



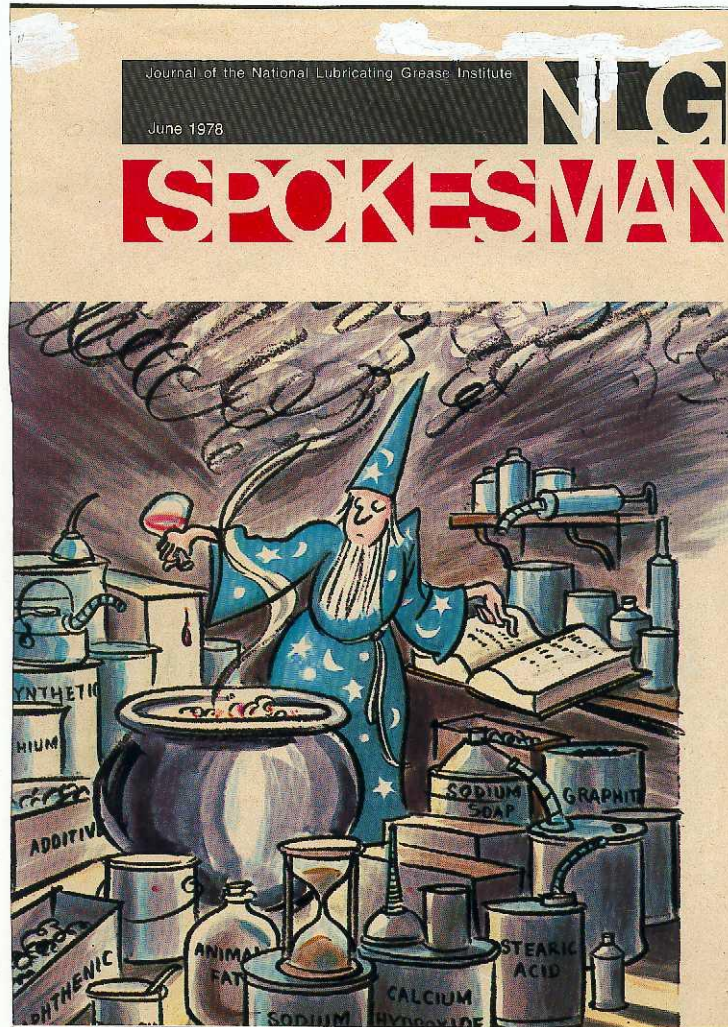
**AXEL**

AXEL CHRISTIERNSSON

**ADDRESSING CHALLENGES  
AROUND FOOD GRADE GREASE  
PRODUCTION**

**ICIS FOOD GRADE LUBRICANTS  
23<sup>rd</sup> September 2014 in Berlin**

# What is Grease?



## ***Grease is...***

“A solid to semi fluid product of a **thickening agent** in a liquid lubricant. Other ingredients imparting special properties may be included.”

*ASTM D-288 , Annual Book of ASTM Standards, American Society for Testing and Materials.*

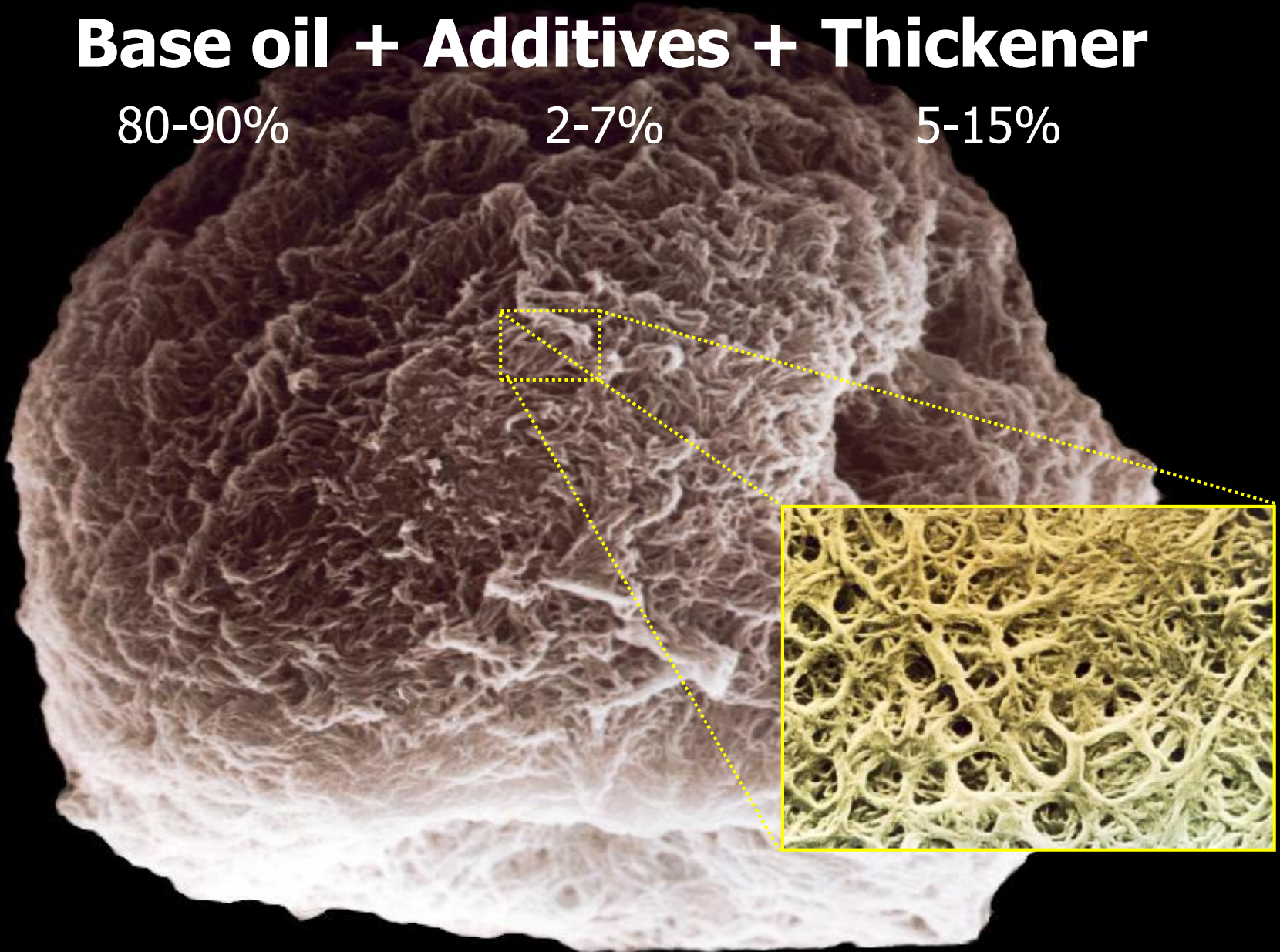
Grease is a **thickened** oil not a thick oil!

# Base oil + Additives + Thickener

80-90%

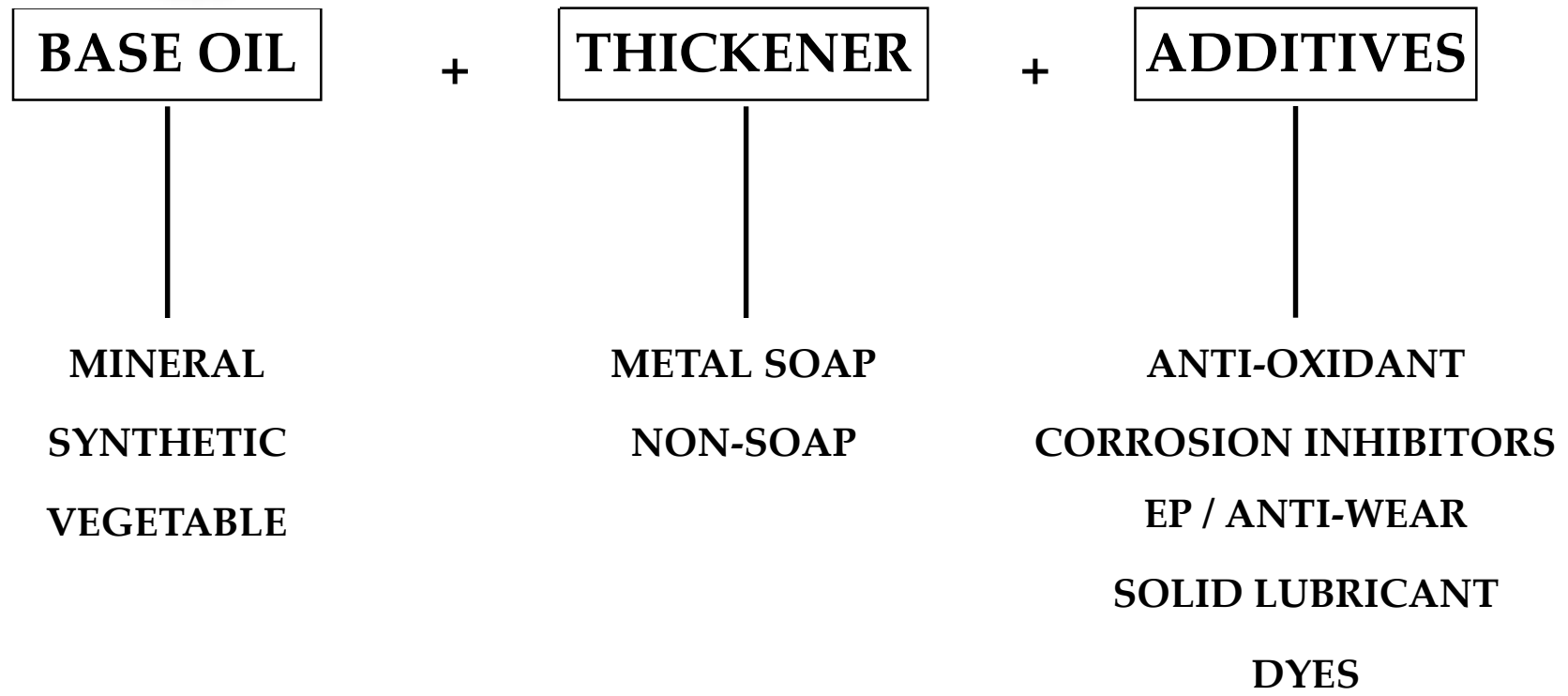
2-7%

5-15%





# Grease Composition



## Soap Thickener

Fatty acid  
( from plant or animal fats)  
+  
metal hydroxide  
(base, alkali)  
=  
Soap and Water



# FOOD GRADE LUBRICATING OIL & GREASE

**Lubricating oil** are often classified by machinery type:

- Hydraulic Oil
- Gear oil
- Compressor oil
- Chain oil
- Vacuum pump oil
- Etc.

**Lubricating grease** are more often introduced by thickener type and then by machinery type:

- INORGANIC THICKENERS
  - Clay, Silica Gels, PTFE, etc
- METAL SOAPS THICKENERS
  - Anhydrous calcium, Calcium Complex, Aluminum Complex, Calcium Sulphonate Complex, etc



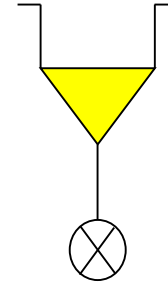
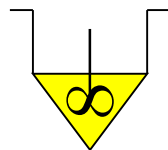
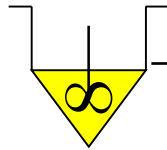
# LUBRICATING OIL MANUFACTURE PROCESS

**Mixer**

**Base Oils**

+

**Additives**

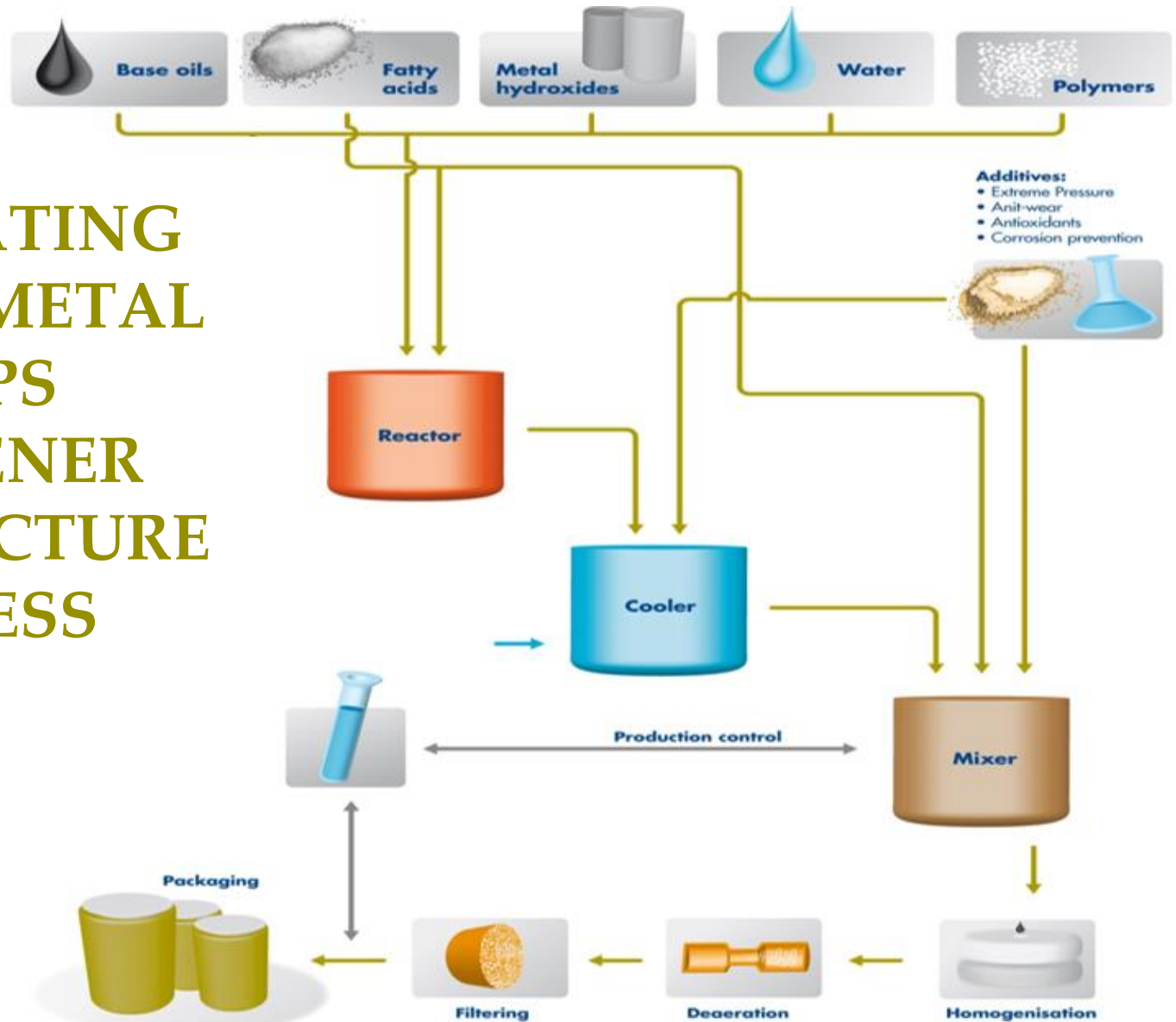


**Mixed with or without heating  
During several hours**

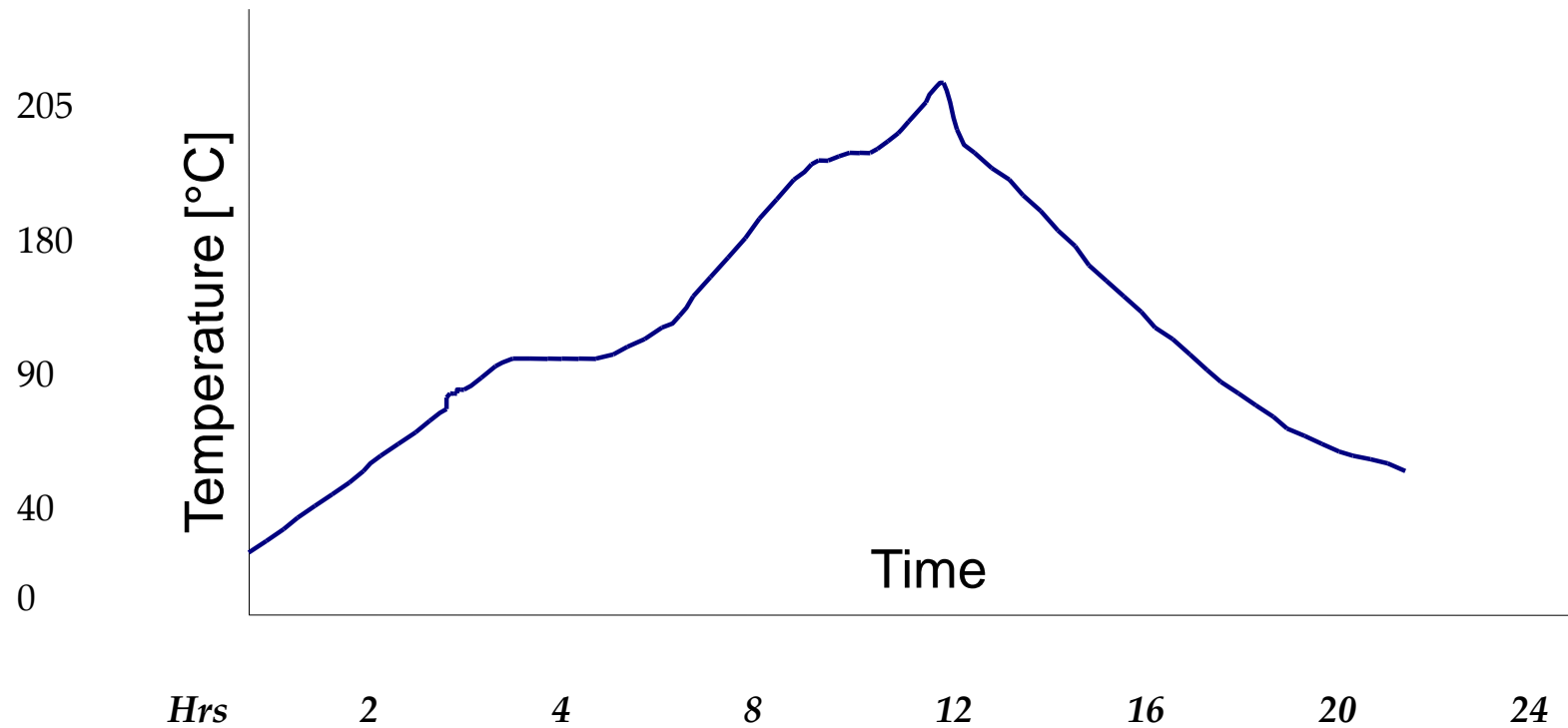
**Packaging**



# LUBRICATING GREASE METAL SOAPS THICKENER MANUFACTURE PROCESS



## Grease Batch-production Example



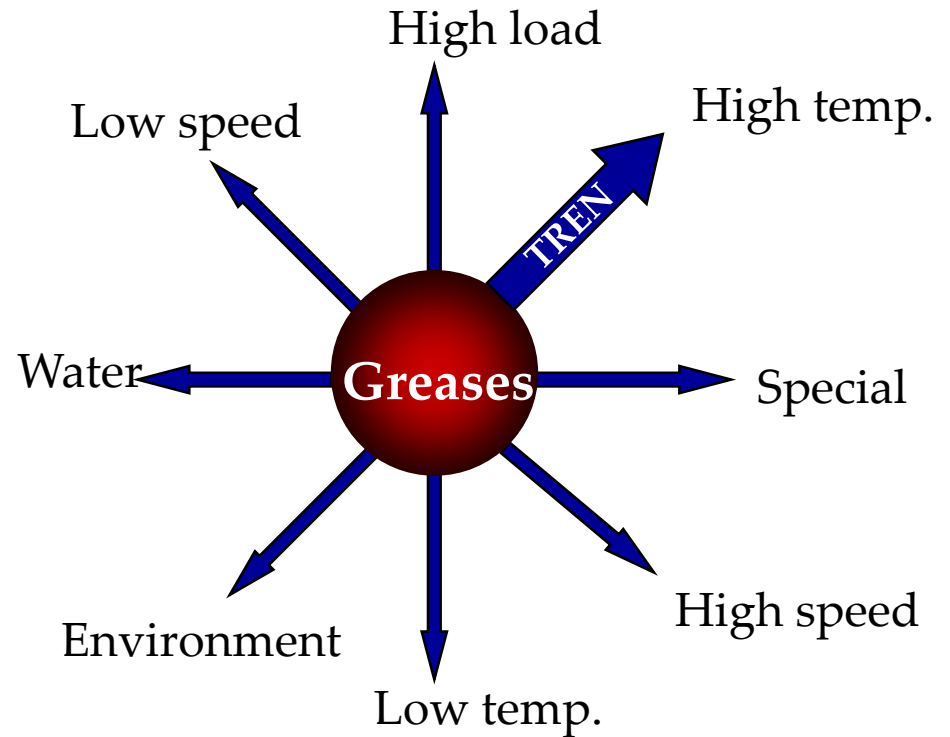
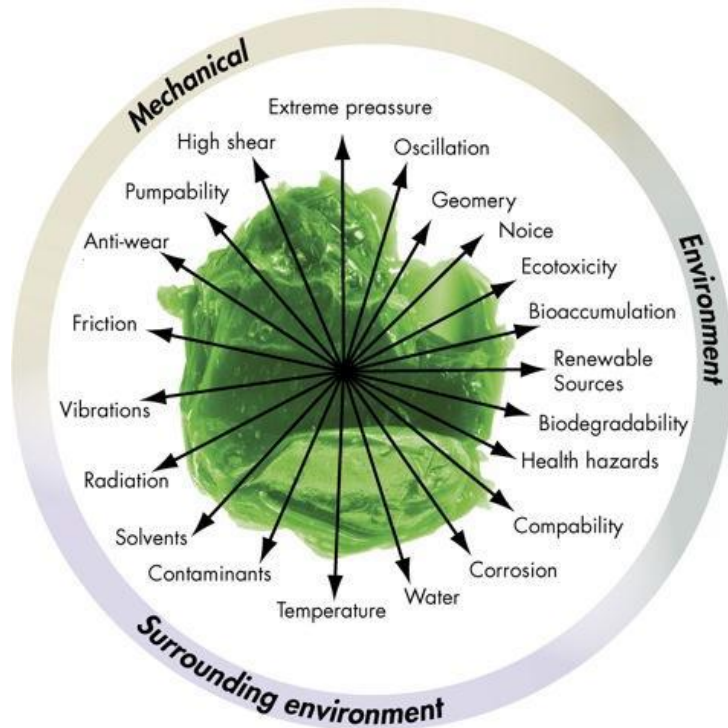


# Quality Control

- ✓ Consistency
- ✓ Stability
- ✓ Corrosion protection
- ✓ EP/AW Performance
- ✓ Water tolerance
- ✓ Oxidation resistance
- ✓ Etc....



# Properties and applications

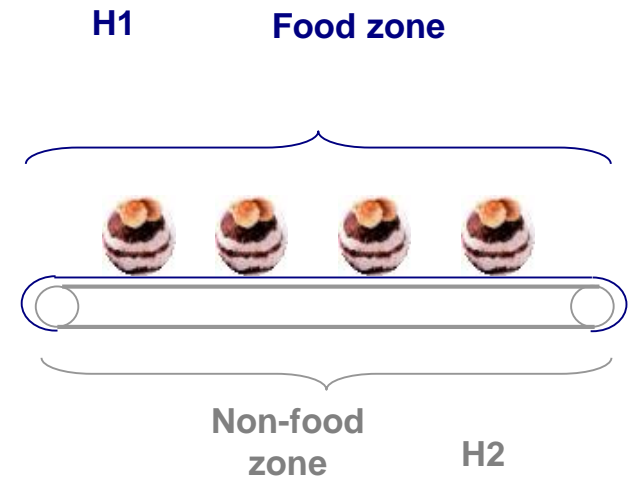




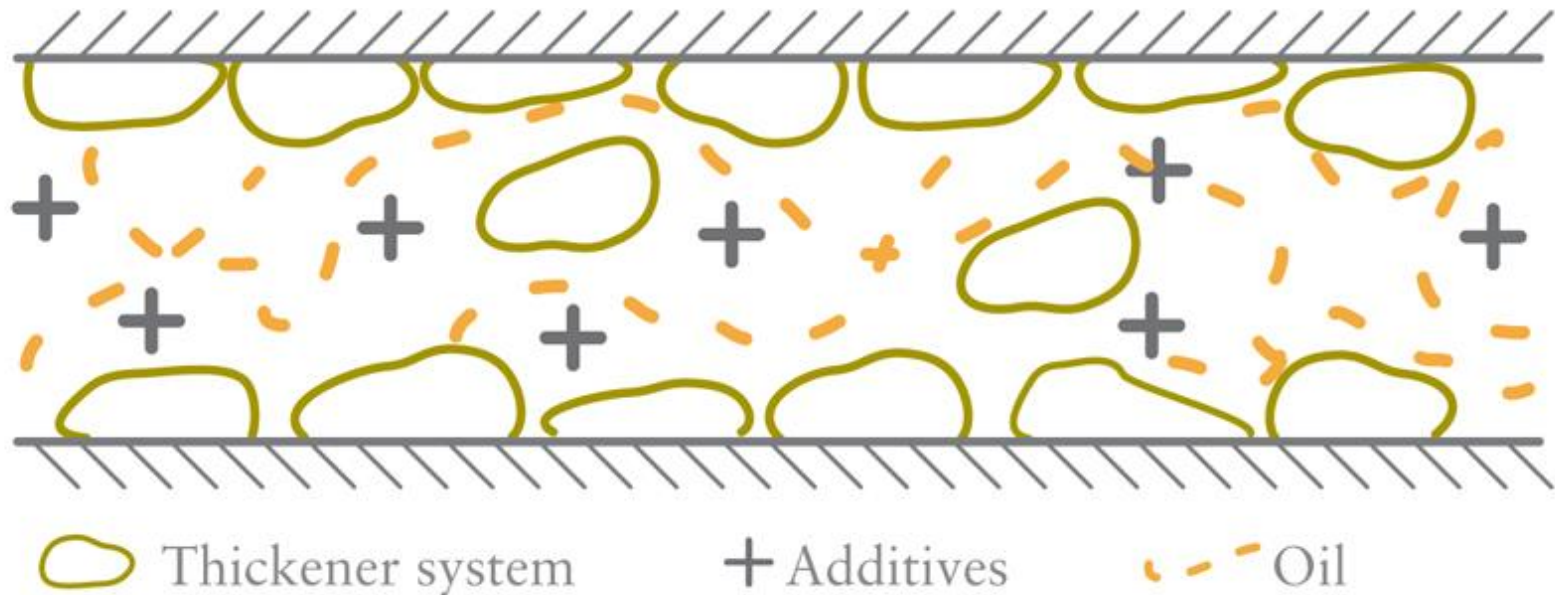
Nonfood Compounds  
Program Listed (Category Code)  
(Registration #)

# Example: Food grade Aluminium Complex grease

- |                          |           |
|--------------------------|-----------|
| • Thermal Stability      | Very good |
| • Shear Stability        | Moderate  |
| • Water resistance       | Very good |
| • Load carrying capacity | Moderate  |



## Ordinary soap thickeners

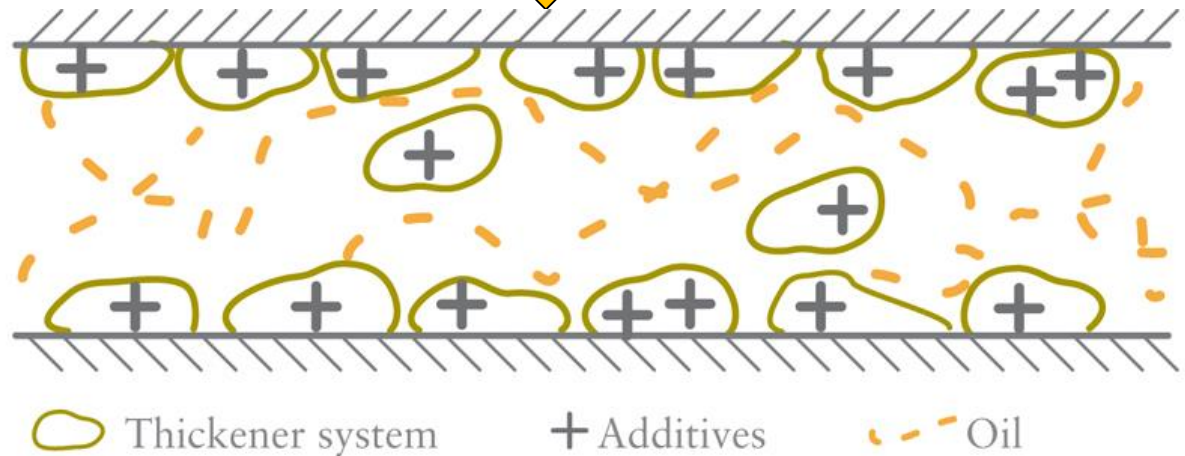
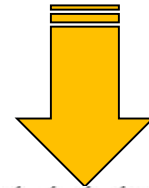
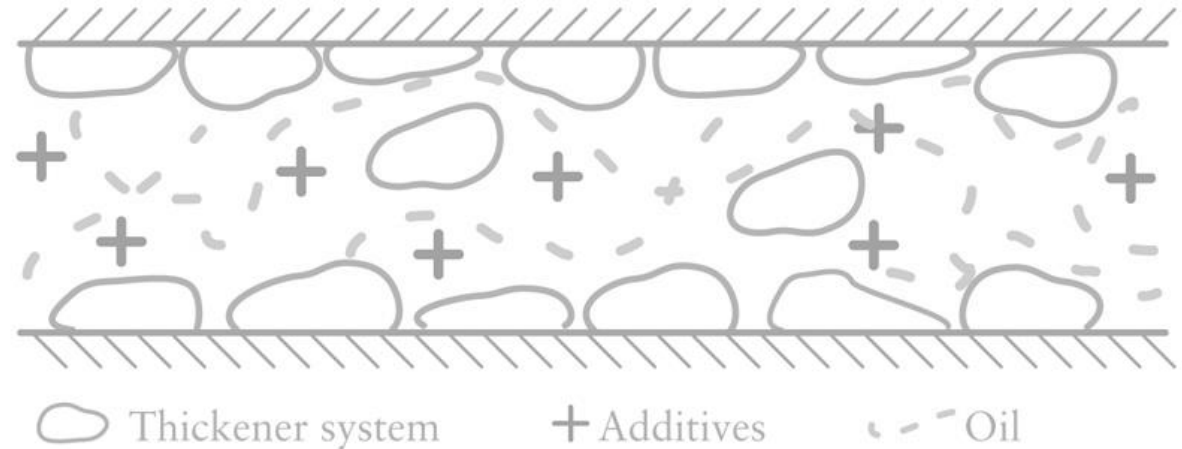


The soap and the additives are competing for the metal surface

- Due to a higher degree of polarity the soap will mostly win
- This limits additive response and performance in conventional soaps

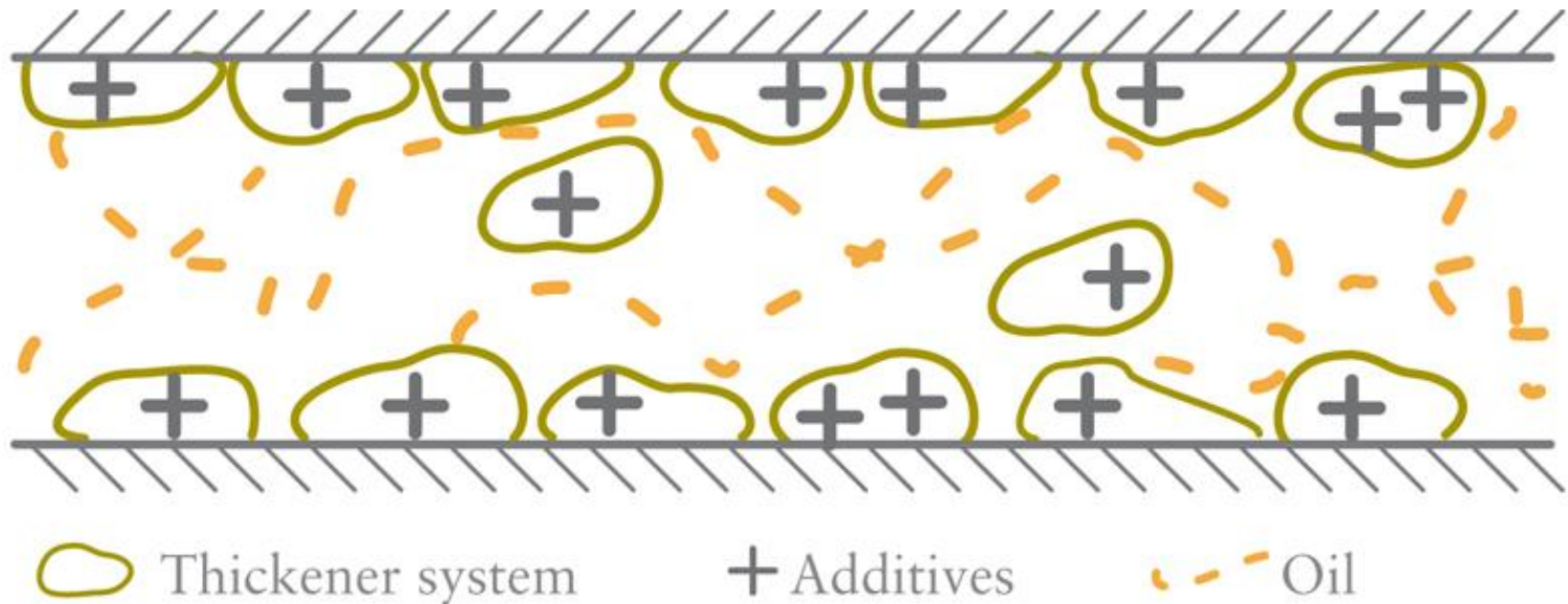
# Combination thickener & additives

*By connecting the additives to the thickener, competition for the metal surface is reduced*



# Functional thickeners

## Example: Calcium Sulphonate Complex Grease

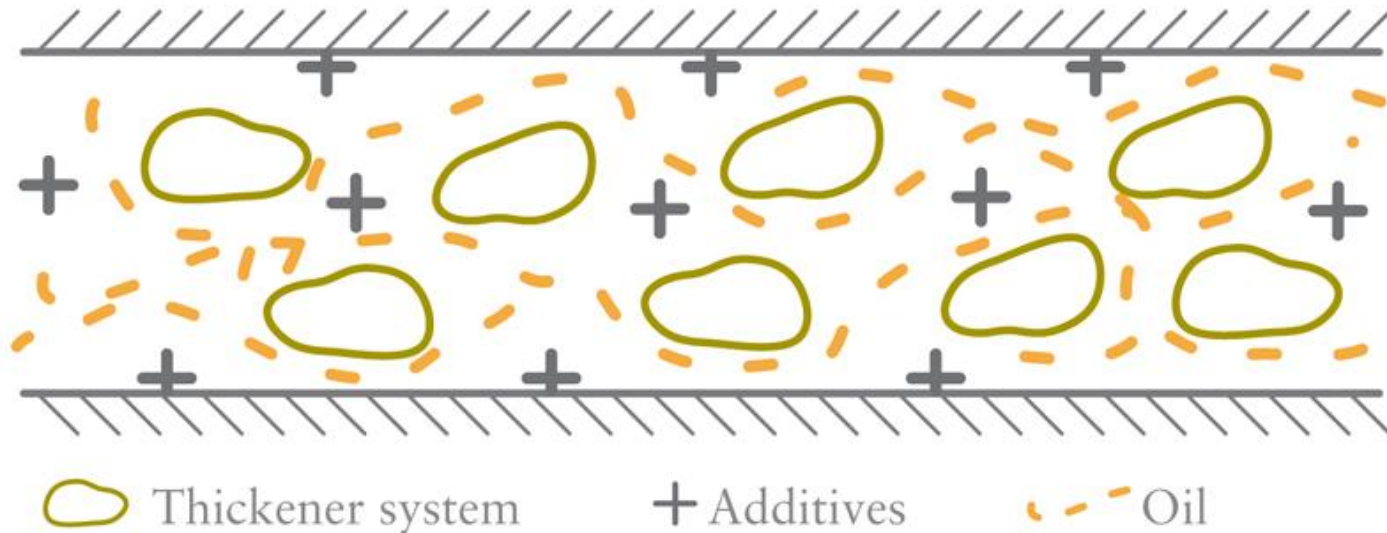


Incorporation of additives in the soap structure

- The soap will “carry” the additives to the metal surface increasing the additive response
- However, some additives will inevitably be blocked in the middle



## Lubricating grease based on EPOCH™



With a non-polar thickener system as the base, the additives can reach the metal surfaces and do their job.

# Different Tribology System

## Closed Tribology System

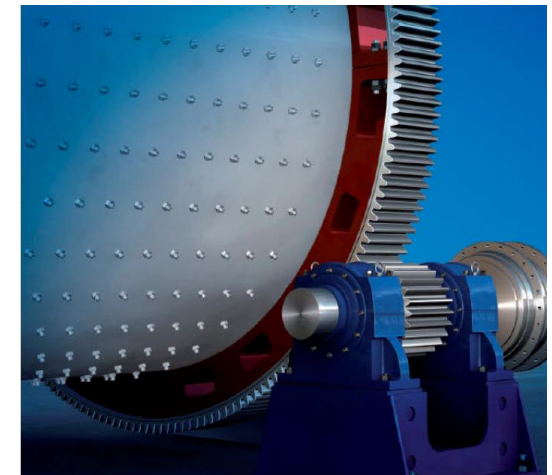
Less constraints  
 ✓ Condensation



Lubricating oil

## Opened Tribology System

More constraints  
 ✓ Dust,  
 ✓ Vapour,  
 ✓ Dripping and leakage  
 ✓ Cleaning solvent...



Lubricating grease

# Factors Affecting Grease Selection

① Method of application

② Operating Temperatures Range

③ Bearing size & load & Rotational speed

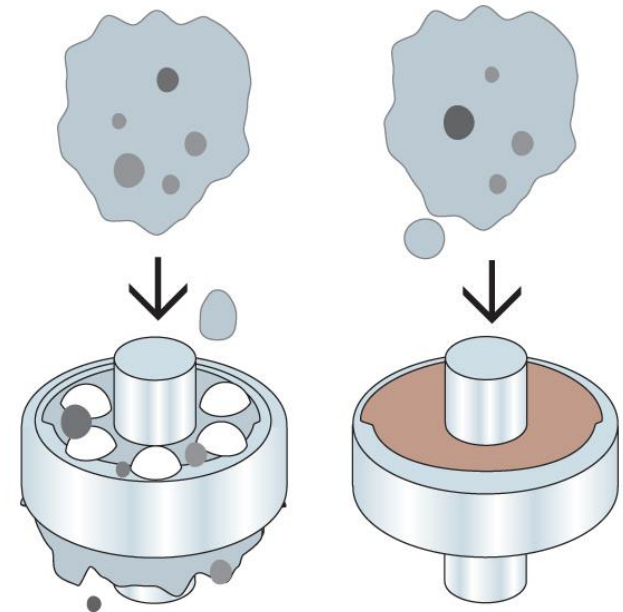
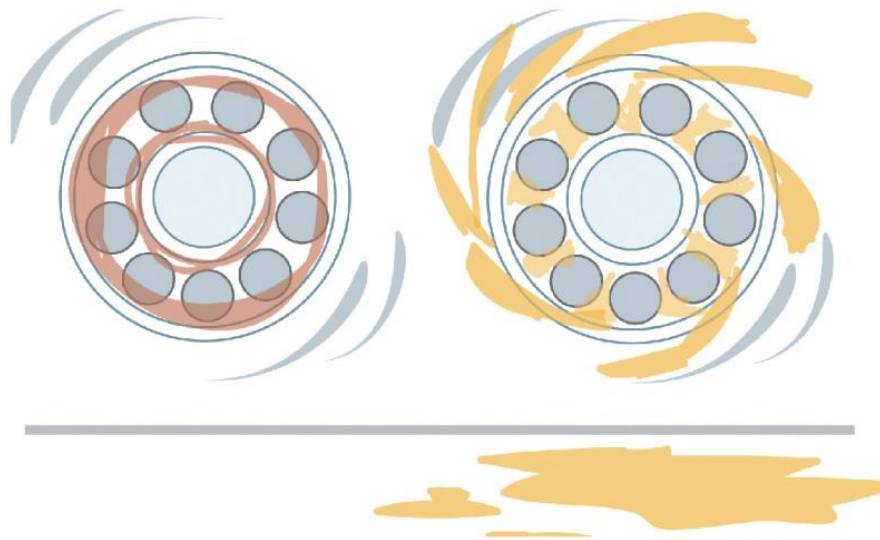
④ Required length of service

⑤ Environmental conditions (water, steam, chemicals)



## Grease versus Oil

- Lubricating ability
- Sealing ability
- Corrosion inhibiting ability
- Carrying ability

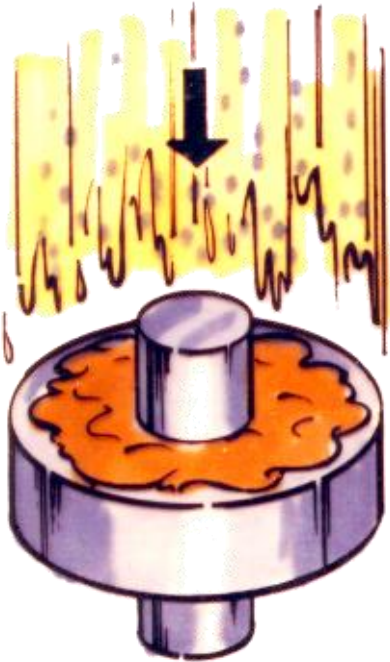


## Grease vs. Oil Lubricating Ability

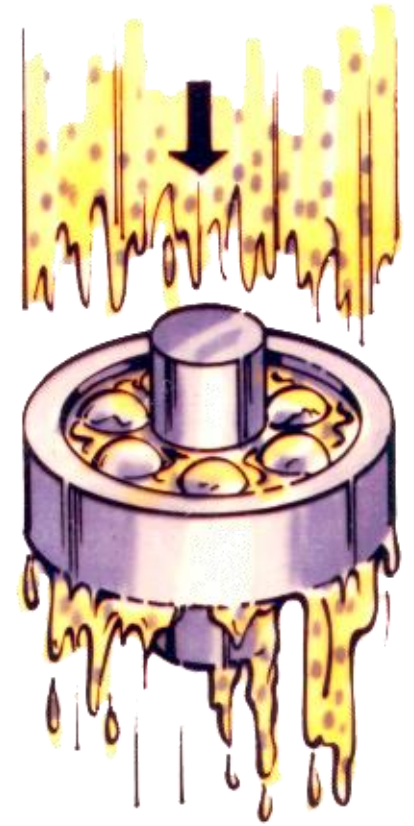
- Superior load carrying capacity
- Acts as reservoir of lubricant



## Grease vs. Oil Sealing

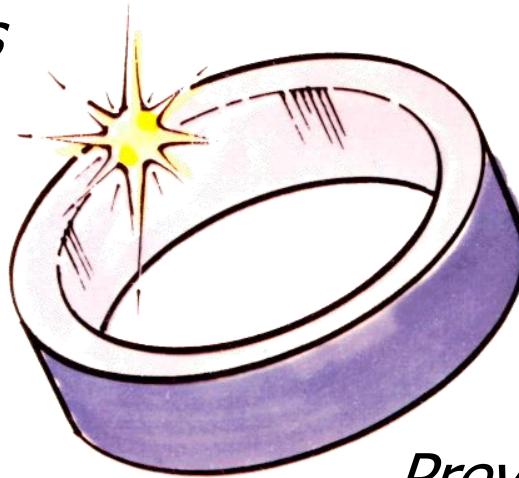


- Prevents fluid and solid contaminants from entering
- Eliminates problems with dripping and leakage
- Allows more freedom in design parameters



## Grease vs. Oil Corrosion Inhibiting

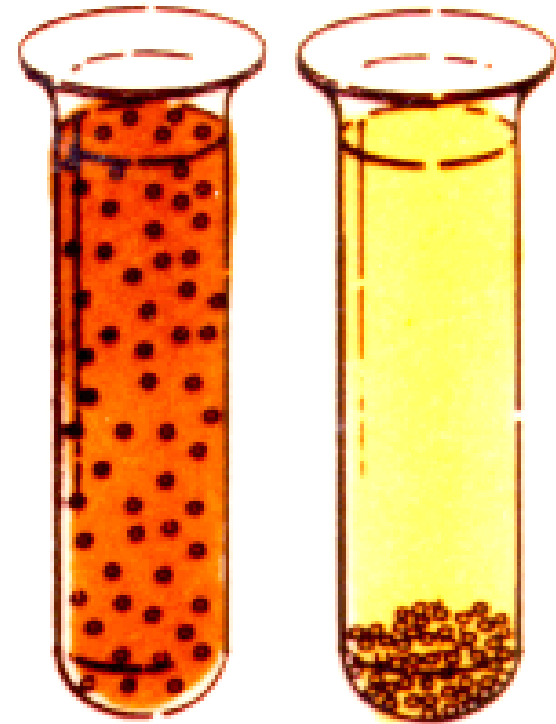
*Superior ability to adhere  
to metal surfaces*



*Prevents reactive liquids  
from coming into contact  
with the metal surfaces*

## Grease vs. oil Carrying Ability

- Consistency provides a firm matrix for additives
- Prevents sedimentation







# Advantages Grease VS Oil

- ☺ Greases act as a seal - no 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 reduce noise
- ☺ Bearing orientation irrelevant
- ☺ Life lubrication



## Disadvantages Grease VS Oil



- ☹ Greases may not reach all places in need of lubrication due to less free-flowing ( Eg. chain lubrication )
- ☹ Greases do not have any cleaning effect
- ☹ Greases do not work as cooling agent

# REGISTRATION



NSF or INS  
H1, 3H Registred

HALAL

**KEY  
WORDS**

KOSHER

ISO 21469  
Certified



## **Main difference of certification process between lubricating oil and grease**

- In general, H1 registration processes for all lubricants are reviewed the same way, based on end use regardless of the type (oil vs grease)
- Formulations, stick labels, MSDS

## Main difference of certification process between lubricating oil and grease

- Review the ingredients to appropriate regulations:

### Lubricating grease ≠ Lubricating oil

- ✓ Percentage of thickener should be taken into account (21 CFR 178.3570)
- ✓ Not only each ingredient, but also if several ingredients would be reacted to form another ingredient during the saponification, the use level limitations of the finished ingredient should also be taken into account



# Product Registration VS Product Certified

	NSF H1 Registered	ISO 21469 Certified
Formulations & Labels & MSDS	YES	YES
Manufacture process	NO	
Raw material and finished product stockage		
Contamination risk evaluation and prevention actions – Audit		
Annual Sample testing		



ISO 21469 Certified

# ISO 21469 COMMITMENT to COMPLIANCE

**ISO 21469** is a relatively new hygiene standard and the certification involves a four step accreditation process;

1. **Review of formulations and labels**
2. **Risk assessment**
3. **Physical audit of the production facility**
4. **Annual testing**



Certified dedicated  
production unit at AXEL  
FRANCE (Since 2009)



**Thanks for your attention!!!**  
**Questions???**

Zhaoying YU  
Food Grade Group Product Manager  
AXEL CHRISTIERNSSON  
Zhaoying.yu@axelch.com