Lubricants; Composition & Properties

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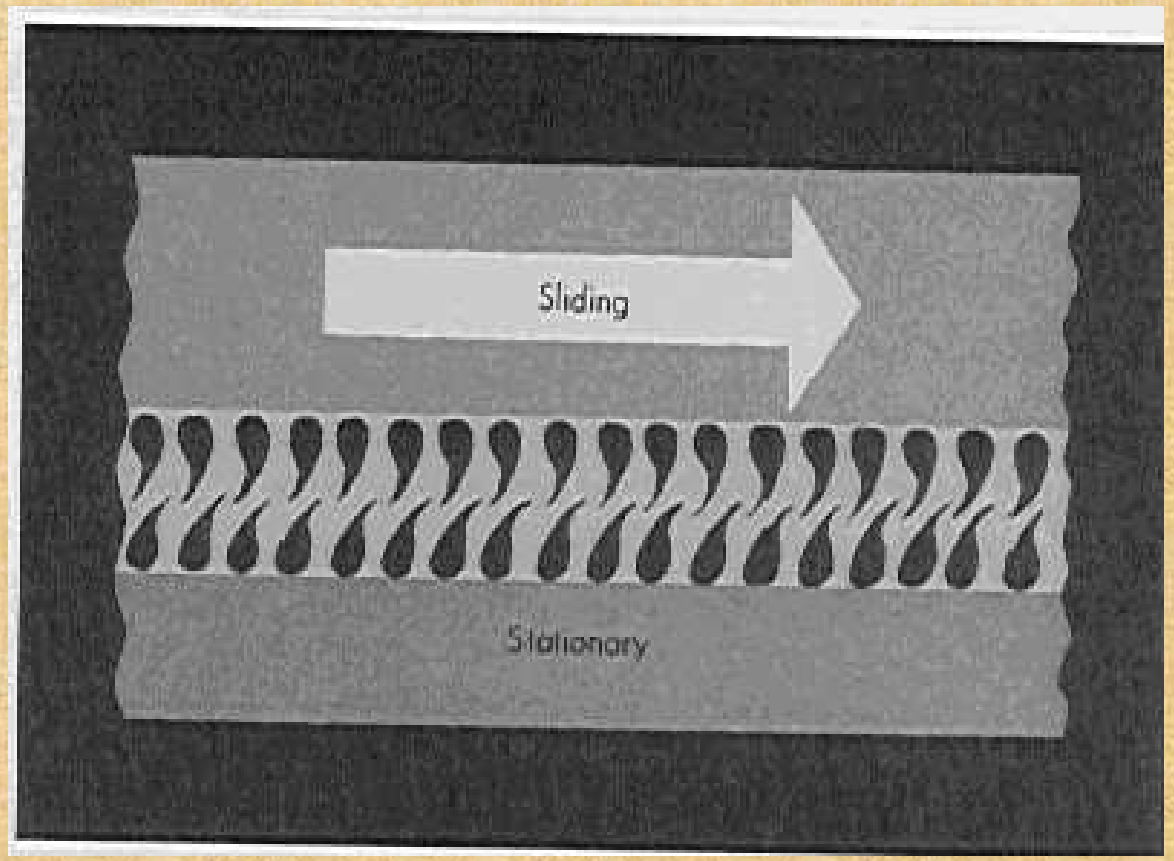
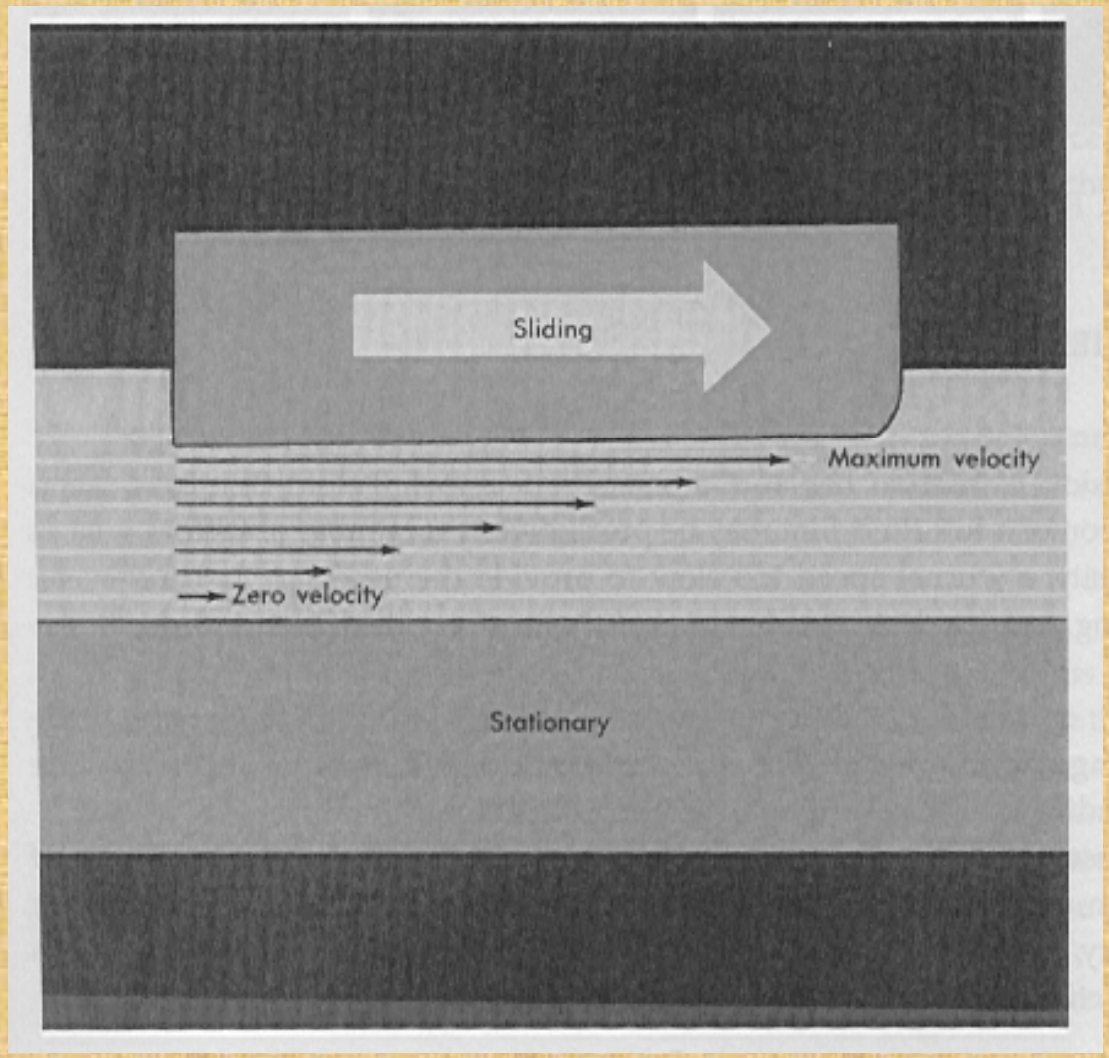
Why lubricants are needed

- Friction / Wear
- Heat Generation
- Combustion Products
- Sealing
- Material Protection

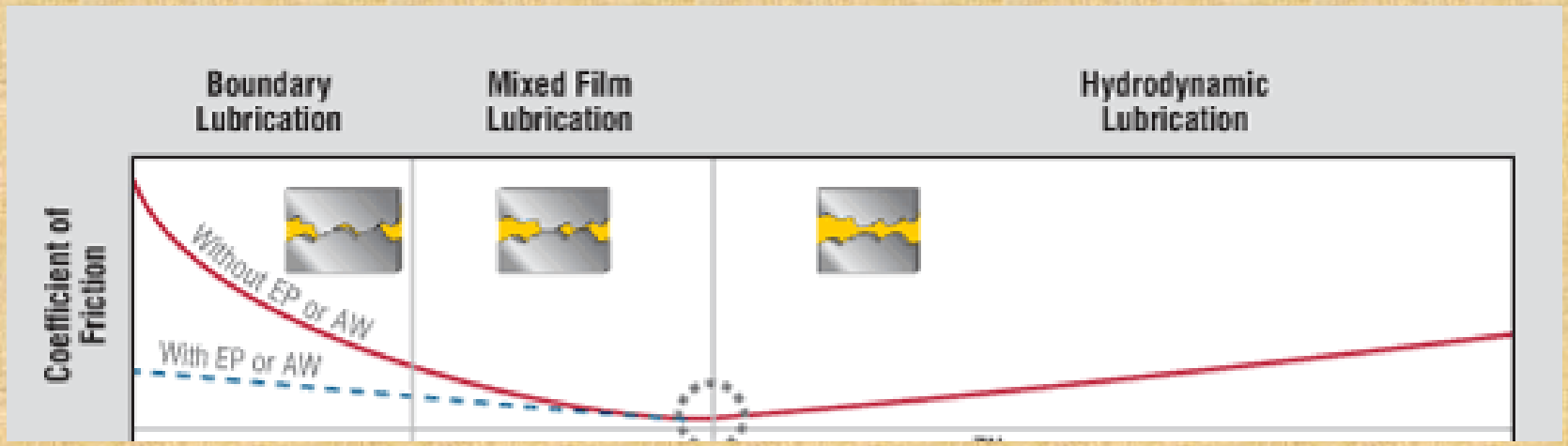
LUBRICATION



LUBRICATION



The Stribeck Curve



The Abscissa,

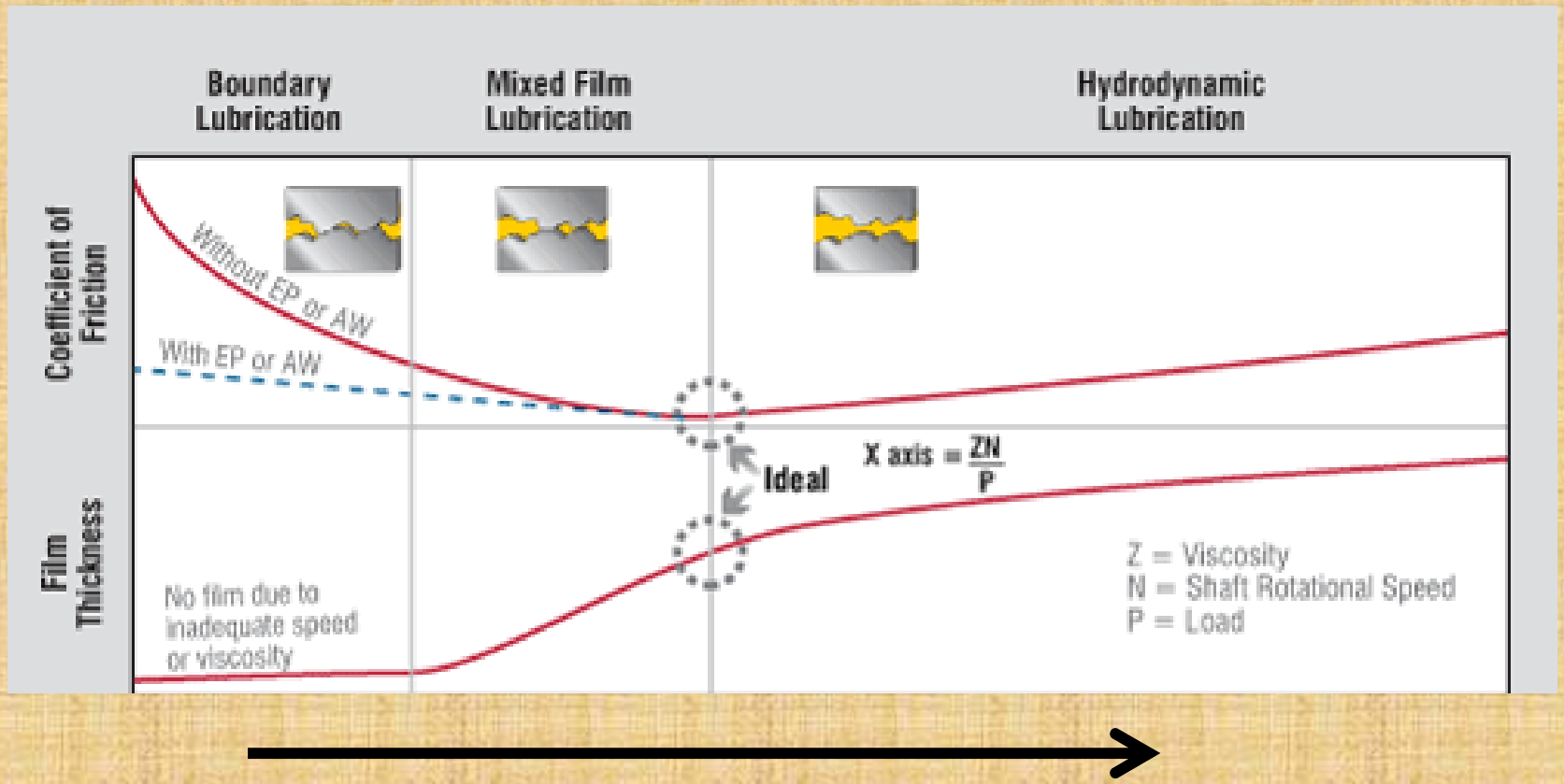
ZN/P

Where: Z = the oil's viscosity

N = speed

P = load on the lubricant film

The Stribeck Curve.....and the rest follows



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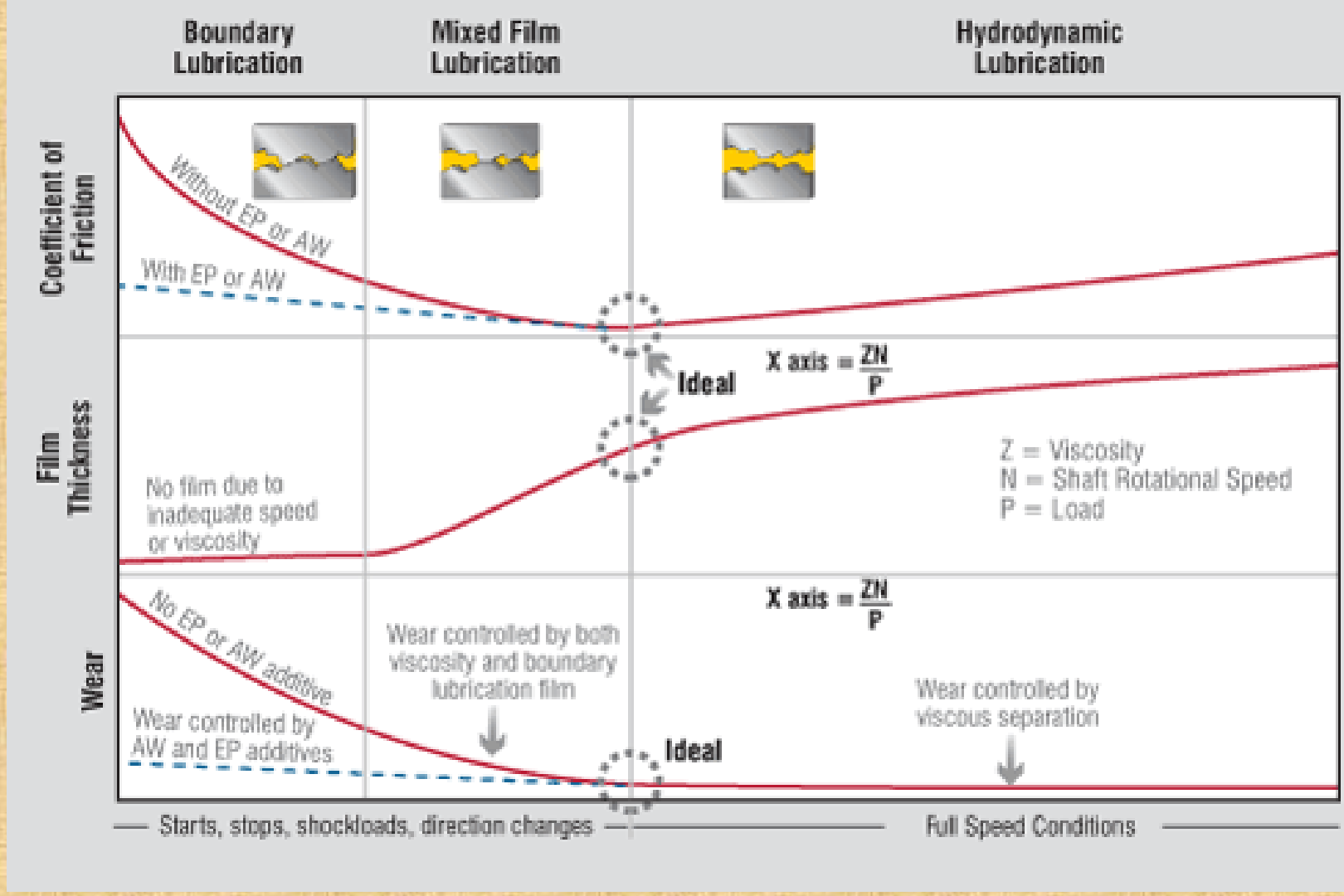


Lubrication Systems:

ONCE THROUGH OIL SYSTEM

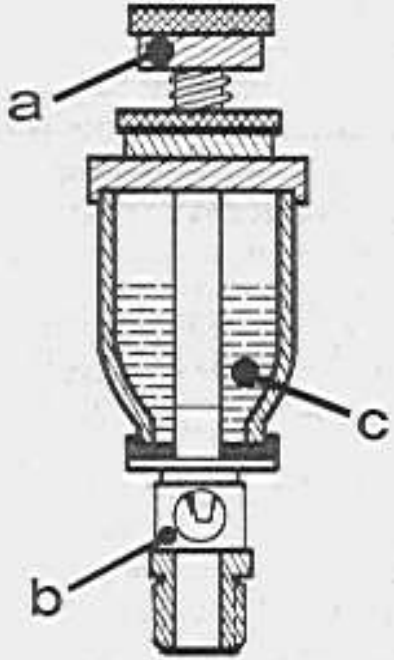


Fig. 1.40 Drip feed.
a Adjustable screw
b Sight glass for drop control
c Lubricant

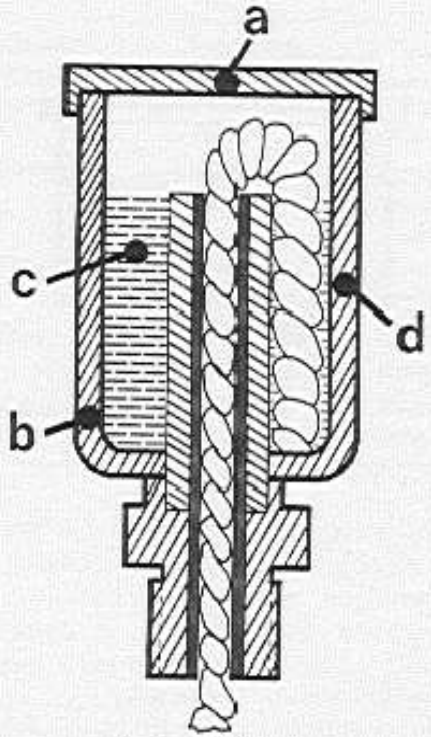


Fig. 1.41 Wick oiler.
a Screwed lid
b Base
c Lubricant
d Wick

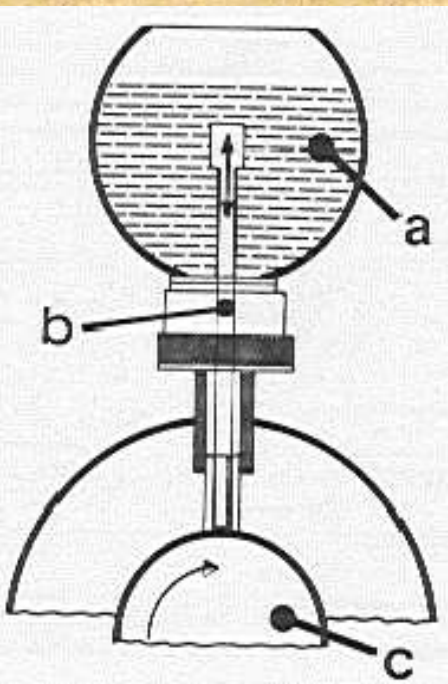
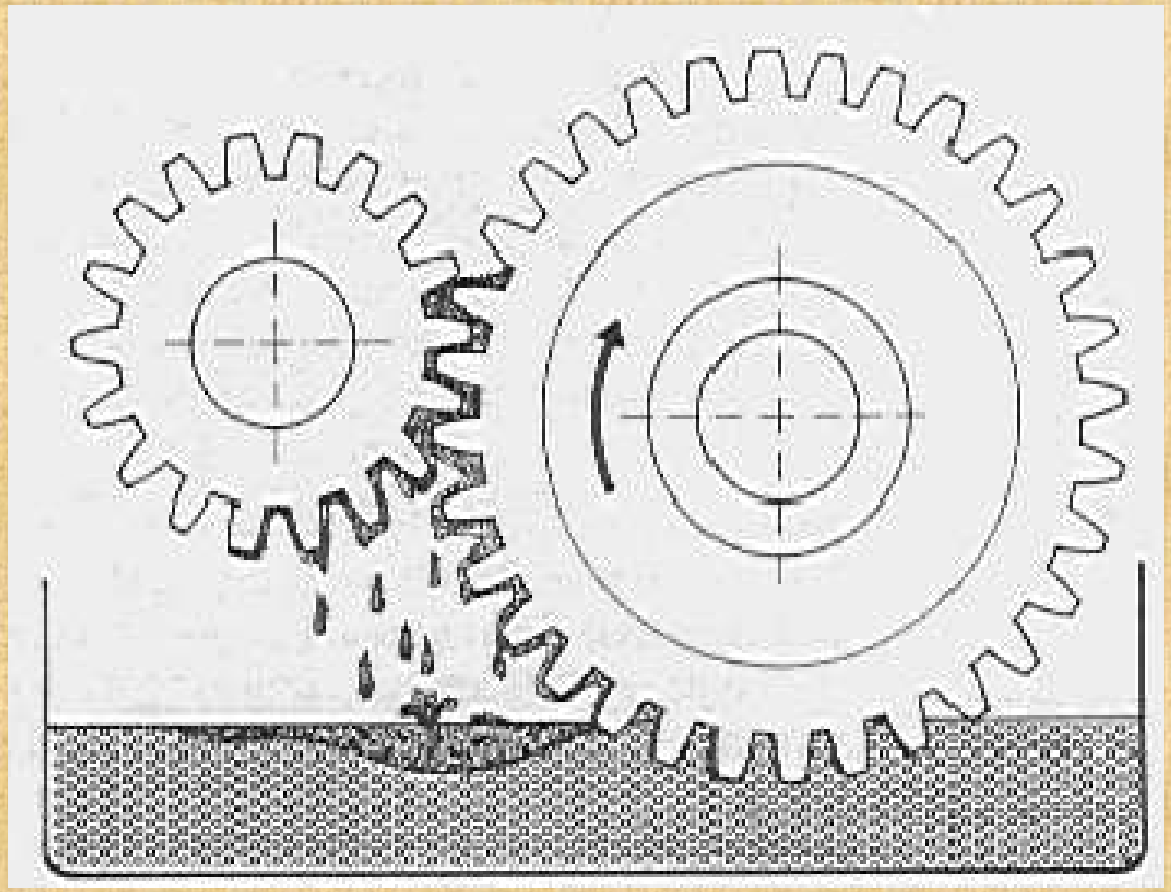


Fig. 1.42 Needle oiler.
a Lubricant
b Moving rod
c Rotating axle

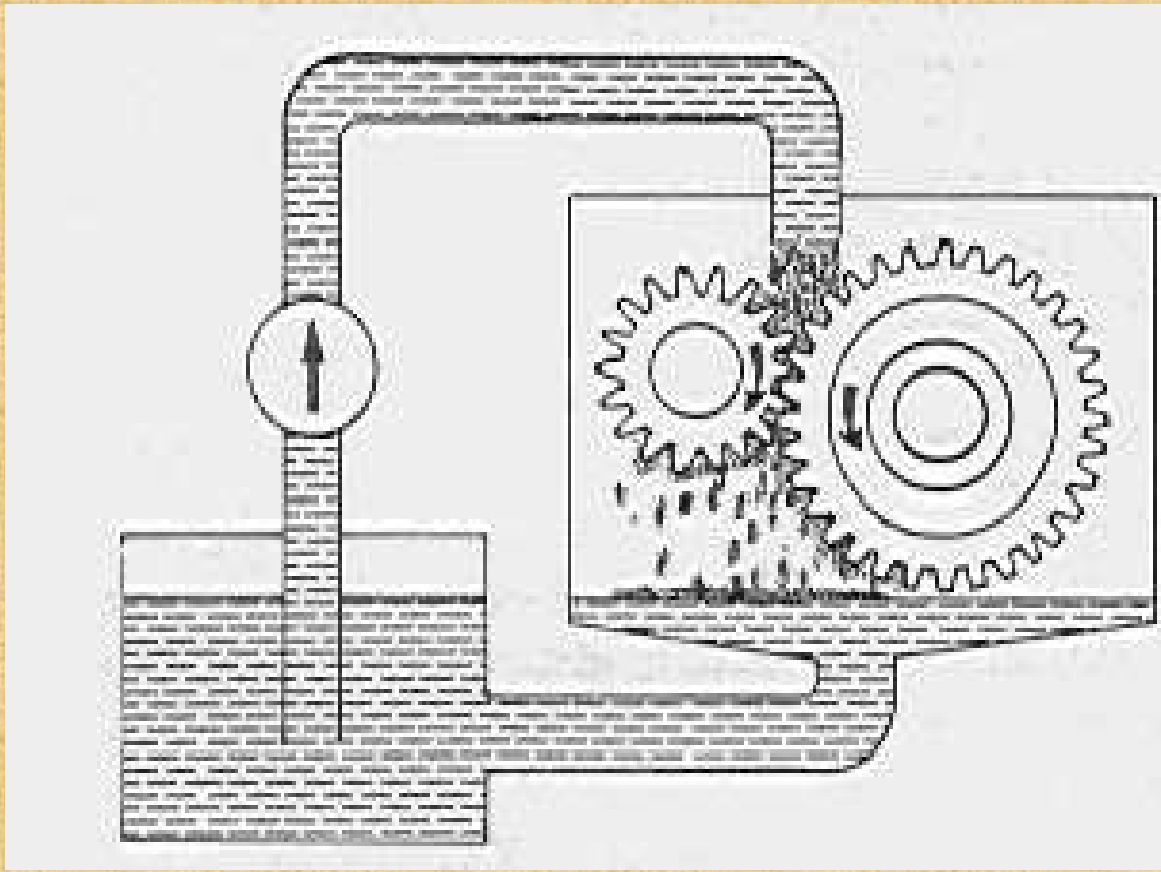
Lubrication Systems:

BATH LUBRICATING SYSTEM



Lubrication Systems:

CIRCULATING LUBE OIL SYSTEM



Composition:

LUBRICANT IS MADE OF

BASE OIL + ***ADDITIVES***

PARRAFFINIC (HVI)

NAPHTHENIC (MVI)

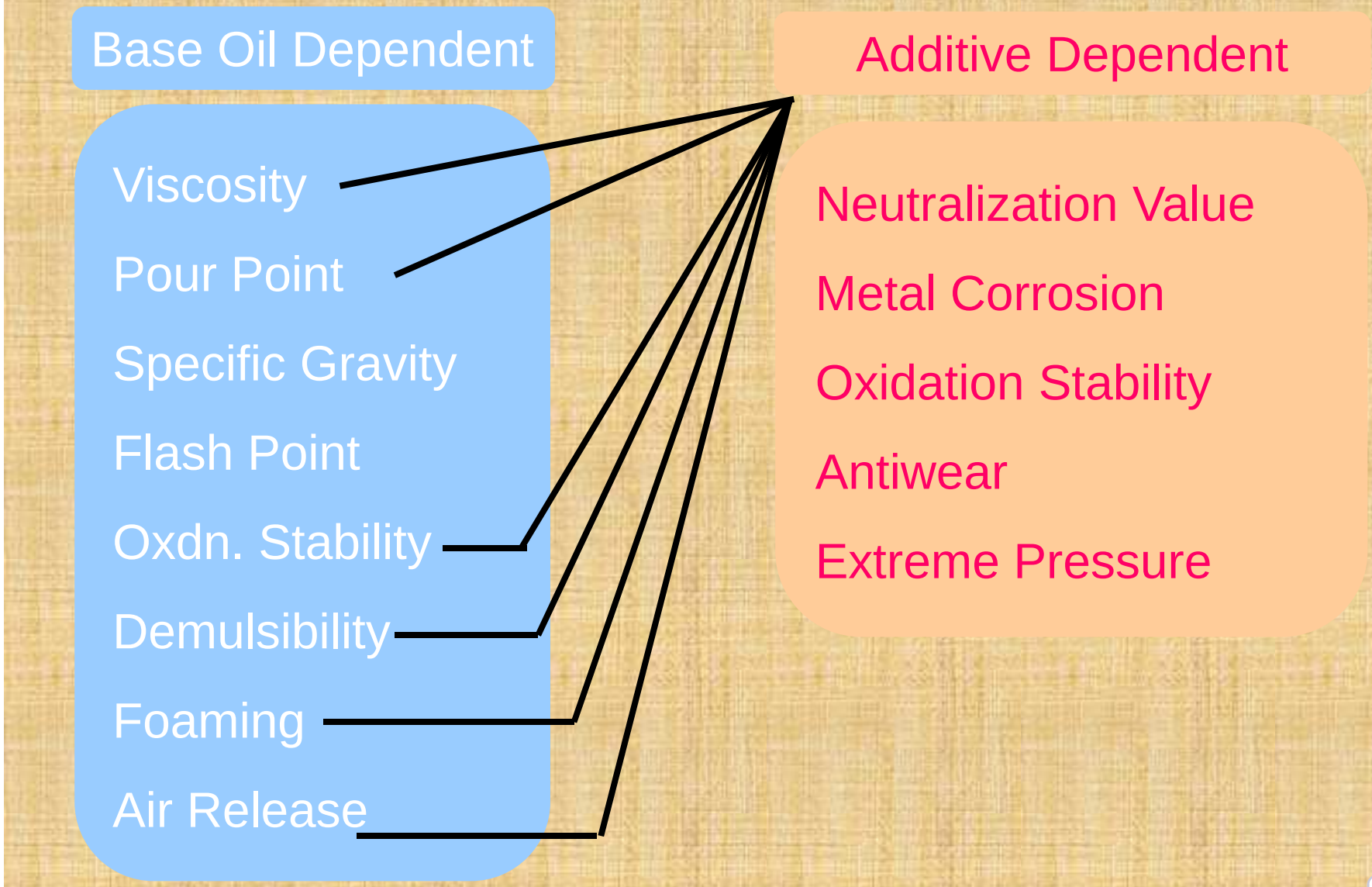
AROMATIC (LVI)

LUBE PROTECTION

ADD PERFORMANCE

SURFACE PROTECTION

Properties of Lubricants



LUBRICANT PROPERTIES

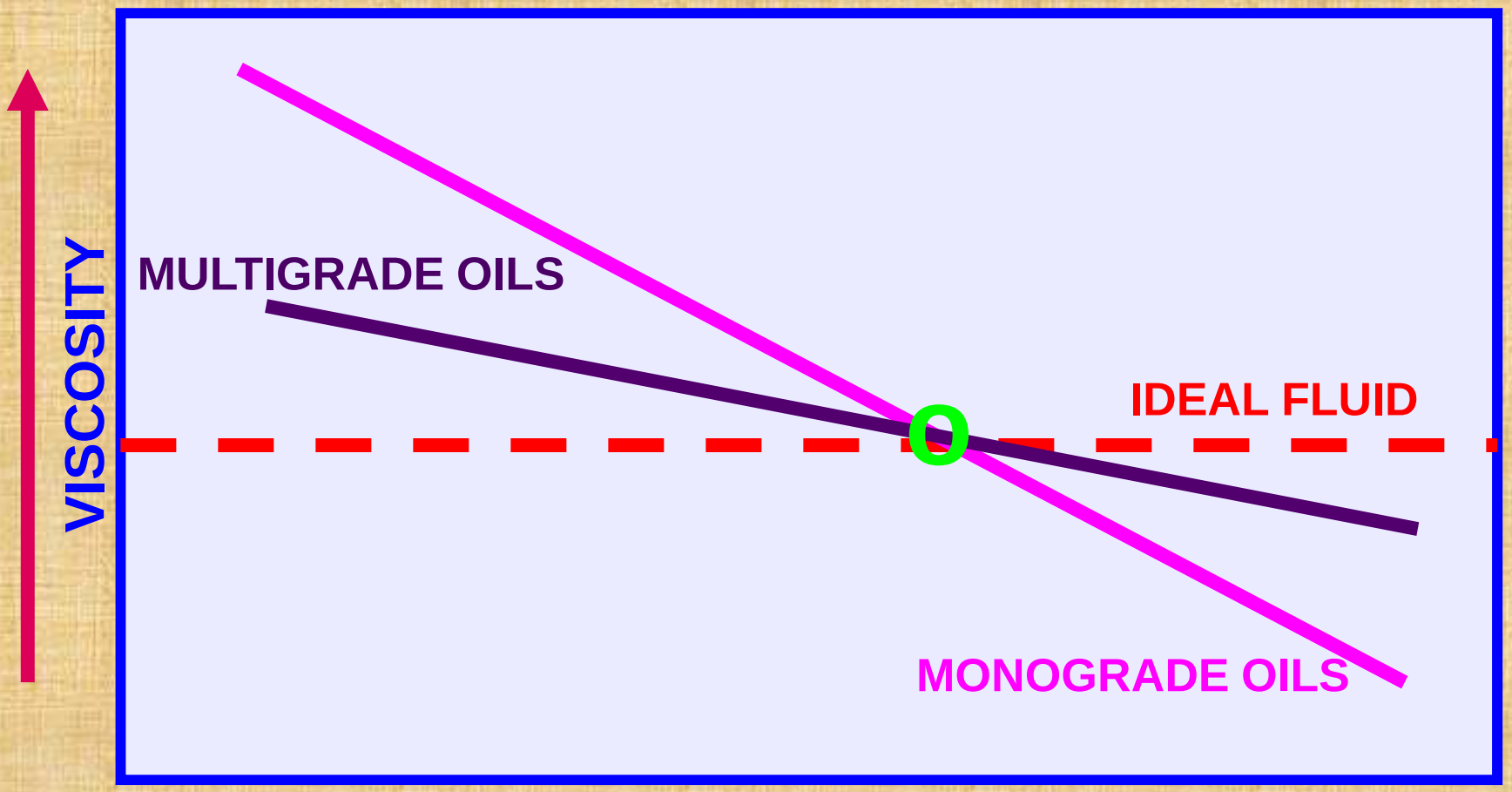
1. KINEMATIC VISCOSITY

- RESISTANCE TO FLOW
- UNIT : cSt (CM^2/SEC)
- SAE NOS. FOR AUTOMOTIVE GRADES
- ISO VG NOS. FOR INDUSTRIAL GRADES

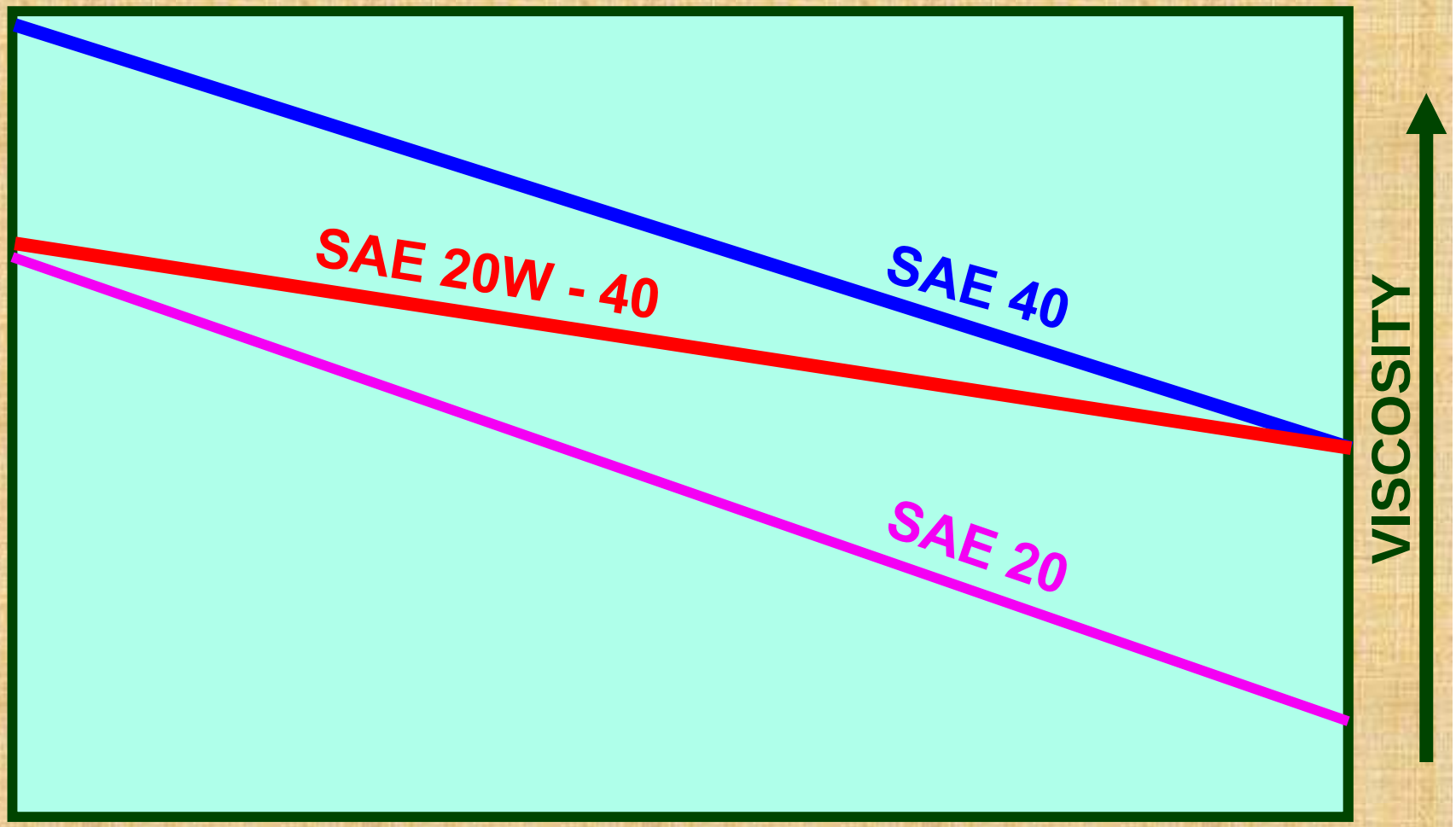
2. VISCOSITY INDEX

- INDICATES CHANGE OF VISCOSITY WITH TEMP.
- EMPIRICAL NO.
- HVI, MVI AND LVI OILS

" IDEAL" FLUID : FOR AUTOMOTIVE ENGINE DESIGNER



A TYPICAL VISCOSITY - TEMPERATURE GRAPHS



LUBRICANT PROPERTIES

3. FLASH POINT

- TEMP. AT WHICH PRODUCT IGNITES IN PRESENCE OF A FLAME
- IMPORTANT FROM SAFETY ANGLE

4. POUR POINT

- LOWEST TEMP. AT WHICH OIL IS OBSERVED TO FLOW

5. OXIDATION STABILITY

- ABILITY TO RESIST OXIDATION
- ACCELERATED BY HIGH OPERATING TEMP.
- PRESENCE OF CERTAIN METALS ACT AS CATALYST
- DETERMINES LIFE OF THE OIL

LUBRICANT PROPERTIES

6. DETERGENCY

- ABILITY TO KEEP THE SYSTEM CLEAN

7. DISPERSANCY

- ABILITY TO KEEP HARMFUL PARTICLES IN SUSPENSION

8. DEMULSIBILITY: RESISTANCE TO EMULSION

- WATER SEPERATION ABILITY

9. ANTI - WEAR PROPERTY

- REDUCE WEAR BY FORMING A FILM BETWEEN SLIDING SURFACES

LUBRICANT PROPERTIES

11. EXTREME PRESSURE

- ABILITY TO WITHSTAND SHOCK LOADING AND IMPACT LOADS.

12. CORROSION RESISTANCE

- ABILITY TO PROTECT METAL AGAINST CORROSION AND RUST.

13. ANTI - FOAM

- CAPACITY OF BREAKING AIR BUBBLES REACHING THE OIL SURFACE

LUBRICANT PROPERTIES

14. BASICSITY - TOTAL BASE NUMBER

- Neutralization of acid production in Engines

15. AIR RELEASE PROPERTY

- ABILITY TO RELEASE ENTRAINED AIR IN OIL

16. ADHESIVENESS

- ABILITY TO WET THE SURFACES
- ADDITION OF FATTY OILs

Lubricant Additives

What is an Additive in the Lubricant ?

- Any material added to the base stock to to change its properties , characteristics and performance .
- Improve existing properties:
  - Viscosity improver
  - Pour Point Depressant
  - Friction Modifiers
- Impart new properties
  - Detergents/dispersants
  - Anti Oxidants
  - Oiliness and Tackiness Agents
- Protect base stock properties
  - Anti Oxidants, Anti Foamants, Acid neutralizers

General Properties Of Additives

- Solubility In Base Petroleum Product
- Color / Odor : Additive blended product color and Odor should not give an impression of inferiority .
- Volatility : The volatility should be low, especially in High Temperature applications .
- Stability :An additive should remain stable in blending, storage and use . It implies chemical, thermal and hydrolytic stability .
- Compatibility :Two or more additive blends should be compatible to each other's properties .

Common Additives In An Engine Oil

- VI Improvers
- Detergent & Dispersants
- Antiwear
- Oxidation Inhibitors
- Corrosion & Rust Inhibitors
- Metal Deactivators
- Defoamant
- Pour Point Depressant

Detergents

- Provides detergency for engine cleanliness
- Neutralize acids , prevent corrosion from acids .
- Calcium, barium salts of petroleum sulfonic acids, phenates and salicylates, phosphorous containing polymers used .

Dispersants

- Function is to keep the sludge, carbon ,varnish and other deposits in colloidal suspension .
- Reduce the deposit formation and minimizes particulate wear and oil thickening.
- Dispersants have a oxygen, nitrogen based polar group and a large non polar group, usually a polymeric olefin .

Oxidation Inhibitors

- Decrease oil oxidation , reducing oil degradation and corrosive action of the oil .
- Classified as primary and secondary anti oxidants .
- Eg are Hindered Phenols,Aromatic amines, ZnDDP, Metal Deactivators such as Disalicylidene propylene diammine and substituted benzatriazole

Extreme Pressure Additives

- EP additive also known as Anti Scuffing additive .
- Form protective film on the metal surface by reacting chemically with the metal surface to form a layer at conditions of high temperature (>1000 deg F)
- Zinc Dialkyl di thio phosphate,tricresyl phosphate,organic phosphate,chlorinated and sulpherised hydrocarbons, metal soaps of lead, antimony and molybdenum used .

Anti Wear Additive

- Anti wear reduces the wear at low and medium speeds.
- Works by forming an oxide film on the metal surface thus preventing the metal-metal contact and also inhibiting action from the rust and corrosion initiators .
- Eg are ZNDDP (Zinc Dialkyl Dithio Phosphate)

VI Improvers

- Used in case of varied temperature applications.
- Polymers are used, which expand with increasing temperature to counter act oil thinning .
- Poly iso butylene, Methacrillates, Acrylate polymers , Olefin copolymers are used .

Pour Point Depressants

- Pour Point depressants work at low temperatures by minimizing the formation of wax networks and thereby reducing the amount of oil bound up in the network .
- Examples are Polyalkyl methacrylates, styrene ester polymers, alkylated napthalenes, ethylene vinyl acetate copolymers and ploy furmates .

Rust / Corrosion Inhibitors

- Prevents corrosion and rusting of metal parts in contact with the lubricant .
- Commonly used are Zinc diothiophosphate,metal phenolates,basic metal sulfonates,fatty acids and amines .

LUBRICANTS MANUFACTURING

LUBRICANT BLENDING

1. SCHEDULING
2. DEHYDRATION OF BASE OILS
3. Q/C CHECKS OF BASE OILS
4. BLENDING OF BASE OILS & ADDITIVES
5. Q/C CHECKS OF BLENDED PRODUCT
6. FINISHED LUBRICANTS

KEY PROCESS

- Base Oils Receipt
- Additives Receipt
- Blending
- Quality Control
- Filling
- Distribution

THANK YOU