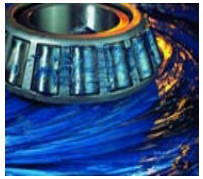
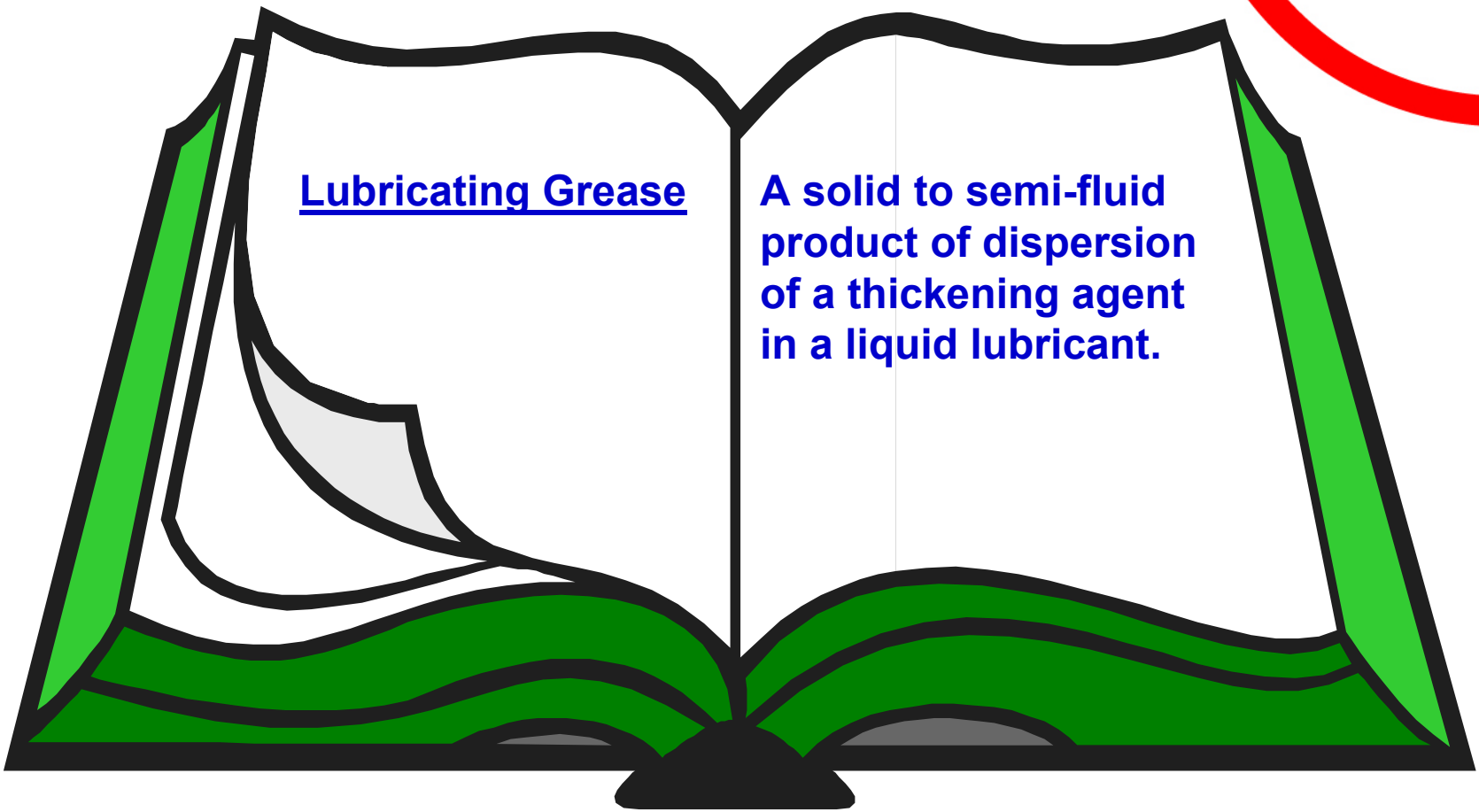
GREASE

Mobil



WHAT IS A LUBRICATING GREASE?



A.S.T.M., Standard Definitions of Terms Relating to Petroleum, 1959

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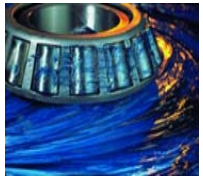

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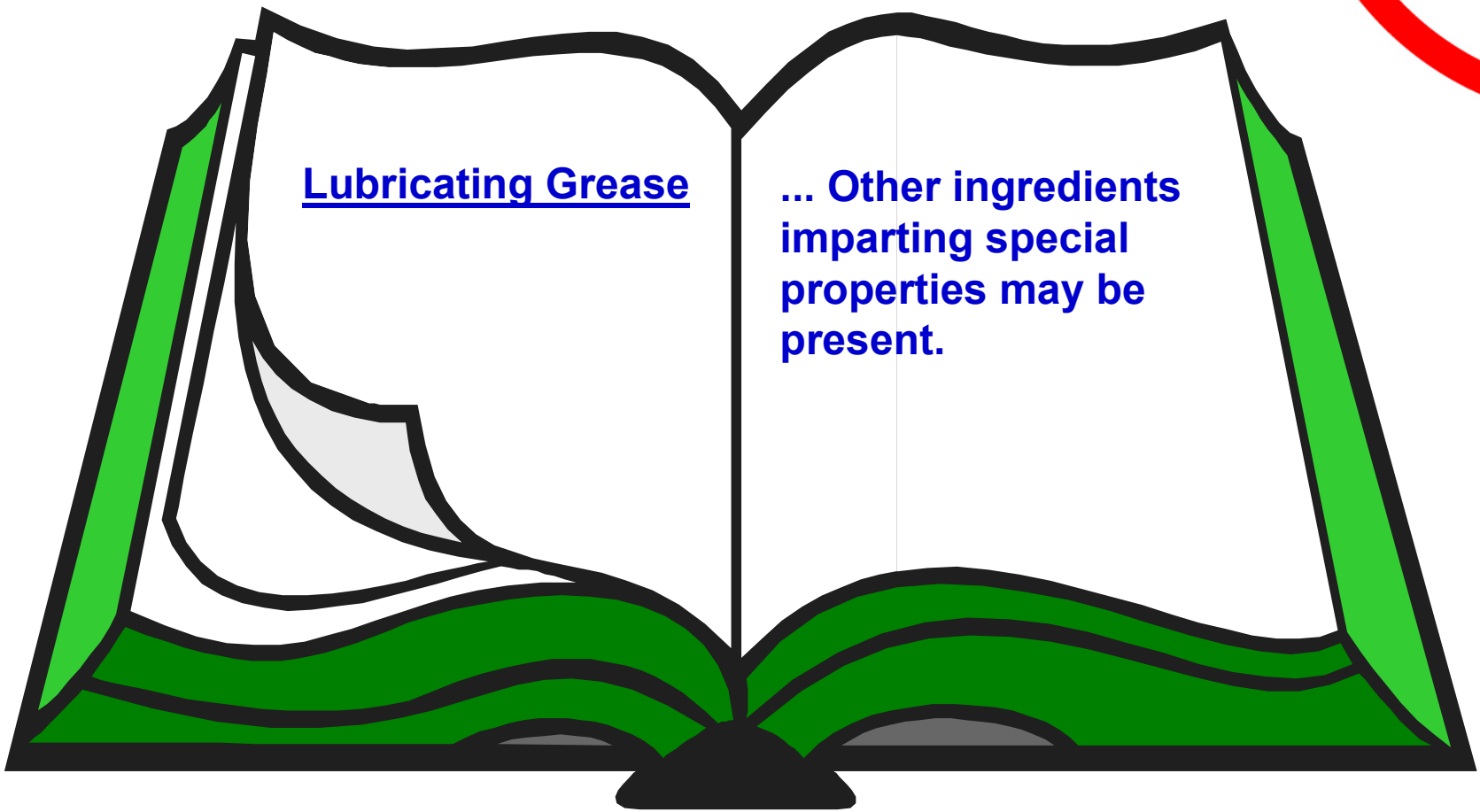

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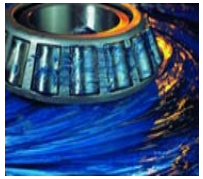

LUBRICATING GREASES

But in any case, greases certainly look nicer than liquid lubricants.

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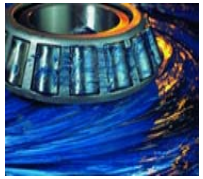

The Mobil Grease Range

Grease	Colour	Thickener	Base Oil	Base Oil Viscosity mm²/sec at 40°C	NLGI	Operating Temp (°C) Min	Operating Temp (°C) Max*	Load Range Properties	Load Range Load	Typical Applications
Mobilith SHC 007		Lithium Complex	SHC	460	00	-40	160	EP	High	Slow speed enclosed gears, gear boxes. Long life.
Mobilith SHC 100		Lithium Complex	SHC	100	2	-40	180	AW	Moderate	Electric motors, fans and high speed bearings.
Mobilith SHC 220		Lithium Complex	SHC	220	2	-40	180	EP	Moderate	Automotive and industrial multi purpose, heavy duty.
Mobilith SHC 460		Lithium Complex	SHC	460	1.5	-30	180	EP	Heavy	Slow speeds & heavy loads. Excellent resistance to water spray-off.
Mobilith SHC 1500		Lithium Complex	SHC	1500	1	-20	180	EP	Heavy	Slow speeds, very heavily loaded bearings operating at high temp.
Mobilith SHC PM		Lithium Complex	SHC	460	1.5	-30	180	EP	Heavy	Paper mills, highly loaded bearing, exellent wear & water protection.
Mobilith SHC 1000 Special		Lithium Complex	SHC	1000	2	-20	180	EP, M, G	Very Heavy	Heavy duty, shock loading on plain and roller bearings.
Mobiltemp SHC 32		Clay	SHC	32	1.5	-50	180	AW	Moderate	High speed rolling element spindle bearing. Machine tools.
Mobiltemp SHC 100		Clay	SHC	100	2	-50	180	AW	Moderate	High speed bearing and electric motors.
Mobiltemp SHC 460 Special		Clay	SHC	460	1	-30	180	EP, M	High	Plain bearing operating under arduous conditions. Glass ovens.
Mobilgrease XHP 222		Lithium Complex	Mineral	220	2	-20	150	EP	Heavy	Multi purpose automotive and industrial applications.
Mobilgrease XHP 322 Special		Lithium Complex	Mineral	320	2	-10	150	EP, M	Very Heavy	Heavy loaded bearing. Fifth wheel. Open gears.
Mobilgrease XHP 461		Lithium Complex	Mineral	460	1	-10	150	EP	Heavy	Centralised system in steel industry. Construction and mining.
Mobilux EP 023		Lithium	Mineral	320	000	-20	120	EP	Heavy	Enclosed gears and bearing in leaking gear cases.
Mobilux EP 004		Lithium	Mineral	150	00	-25	120	EP	Heavy	Enclosed gears and bearing in leaking gear cases.
Mobilux EP 0		Lithium	Mineral	150	0	-20	130	EP	Heavy	Plain and rolling bearings of very soft consistency.
Mobilux EP 1		Lithium	Mineral	150	1	-20	130	EP	Heavy	Heavily loaded plain and roller bearings. Centralised systems.
Mobilux EP 2		Lithium	Mineral	150	2	-20	130	EP	Heavy	Heavily loaded plain and roller bearings.
Mobilux EP 3		Lithium	Mineral	150	3	-10	130	EP	Heavy	Heavily loaded plain and roller bearings of stiffer consistency.
Mobilgrease Special		Lithium	Mineral	150	2	-20	130	EP, M	Heavy	Wheel bearing & chassis components.
Mobilux EP 111		Lithium	Mineral	1000	1	-10	120	EP	Heavy	Gear, grid or spring, and chain heavily loaded couplings.
Chassis Grease LBZ		Lithium	Alkylated	42	000	-25	90	AW	Light	Automatic chassis lubrication. Daimler Benz pg 264.
Mobiltemp 78		Clay	Mineral	460	1	-10	170	EP, M	Moderate	Low speed plain and roller bearings at high temperature.
Mobilgrease FM 462		Aluminium Complex	SHC	460	2	-20	140	EP	Heavy	Multi purpose grease for the food industry. FDA approved.
Mobilgrease OGL 007		Lithium	Mineral	460	00	-20	120	EP	Heavy	large, slow to meduim speed, heavily loaded open gear lubrication

SHC = Synthetic Hydrocarbon *depending on re-lubrication intervals AW Anti Wear, EP Extreme Pressure, M Molybdenum Disulphide, G Graphite

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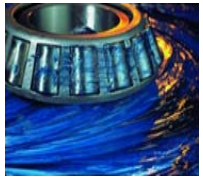

Pack Options

180 kg Drum

50 kg drum

12.5 kg pail

400 g Cartridge

120 ml Automatic dispenser

* limited grade availability

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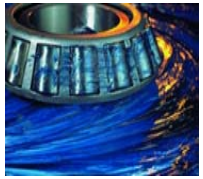
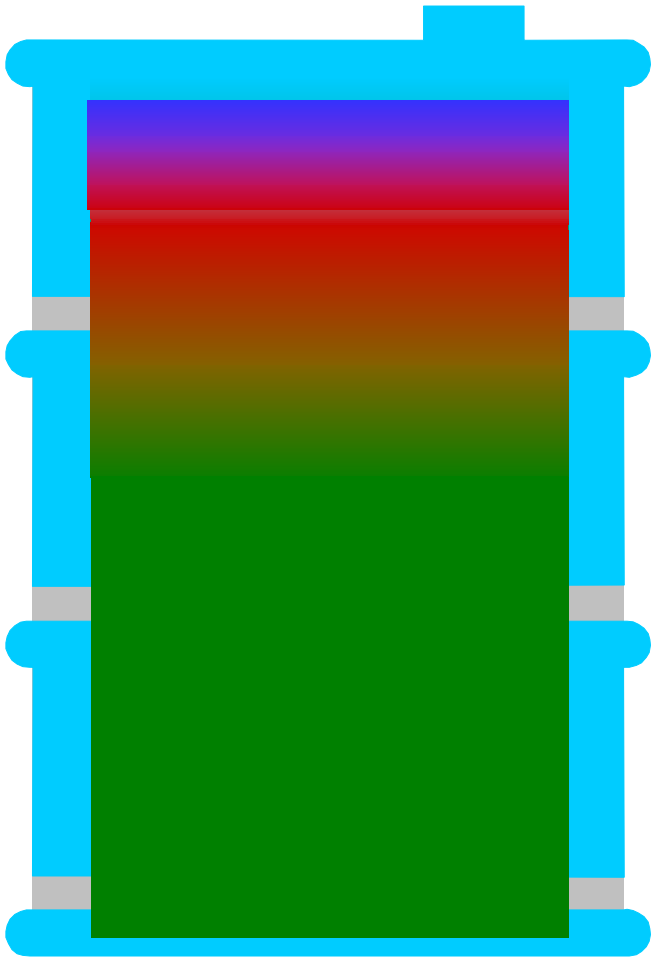


GREASE INGREDIENTS



Additives ≈ 0 - 10 %

Thickener ≈ 5 - 20 %

Base Oils ≈ 75 - 95 %

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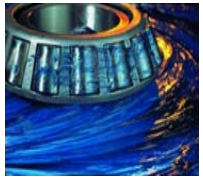
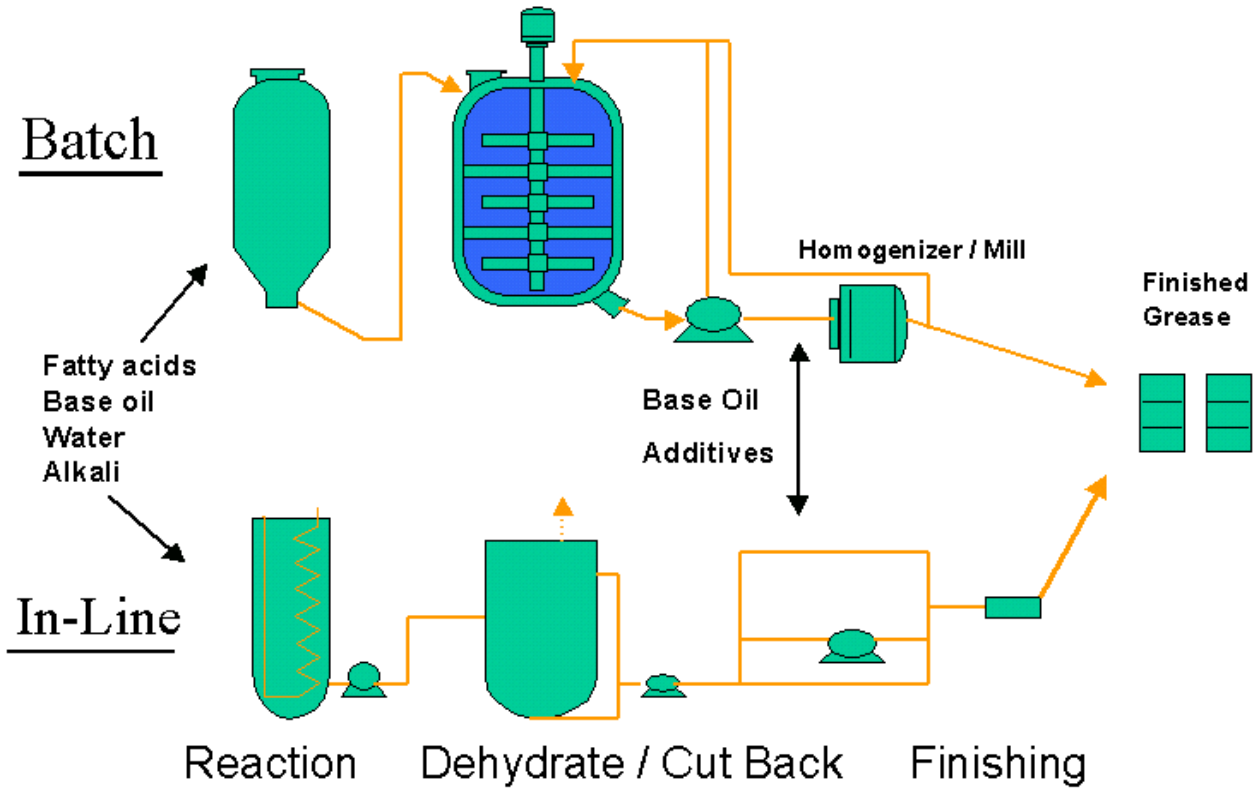


Grease Manufacturing Process Comparison



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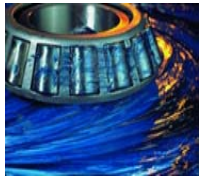
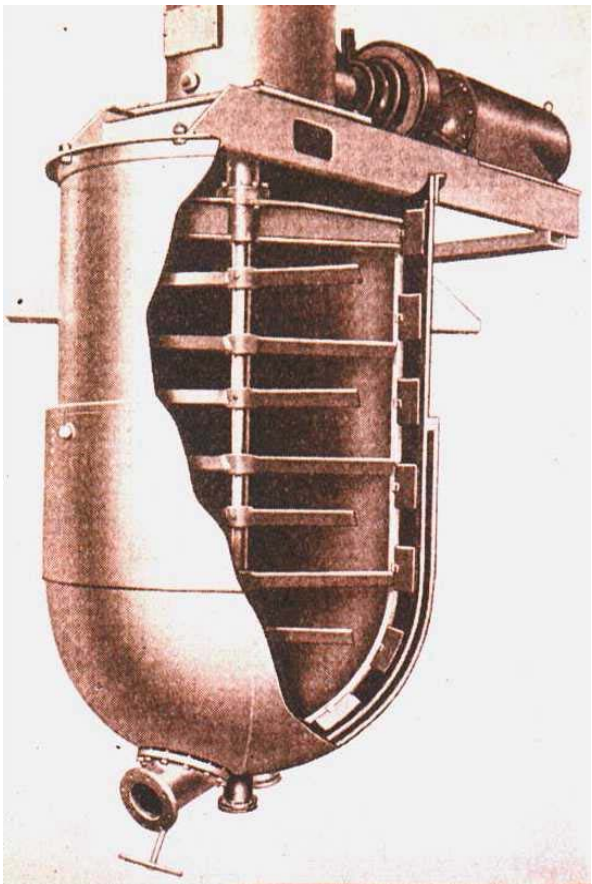


Batch Process -Typical Grease Kettle



- Grease kettles are heated with steam or hot oil to as much as 200°C (395 °F) or more
- Kettle capacities generally range from 2 tons (4000 lbs) to 20 tons (40,000 lbs)
- Kettles usually have counter rotating paddles which force the grease in opposite directions to improve mixing efficiency
- Kettles also have recirculation pumps to provide additional (vertical) mixing action and to transport the grease to other processing equipment such as a homogenizer.

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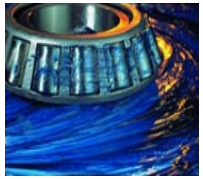

In Line - Continuous Processes

- Continuous saponification, dehydration, and finishing of grease.
- Flexible and fast
- Much better process control

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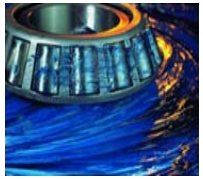

FACTORS AFFECTING GREASE PERFORMANCE

Base Oils
mineral oils (paraffinic, naphthenic), synthetic hydrocarbons (PAO, Alkylates) and other synthetic compounds (Esters, Polyglycols, etc.)

Additives
oxidation inhibitors, corrosion and rust preventives, metal deactivators, AW/EP agents, tackifiers, solid lubricants (MoS2, Graphite), friction modifiers, dyes etc.

Thickener
simple soap (Lithium, Sodium, Calcium), complex soap (Lithium, Calcium, Aluminium, Sodium) and non-soap (Polyureas, Bentonite, Sulphonates, Polymers) thickeners

The Grease Magic
the interactions between thickener and lubricant (Base Oil + Additive) together with the manufacturing process make up a major part of the grease performance

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Properties of Different Thickeners

PROPERTIES	SIMPLE SOAP			COMPLEX		NON SOAP	
	Ca	Na	Li	Ca	Li	POLYUREA	CLAY
OPERATING TEMP. MAXIMUM, °C (1)	80	120	120	130	160	180	200
DROPPING POINT, °C	90	190	190	>300	280	>300	>300
WET CONDITIONS	YES	NO	YES	YES	YES	YES	YES
MAXIMUM BEARING SPEED	MODERATE	HIGH	VERY HIGH	HIGH	VERY HIGH	VERY HIGH	HIGH
COST	LOW	LOW	MEDIUM	MED / HIGH	HIGH	VERY HIGH	HIGH

Notes: (1) Minimum operating temperature is largely dependent on base oil viscosity

(2) Care should be taken to avoid mixing greases made with different thickeners, as they may not be compatible

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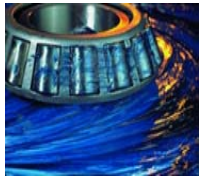
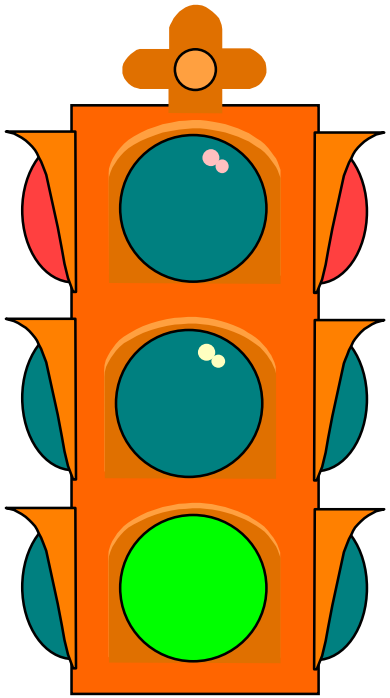


WHY/WHEN USE GREASES FOR LUBRICATION?



Using greases for lubrication has some advantages:

- ☺ Greases stay put
- ☺ Greases seal out contaminants
- ☺ Greases do not need circulation systems
- ☺ Greases decrease dripping, splattering and leakage
- ☺ Greases suspend solid additives easily
- ☺ Greases are suitable for intermittent operations
- ☺ Greases work under extreme operating conditions
- ☺ Greases seal for life
- ☺ Greases reduce noise
- ☺ Greased machinery tends to need less power

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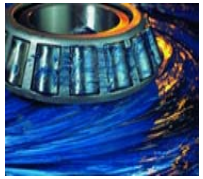
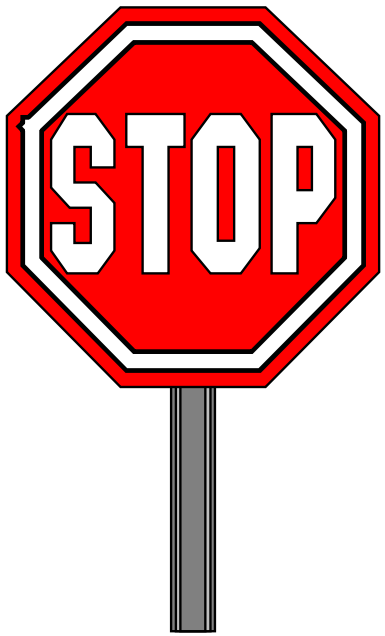


WHY/WHEN NOT USE GREASES FOR LUBRICATION?



Greases may also bear some disadvantages:

- ☹ Greases may not reach all places in need of lubrication
- ☹ Greases do not have any cleaning effect
- ☹ Greases do not work as cooling agent
- ☹ Greases cannot be used at as high speeds as liquids

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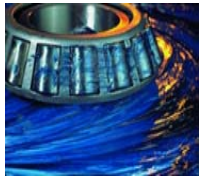

COMMON GREASE TESTS

Consistency	Cone Penetration
Mechanical Stability	Working Stability, Roll Stability
High Temp. Performance	Dropping Point, Bearing Life Tests
Low Temp. Performance	Low Temperature Penetration and Torque, Flow Pressure
EP/AW Performance	TIMKEN and Four Ball Apparatus
Wet Condition Performance	EMCOR, Water Resistance, Water Washout, Water Spray-Off
Pumpability/Dispensibility	Apparent Viscosity
Stability	Oil Bleed, Oil Separation
Other	Oxidation Stability, Copper Corrosion, Base Oil Viscosity, Solid Contaminants

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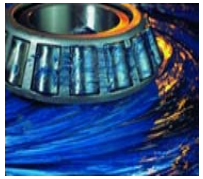
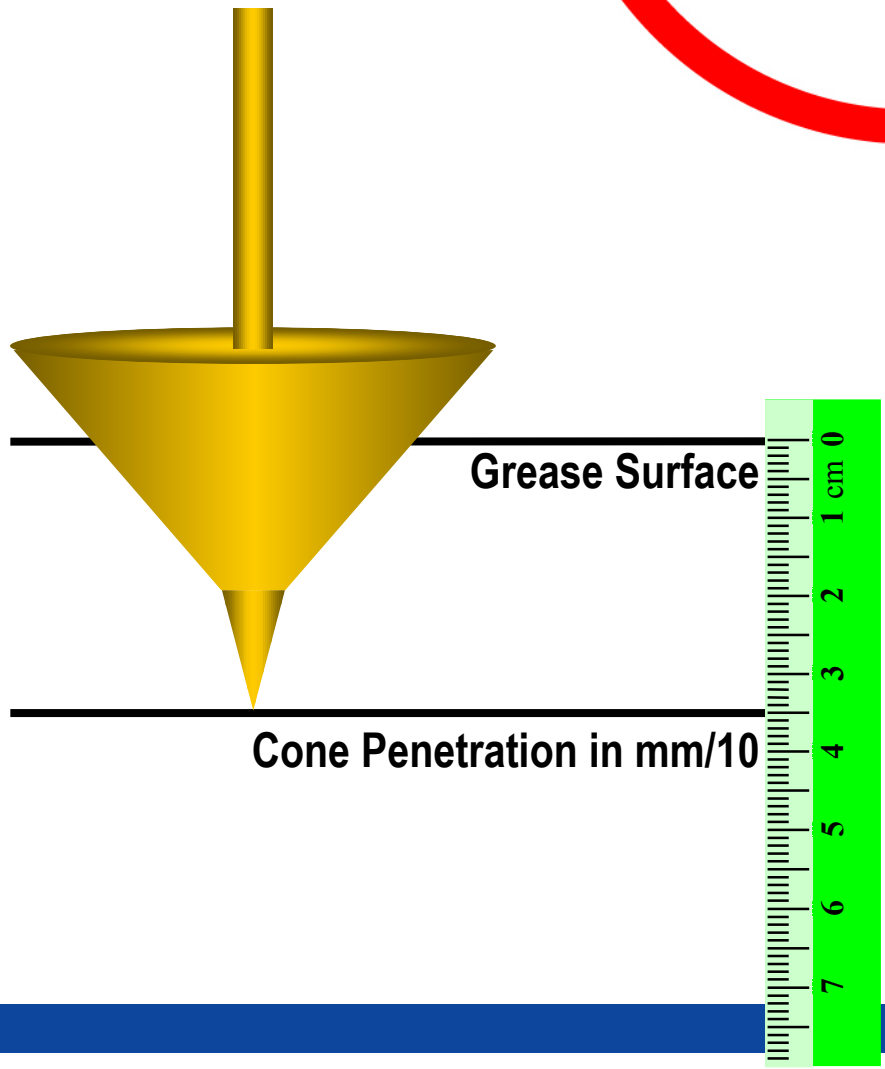


GREASE CONSISTENCY AND CONE PENETRATION

Consistency is the condition of a material of standing together or remaining fixed in union, i. e. its resistance to movement or separation of the constituent parts

Grease consistency is important for both type of application (ability required to stay put, seal and lubricate) and method of application (dispensing method)

For lubricating greases the consistency is usually determined by cone penetration, i. e. the penetration depth of a standard cone under prescribed conditions of weight, temperature and time



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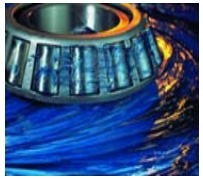


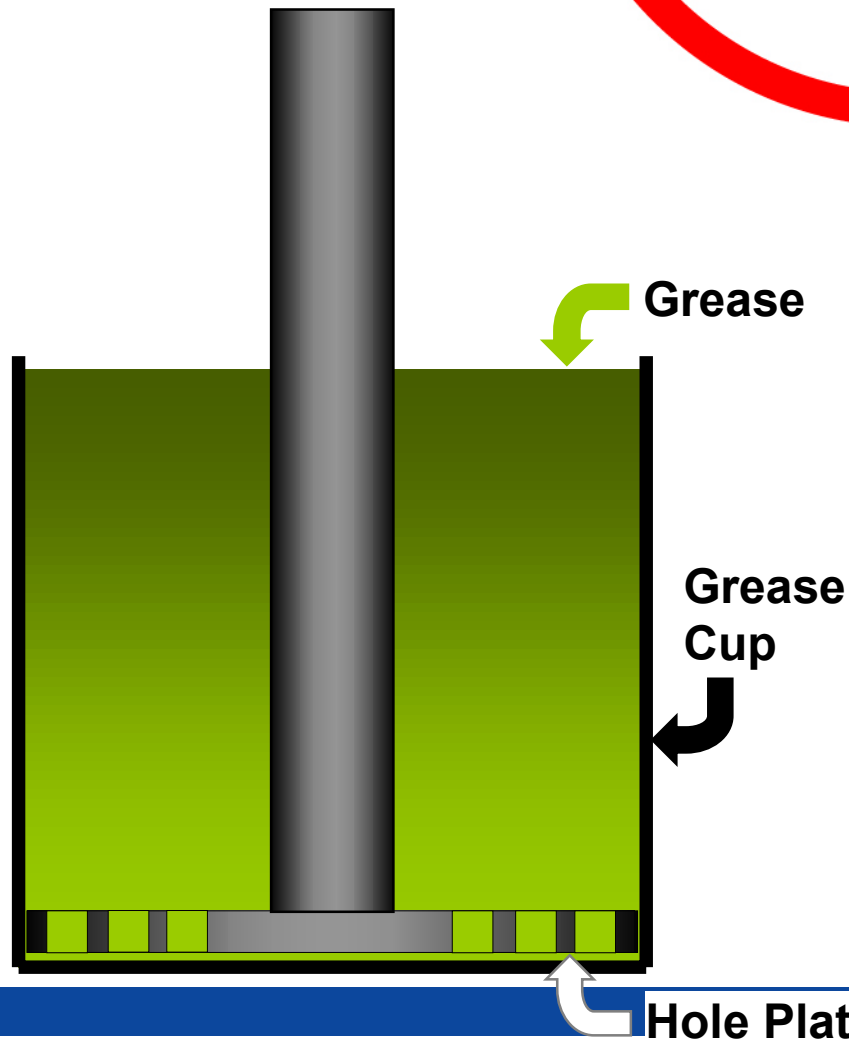
GREASE CONSISTENCY AND WORKING STABILITY

In service greases often become softer due to mechanical shear of the thickener structure

The softening effect can be temporary (Thixotropy) or permanent

The ability of a grease to maintain its consistency in service is one parameter determining its service life

Resistance of a grease to mechanical shear can be evaluated by measuring penetration before and after a defined number of cycles in a grease worker



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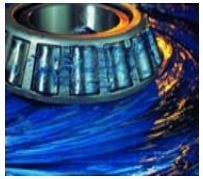

GREASE CONSISTENCY AND WORKING STABILITY

Grease Cup with Hole Plate

Grease Worker

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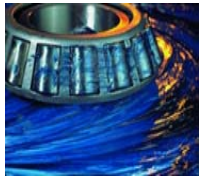


GREASE CONSISTENCY CLASSIFICATION

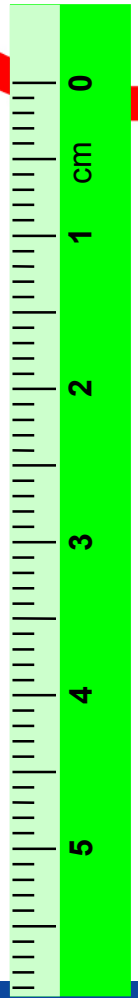
NLGI has worked out a consistency classification system for greases which meanwhile has become accepted as international industry standard

The NLGI classification system is based on cone penetration of the worked grease (60 strokes) at 25 °C

The lower Penetration, the harder the Grease, the higher the NLGI Class

Penetration, mm/10	NLGI Class
85 - 115	6
130 - 160	5
185 - 205	4
220 - 250	3
265 - 295	2
310 - 340	1
355 - 385	0
400 - 430	00
445 - 475	000

Hardness/NLGI Class decrease
Penetration/Softness increase



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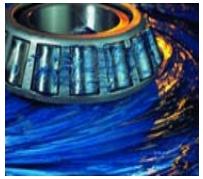
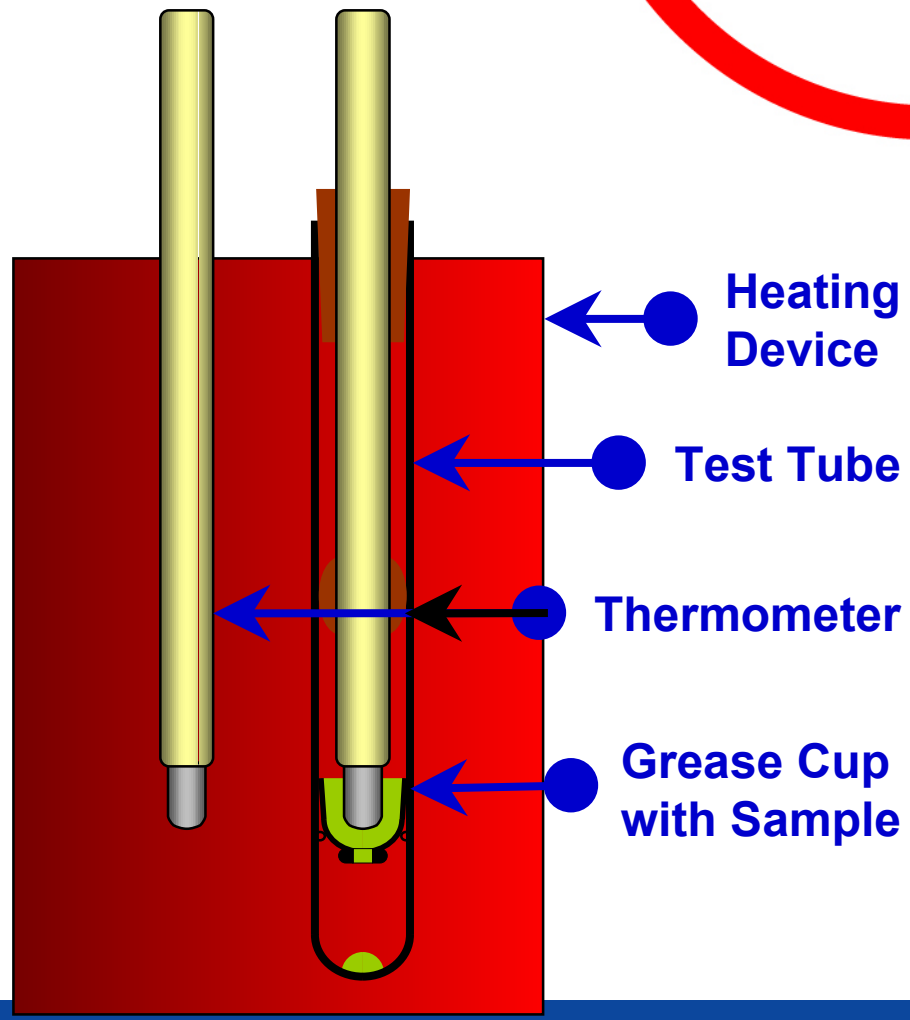


DROPPING POINT

The dropping point is a material specific temperature, at which conventional soap greases pass from a semisolid to a liquid state and start flowing, while certain other non-soap greases (e. g. Bentonite greases) exhibit rapid oil separation

In the laboratory the dropping point is expressed as temperature, at which the first drop of grease/oil is extruded from a sample under prescribed conditions



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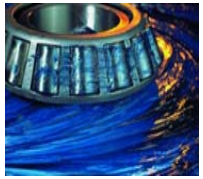
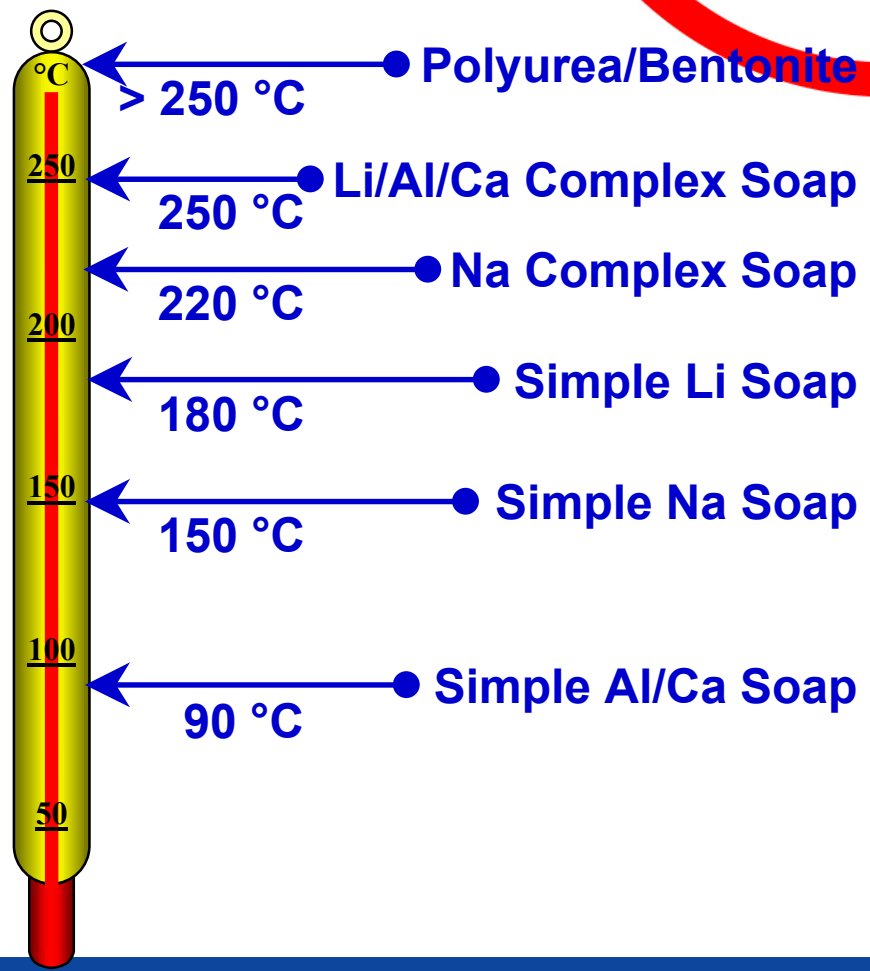


TYPICAL DROPPING POINTS

Dropping point levels depend mostly on the thickener type, but could also vary considerably due to variations in raw materials and manufacturing process and thus could be used as quality control standard

A dropping point test result may be used as indication of the maximum temperature a grease can be exposed to, but in practice operating temperatures should be kept well below it



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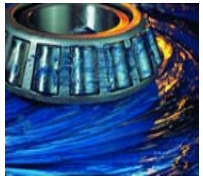
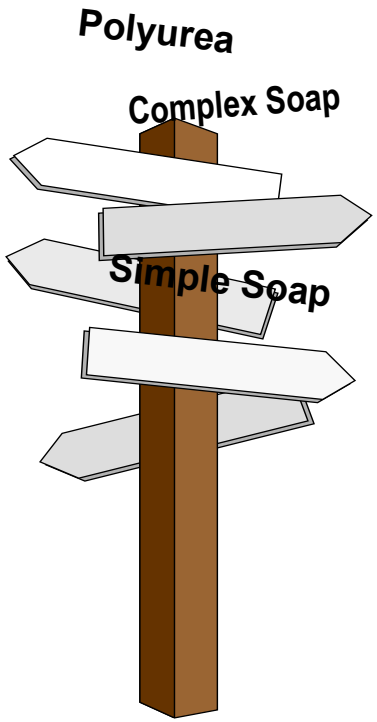


HOW TO CHOOSE THE RIGHT GREASE?



Select Thickener Type by Application

Use softest Consistency to stay in Place

Select Base Oil Viscosity as if only Oil will be used

Look for other criterion required by application (e. g. AW/EP performance, tackiness, operating temperatures etc pp.)

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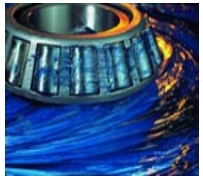
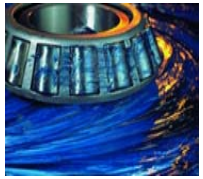


Mobil Grease

- High quality products
- Available for a wide range of applications
- Available in a wide range of pack size

Performance, Innovation, Expertise

Mobil



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