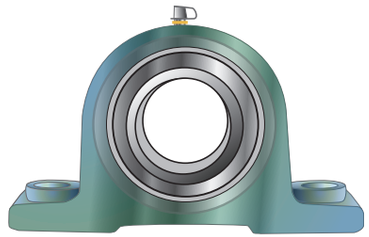


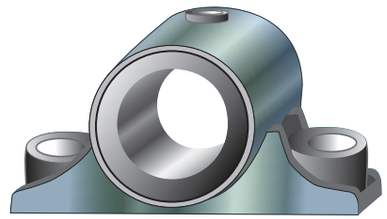
GREASED BEARING TYPES

Meeting NLGI standards for approved applications.

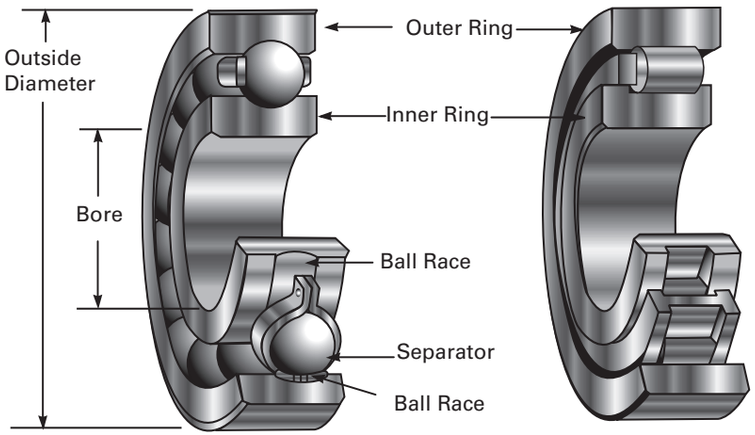
JOURNAL AND PLAIN BEARINGS





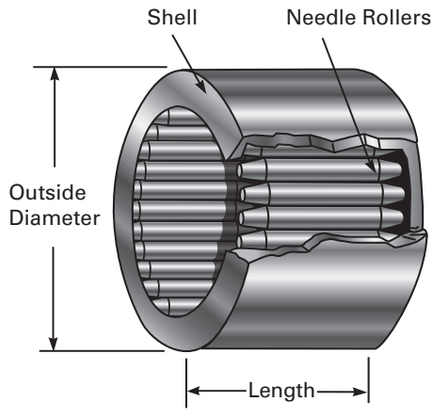


ROLLING ELEMENT BEARINGS



Ball Bearing

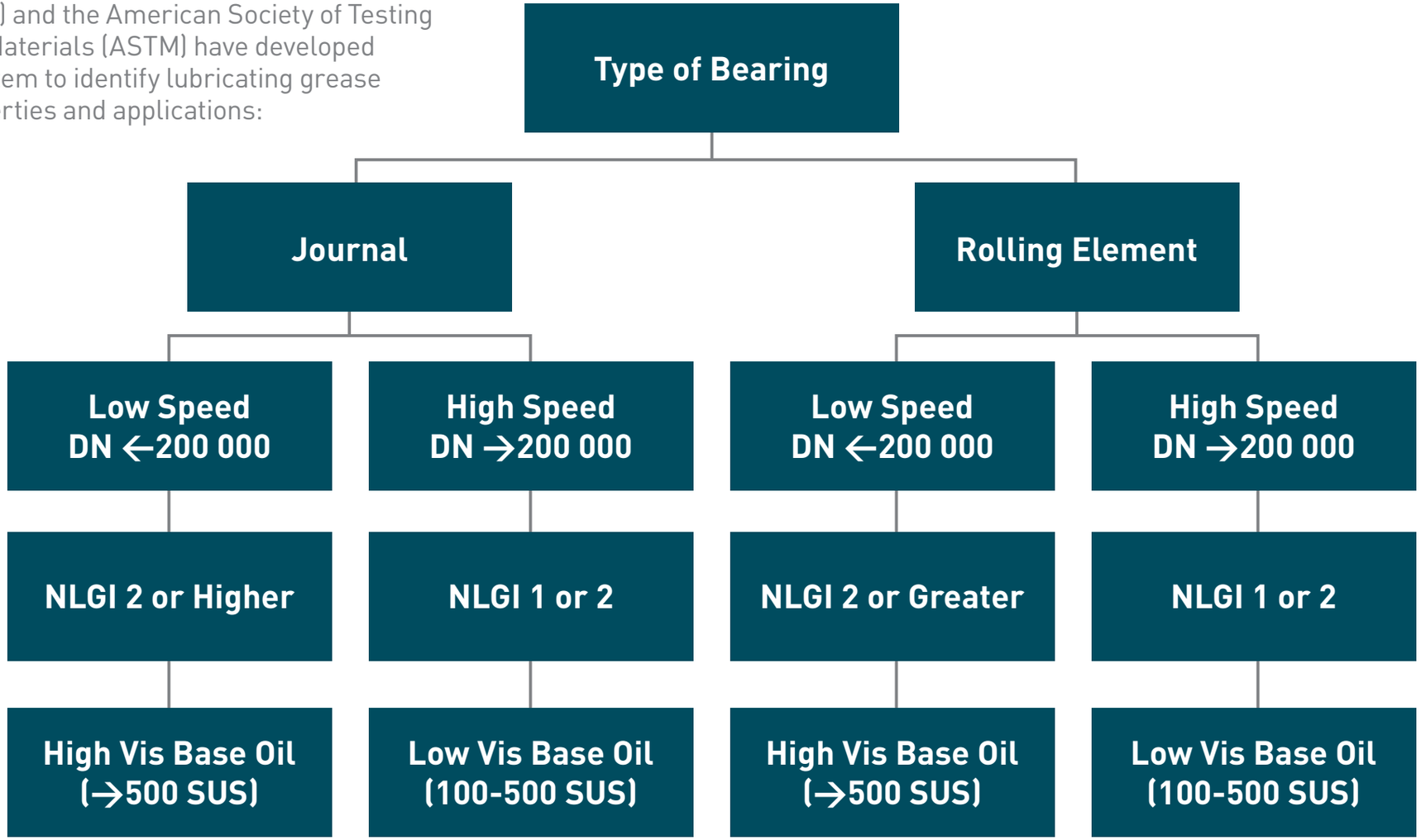
Roller Bearings



Needle Bearings

GENERAL GREASE BEARING RECOMMENDATIONS

The National Lubricating Grease Institute (NLGI) and the American Society of Testing and Materials (ASTM) have developed a system to identify lubricating grease properties and applications:



Note: US Bearing Mfgs - DN = N x RPM; where N is bore diameter (in mm).
European Bearing Mfgs - nD = ((D1+D2))/2 x RPM; where D1 and D2 are the outer and inner bore diameters respectively (in mm).

NLGI SERVICE CATEGORIES

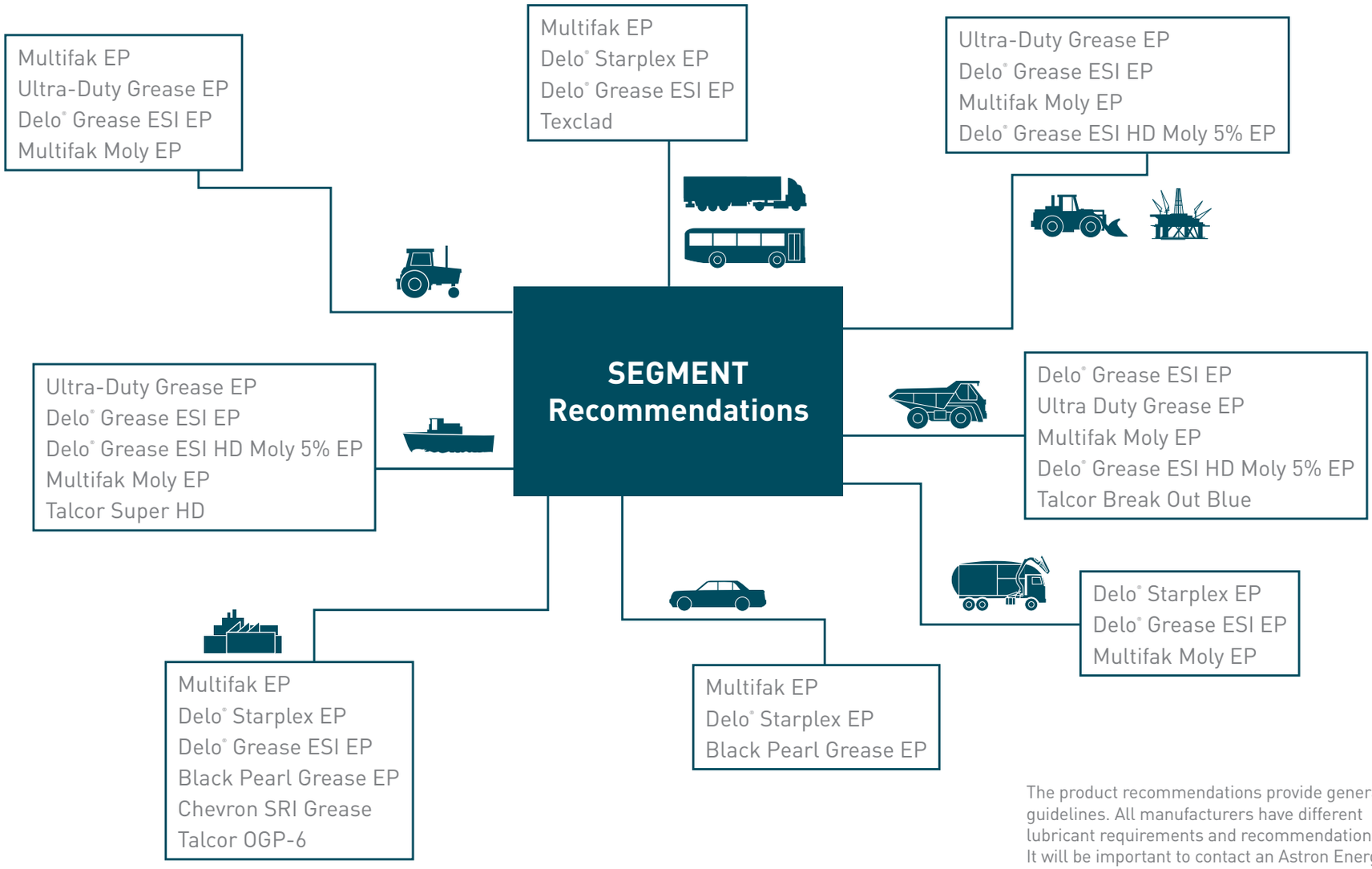
Category	Service	Performance
LA chassis	Frequent re-lubrication intervals (←3 200 km). Mild duty (non-critical applications.)	Oxidation resistant, shear stable, and corrosion and wear protective.
LB chassis	Prolonged re-lubrication intervals (→3 200 km). Mild to severe duty (high loads, vibration, exposure to water).	Oxidation resistant, shear stable and corrosion and wear protective even under heavy loads and in presence of aqueous contamination. Temperature range -40°C to 120°C.
GA wheel bearings	Frequent re-lubrication intervals. Mild duty (non-critical applications.)	Temperature range -20°C to 70°C.
GB wheel bearings	Mild to moderate duty (cars, trucks in urban and highway service).	Oxidation and evaporation resistant, shear stable, and corrosion and wear protective. Temperature range -40°C to 120°C with occasional excursions to 160°C.
GC wheel bearings	Mild to severe duty (vehicles in frequent stop-and-go service, trailer hauling, mountain driving, etc.).	Oxidation and evaporation resistant, shear stable, and corrosion and wear protective. Temperature range -40°C to 120°C with frequent excursions to 160°C and occasional excursions to 200°C.

CALTEX PREMIUM GREASE FOR EVERY SEGMENT, APPLICATION AND CONDITION

We understand what drives your business and we have you covered when it comes to durability, reliability and efficiency. Selecting the right premium grease for the appropriate application, segment and condition is what will help drive total vehicle/equipment efficiency and ensure your parts and equipment lasts longer, and your business goes further.

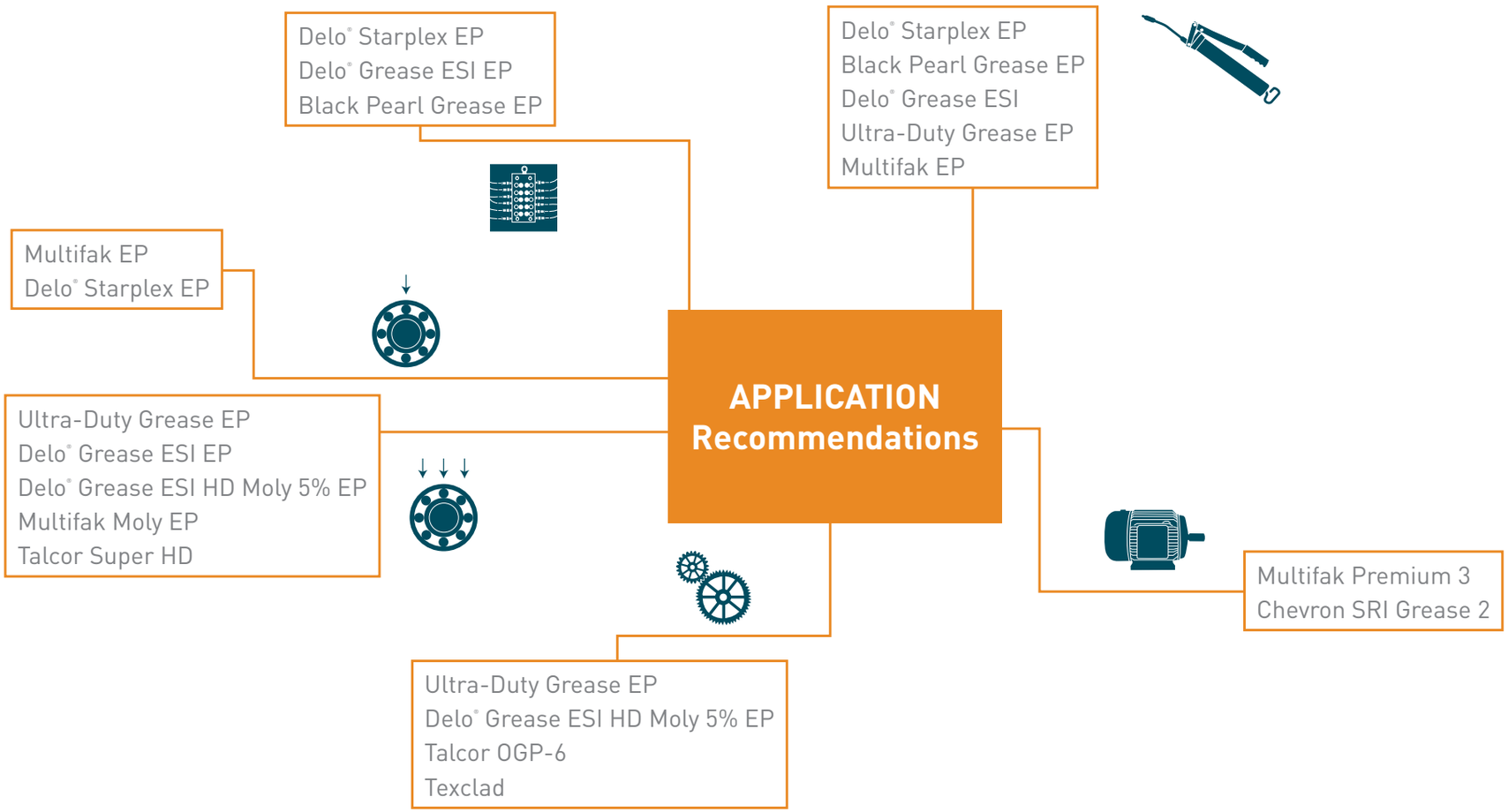
Key Segments	Applications	Conditions
Automotive	Electric Motors	High Temperature
Fleet/Owner Operator	Centralised Systems	Low Temperature
Service Trucks	Gears	High Speed
Buses	Couplings	Low Speed
Construction	Bearings - Heavy Loaded	Shock / Extreme Load
Agriculture	Bearings - Light Loaded	High Moisture
Mining	Multi-purpose	Boundary Film Lubrication
Manufacturing		
Marine		
Power Generation		
Oil and Gas		

CALTEX GREASE BY SEGMENT



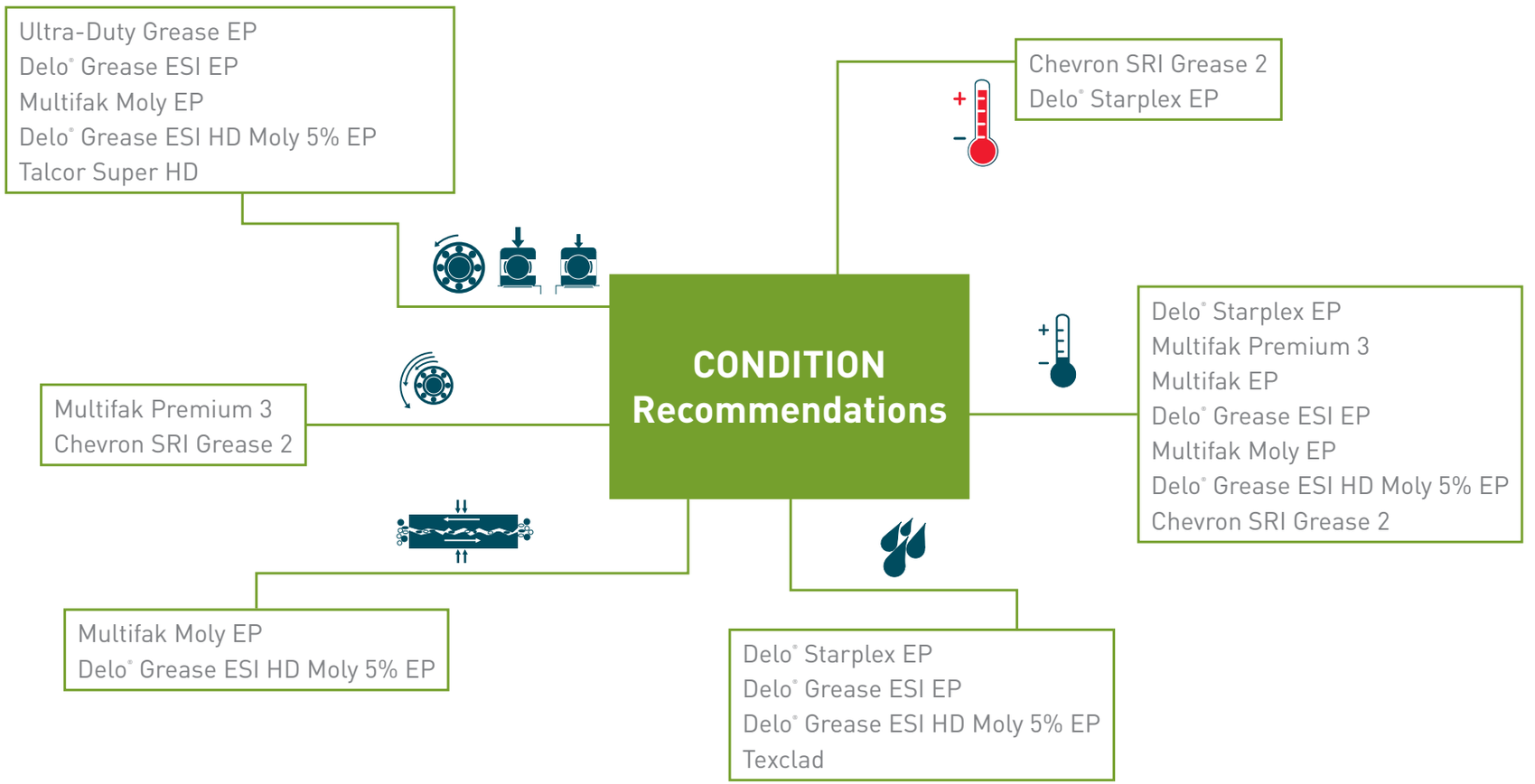
The product recommendations provide general guidelines. All manufacturers have different lubricant requirements and recommendations. It will be important to contact an Astron Energy representative or refer to the Original Equipment Manufacturer manual to confirm the proper product is used for the application.

CALTEX GREASE BY APPLICATION



The product recommendations provide general guidelines. All manufacturers have different lubricant requirements and recommendations. It will be important to contact an Astron Energy representative or refer to the Original Equipment Manufacturer manual to confirm the proper product is used for the application.

CALTEX GREASE BY CONDITION

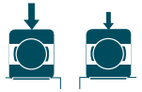


The product recommendations provide general guidelines. All manufacturers have different lubricant requirements and recommendations. It will be important to contact an Astron Energy representative or refer to the Original Equipment Manufacturer manual to confirm the proper product is used for the application.

ULTRA-DUTY GREASE EP

FEATURES

- Li 12-hydroxystearate thickener with high viscosity base oil
- Unique EP additive package and tackiness
- General industrial applications
- NLGI grades 0, 1 and 2

Key Segments	Applications	Conditions
		
		
		
		

DELO® STARPLEX® EP

FEATURES

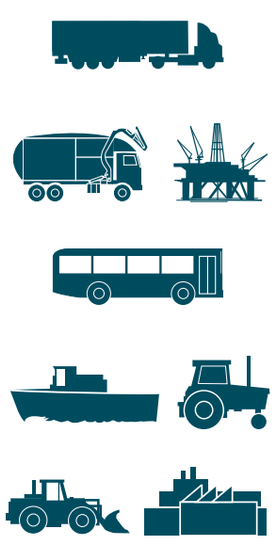
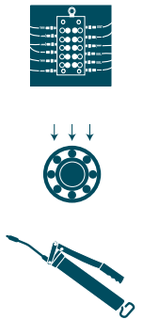
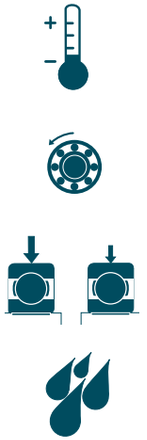
- Lithium complex thickener with high viscosity index base oils
- Multi-purpose grease for bearings, chassis and general lubrication
- Approved for NLGI certification mark GC-LB for NLGI grades 1 and 2

Key Segments	Applications	Conditions
		
		
		
		

DELO® GREASE ESI® EP

FEATURES

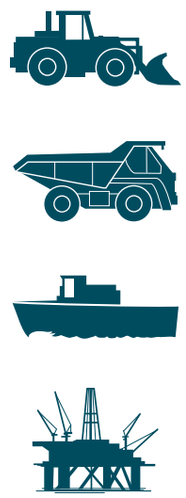
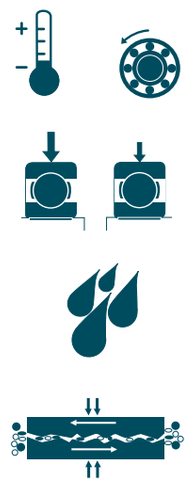
- Lithium complex thickened with medium/heavy viscosity base oil
- Good pumpability versus heavy-duty greases
- Approved for NLGI certification mark LB
- Extended service protection for chassis, bearings, fifth wheels and king pins
- Excellent water washout resistance
- NLGI grade 2

Key Segments	Applications	Conditions
		

DELO® GREASE ESI® HD MOLY 5% EP

FEATURES

- Lithium complex thickened with heavy viscosity base oil
- Designed for heavy shock loading applications
- Formulated with 5% MoS_2 to meet CAT and other OEM mining requirements
- NLGI grades 1 and 2

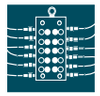
Key Segments	Applications	Conditions
		

BLACK PEARL® GREASE EP

FEATURES

- Polyurea thickened with premium base oil
- Excellent pumpability for centralised greasing systems
- Superb high speed/high temperature in roller bearings
- Approved for NLGI certification mark GC-LB for NLGI grades 1 and 2
- Check compatibility with other greases
- NLGI grades 0, 1 and 2

Key Segments	Applications	Conditions


CHEVRON SRI GREASE 2

FEATURES

- Premium ashless polyurea thickener
- Can be used as a “life pack” lubricant in sealed bearings
- For use in anti-friction bearings operating at high speeds (10 000 rpm and greater)
- Primary recommendation for electric motor bearings
- Check compatibility with other greases
- NLGI grade 2

Key Segments	Applications	Conditions


SELECTING THE RIGHT GREASE: HOW TO GET STARTED

Information Gathering:

- Evaluate equipment recommendations and conditions
- Review OEM requirements
- Review NLGI consistency/penetration numbers
- Review NLGI service categories
- Understand operating conditions of equipment and lubricant
- Evaluate intervals and any problems with current greases
- Move to “Prescribe the Right Grease” selection criteria guidelines

How to Evaluate Which Grease is Right for You:

- Where is it going?
- How do we apply it?
- How do we keep it in place?
- Will it keep working?
- Will it be compatible with the previous grease?

EVALUATE WHICH GREASE IS RIGHT FOR YOU

Application	Condition	Grease Property	Measurement
Where is it going?	Type of bearing component	Consistency Base oil	NLGI grade Viscosity/viscosity index
How do we apply it?	Application method - Grease gun - Centralised system - Hand applied	Consistency Pumpability Base oil	NLGI grade Lincoln ventmeter Viscosity/viscosity index
How do we keep it in place?	Vibration Shock load Water impingement	Additives/Solids Consistency Thickener Tackifiers	Film strength NLGI grade Emulsibility Water washout
Will it keep working?	Operating temperature	Thickener Thickener Base oil Additives	Dropping point Oxidation resistance Viscosity/viscosity index Oxidation resistance
	Water contamination	Additives Thickener	Rust protection Emulsibility
	Chemical contaminants	Additives Additives Thickener	Corrosion inhibition Film strength Resistance to chemicals
Will it be compatible with previous grease?	Other greases	Thickener	Review Table 1 (page 21)

GREASE CONVERSION COMPATIBILITY AND BEST PRACTICES

Grease conversion and compatibility are an important part of providing a customer reliable operations.

When provided with an opportunity to change over a customer to a Caltex grease, it's important to take into account key items for the transition:

1. Understand the application and conditions the grease will be applied — check OEM recommendations.
2. Confirm current competitive grease use and re-lubrication intervals.
3. Check current competitive grease details:
   a. Thickener type
   b. Base oil viscosity
   c. NLGI grade number
   d. Any equipment / performance problems experienced
   e. Current application method – centralised system/ grease gun/bulk, etc.
4. Confirm "best" Caltex grease recommendation for the equipment/condition application and re-lubrication interval required by customer.
5. Check compatibility of Caltex grease and Competitor grease – Table 1 may be referenced as a guide (page 21).
6. If products are in green section – compatible – proceed with additional application questions and confirm final fit with customer and equipment application/conditions.
7. If product is in yellow section – may be compatible - talk with Caltex Technical Support/Caltex Sales Representative on next steps for additional compatibility work.
8. If products are in red – not compatible – a full clean out and/or purge of greased equipment must be conducted – please contact Caltex Technical Support for guidance based on equipment.
9. Failure to follow these steps risks a successful conversion and may result in poor equipment performance, loss of business, and possible failure/ shutdown for the customer.

COMPATIBILITY CHART

Table 1 - Compatibility of Binary Grease Mixtures

	Lithium	Lithium Complex	Aluminium Complex	Calcium	Calcium Sulfonate Complex	Barium Complex	Sodium	Bentone (Clay)	Polyurea
Lithium									
Lithium Complex									
Aluminium Complex									
Calcium									
Calcium Sulfonate Complex									
Barium Complex									
Sodium									
Bentone (Clay)									
Polyurea									

Compatible

Check Compatibility with Caltex Technical Support

Not Compatible – Full Clean Out Required for Change

Table 1 should be used only as a guideline for determining compatibility. For the purpose of changing products in the field, the compatibility of the greases in question should be determined by laboratory testing.

GREASING PROCEDURES

Proper Intervals and Amounts

Proper greasing intervals should be based on a number of factors including: OEM recommendations, ambient conditions, equipment operating hours, criticality of equipment or component, maintenance plan.

High Temperature Application

1. Greases fail more rapidly as temperature of operation increases. This failure typically lies in the melting point of the thickener or dropping point of the grease. Oxidation also increases rapidly as temperature rises.
2. Most mineral-oil-based greases (of adequate dropping point) will operate successfully to about 250°F (121°C) at more frequent re-lubrication intervals. As service temperature rises, frequency of re-lubrication must increase.
3. If speed is high, bearing is large, or load severe, re-lubrication intervals should be even shorter. Where service is severe and/or contamination is unavoidable, re-lubrication is best carried out with a centralised lubrication system, and lubrication intervals may be measured in hours or minutes.
4. Listed below are general guidelines for re-lubrication intervals for rolling element bearings (assuming eight work hours per day). As always check specific OEM recommendations, ambient conditions and application before finalising specific greasing intervals:

   180°F (82°C) 6 months

   220°F (104°C) 3 months

   300°F (149°C) 1 month

   →300°F (149°C) 1 day to 1 month - check OEM recommendations and review grease type to determine correct interval at high temperatures.
5. Care should be taken when operating machinery at these elevated temperatures. Evaluate the oil(s) used in the grease to ensure that the flash point of the oil(s) has not been exceeded.

Proper quantity of grease to be pumped into greased bearings/components should be determined by your Lubrication or Maintenance Engineer who will typically utilise: OEM recommendations, bearing dimensions, severity of conditions, grease selection criteria (see pages 22-23) and maintenance plan to ensure correct amount is applied. As a guideline the following formula can be used as reference:

Ounces of Grease required in Bearing = 0.114 x Bearing Outside Diameter (O.D.) x Width (W)

Under/over greasing reduces equipment reliability and increases potential failure rates and costs.

GREASING PROCEDURES

General Guidelines

Greased bearing/component failures can normally be attributed to several consistent factors: lack of lubrication, contamination, incompatibility, overgreasing, grease usefulness. Addressing these items as outlined below can help improve greased bearing/component life when applied:

1. Lack of lubrication
   a. Ensure all critical greased components are identified and scheduled in maintenance plan/ intervals
   b. Tag/colour code fittings/equipment that may be hard to locate
   c. Utilise delivery systems to help ensure grease gets to the component
   d. Check or replace blocked fittings/inspect delivery system
   e. Clean out or replace any blocked bearing/ component areas
2. Contamination
   a. Ensure all grease pumping or application equipment is contaminant free
   b. Understand how to change out old and new grease containers and associated pumping equipment to eliminate contamination
   c. Wipe grease fittings before application of grease
   d. Do not leave grease containers open to the environment
3. Incompatibility
   a. Try to consolidate number of greases used on site
   b. Refer to pages 20-21 for changeover and incompatibility reference
4. Overgreasing
   a. Seals may rupture allowing grease to leak out of bearings into the environment or into other components like electric motor windings
   b. Ensure correct amount is applied at appropriate intervals
   c. Check for any grease hardening/thickener separation that may block grease application
5. Grease usefulness
   a. Visually check new grease containers and contents when they are opened
   b. A thin layer or small pools of separated oil on top of the grease in a newly opened container is acceptable
   c. Check containers for dents/broken seals/general condition to ensure grease can be applied appropriately
   d. Check colour and texture with previous grease to ensure no noticeable changes from shelf life or wrong grease being utilised

As always, consult your local Caltex representative if there are any questions or if product needs to be verified for application or useful life.

www.caltexlubricants.co.za