Lubricants – Lubricating Oils

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Budapesti Műszaki- és Gazdaságtudományi Egyetem

Agenda

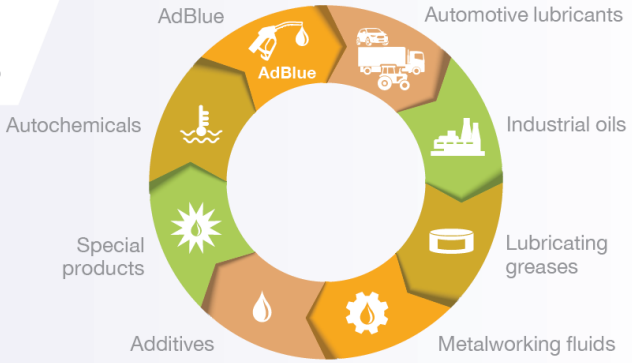
MOL LUB Ltd.

Lubricants

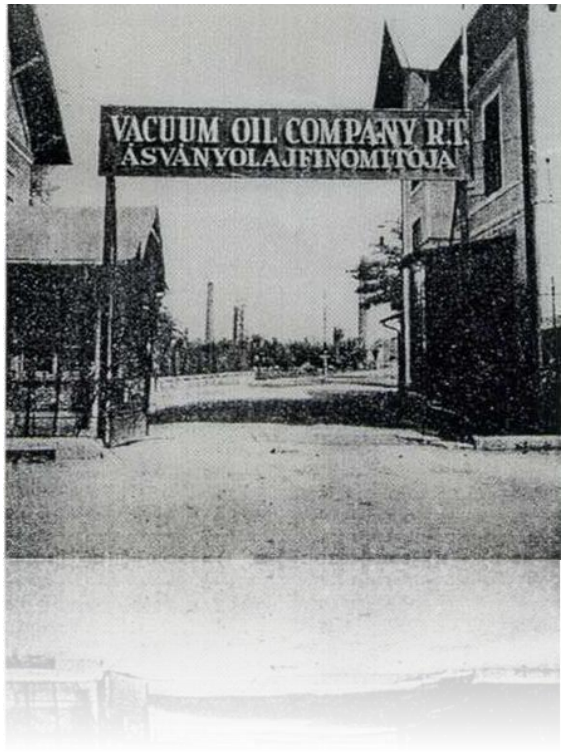
Lubricating oils

MOL-LUB Ltd.

MORE THAN
300 OEM APPROVALS



MOL LUBRICANTS
110 YEARS



900 products, more than **2000** packaging

Own lubricant R&D, production & laboratory in Hungary and Croatia

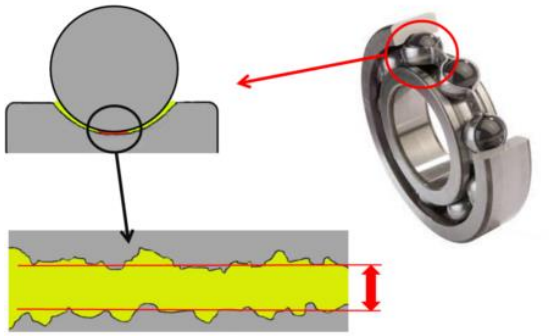
MOL

HISTORY OF LUBRICANTS

- Lubricants have been present since the first mechanical parts
- First shafts were made of wood, and their rotation was aided by animal fats.
- During the Industrial Revolution lubricants served as coolants
- The improvement of mechanical parts and the increasingly severe conditions require continuously improving lubricants.

TASKS OF LUBRICANTS

- Lubricants produce a liquid film between moving mechanical parts.
  - They decrease the coefficient of friction
  - Reduce wear
  - Protect mechanical parts from seizure
  - Protect and passivise surfaces,
  - Inhibit corrosion
  - Etc.
  - Increase the life of equipment!



Lubricants have become structural elements!

TYPES OF LUBRICANTS

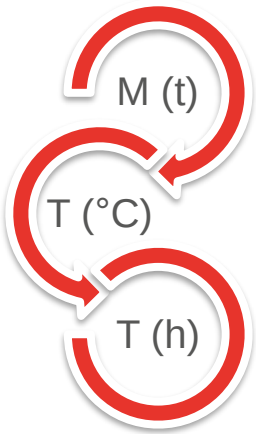
- **PHYSICAL STATE**
  - Gases
  - Liquids
  - Consistent materials
  - Solid lubricants
- **Application conditions determine the selection of lubricant, therefore the highest demand is for liquid lubricants**

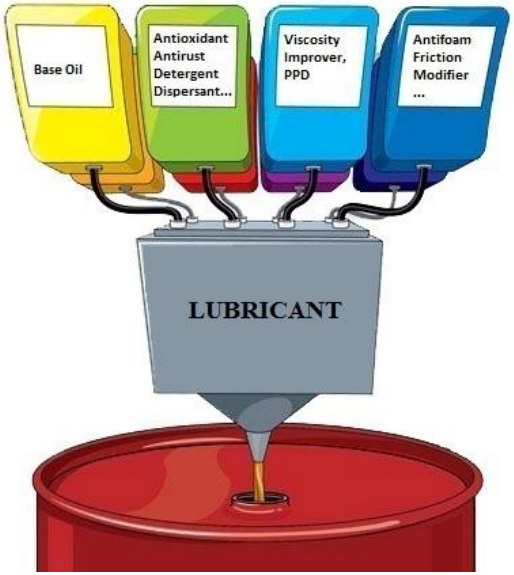
USE OF LUBRICATING OILS

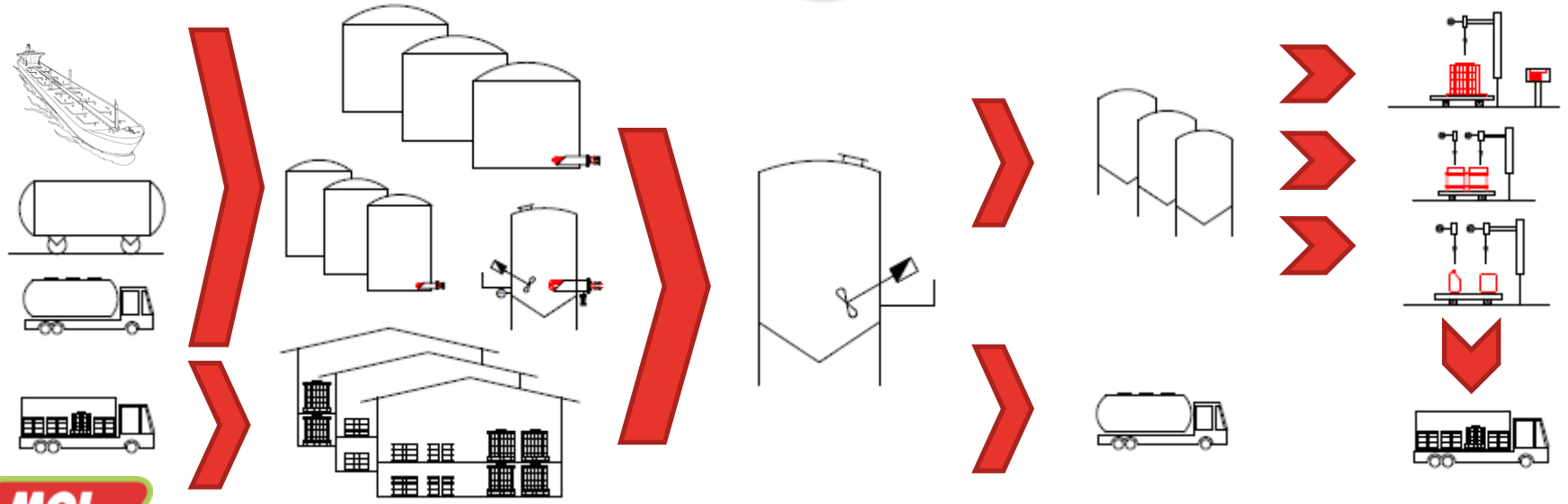
- Automotive lubricants
  - Engine oils
  - Gear oils
- Industrial oils
  - Hydraulic oils
  - Turbine oils
  - Compressor oils
  - Oils for machine tools
  - Heat transfer oils
- Other areas
  - Food industry
  - Pharmaceutical (white) oils

PRODUCTION OF LUBRICATING OILS

- „Oil blending”
- Batch operation







COMPOSITION OF ENGINE OILS

- ~ 80% base oil
- Mineral
  - Gr. I.
  - Gr. II.
  - Gr. III.
- Synthetic
  - Gr. IV (PAO)
  - Gr. V (other, eg. esters)

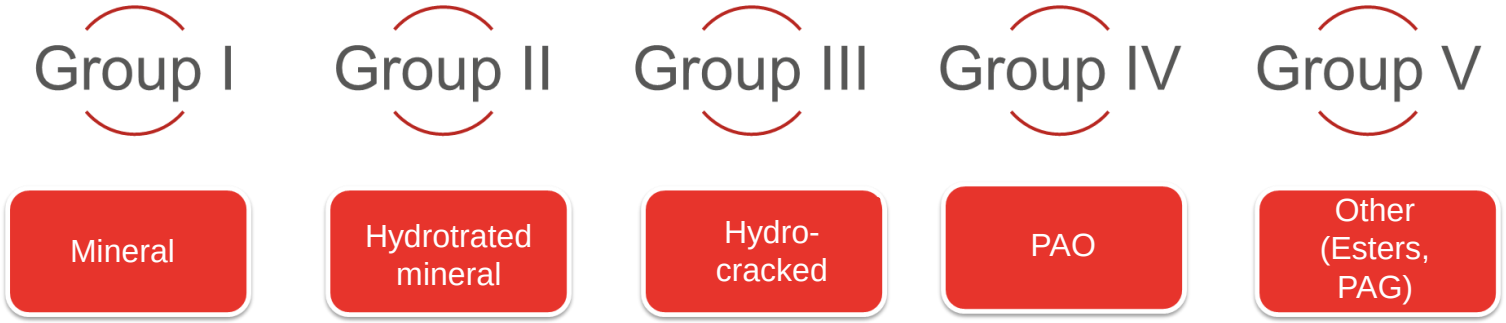
- ~ 20% additive
  - Viscosity Modifier
  - Pour Point Depressant
  - Detergent
  - Dispersant
  - Anti-Wear additive
  - Oxidation inhibitor
  - Friction Modifier
  - Foam Inhibitor

FUNCTION OF BASE OILS

- Role of Base Oils in Lubricants
  - Provides some level of lubrication
  - Solvent for additives
  - Medium for heat transfer
  - Cleaning agent
  - Provides flow properties

TYPES OF BASE OILS

API Base Oil categories				
BO Group	S content (m/m) %		Saturated hydrocarbons (m/m) %	Viscosity Index
Group I	> 0,03	And/or	< 90	80 - 119
Group II	< 0,03	And	> 90	80 - 119
Group III	< 0,03	And	> 90	> 120
Group IV	Polyalphaolefins (PAO)			
Group V	Other base oils			



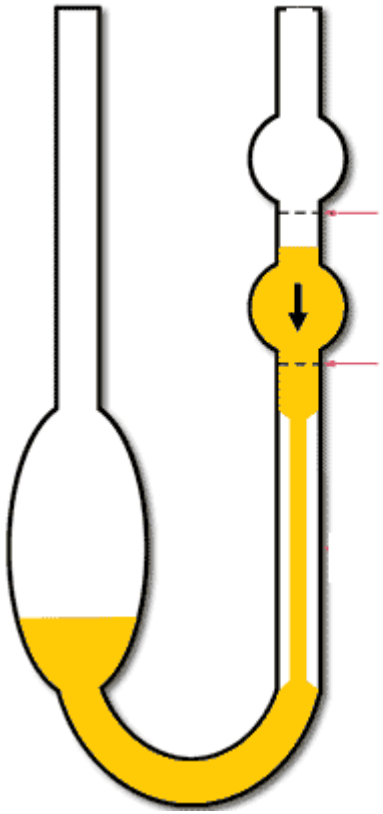
MOST IMPORTANT PARAMATER

Kinematic Viscosity

- A fluid's resistance to gradual deformation by stress
- „How thick the fluid is"

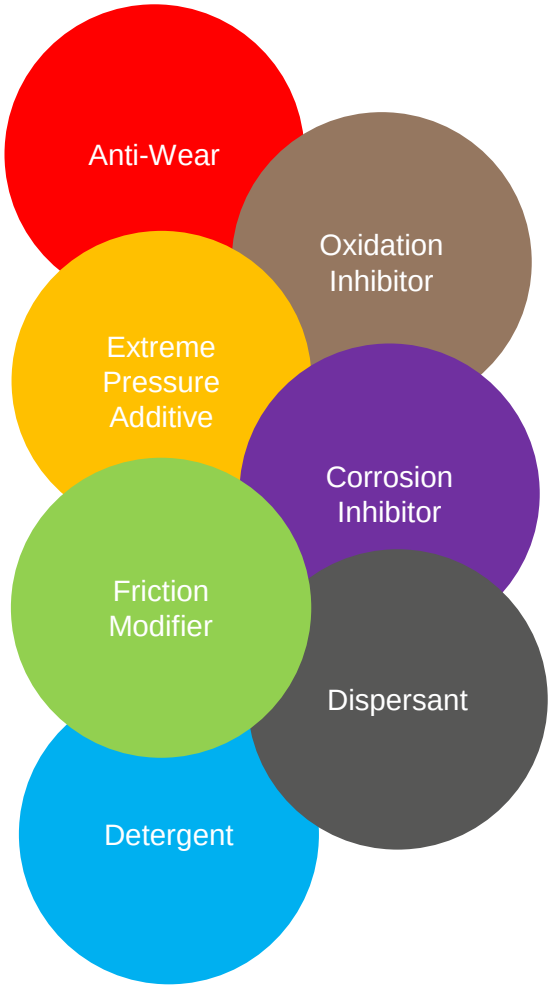
$$\mu = \frac{\pi \times r^4 \times g \times l \times t}{8L \times V} = k \times (t_1 - t_2)$$

μ:	Kinematic Viscosity
r:	Radius of capillary
l:	Average hydrostatic head
g:	g force
V:	Volumetric speed
t:	Time
k:	Capillary constant

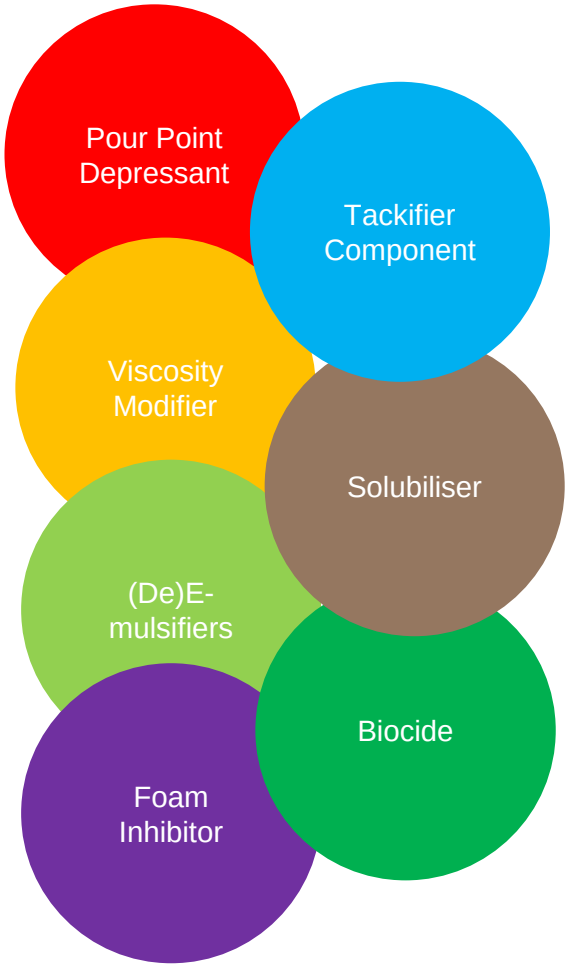


ADDITIVES

Active

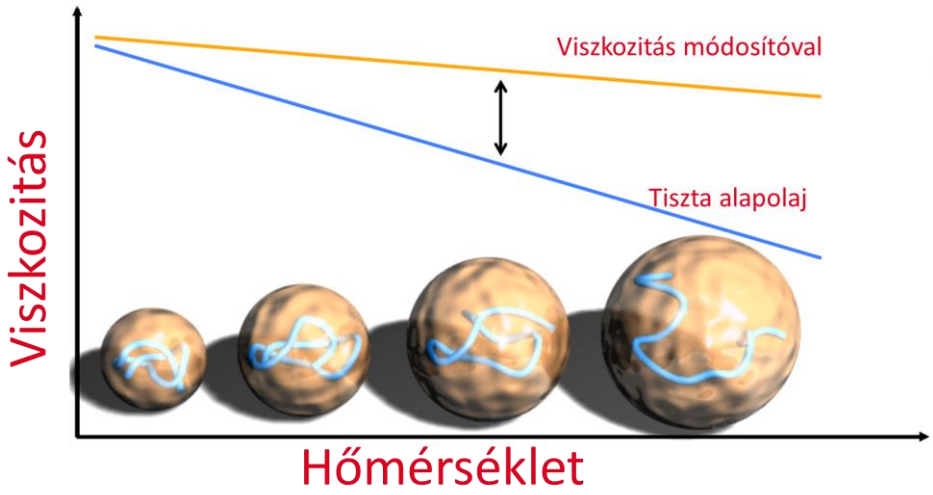


Inactive

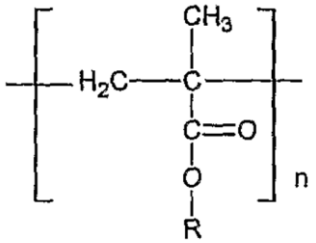


MOST IMPORTANT ADDITIVES

Viscosity Modifier



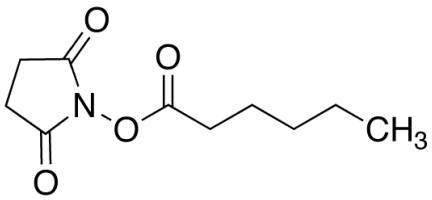
Pour Point Depressant

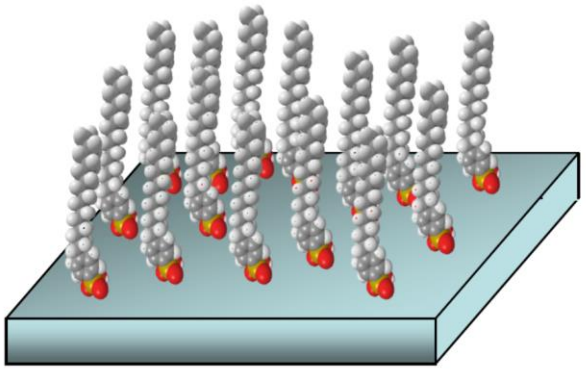


PAMA

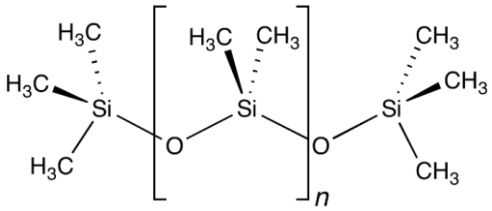
MOST IMPORTANT ADDITIVES - II

Dispersant





Foam Inhibitor



WHAT'S ON THE BOTTLE?

Viszkozitási osztályok (SAE J 300)

	CCS max. cP	MRV max. cP	Kinematikai viszkozitás, 100°C min. cSt	Kinematikai viszkozitás, 100°C max. cSt	HTHSV, 150°C min. cP
0W	6,200 at -35	60,000 at -40	3.8	-	-
5W	6,600 at -30	60,000 at -35	3.8	-	-
10W	7,000 at -25	60,000 at -30	4.1	-	-
15W	7,000 at -20	60,000 at -25	5.6	-	-
20W	9,500 at -15	60,000 at -20	5.6	-	-
25W	13,000 at -10	60,000 at -15	9.3	-	-
20	-	-	5.6	< 9.3	2.6
30	-	-	9.3	< 12.5	2.9
40	-	-	12.5	< 16.3	2.9 (0W-40, 5W-40, and 10W-40 grades)
40	-	-	12.5	< 16.3	3.7 (15W-40, 20W-40, 25W-40, 40 grades)
50	-	-	16.3	< 21.9	3.7
60	-	-	21.9	< 26.1	3.7