Advantage Lubricants Engineering for Industry

ความรู้พื้นฐานน้ำมันตัดและการใช้งาน

Basic Knowledge of Metal Cutting Oils And Application

ISO 9000:2008

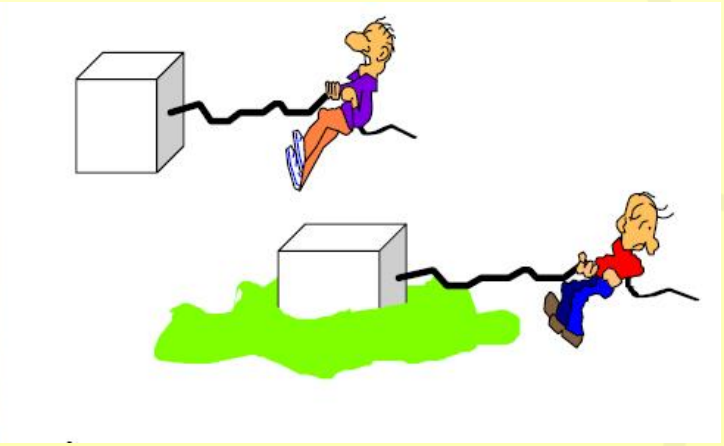
www.98Oils.com

Metal Cutting Fluids

- Types of Metal Cutting Fluids
- Composition of Metal Cutting Fluids
- Properties of Metal Cutting Fluids
- Maintenance of Metal Cutting Fluids
- Problems and Trouble Shooting Guide
- Keeping the Fluid Clean
- Cleaning Out Machines
- Storing Fluids

Function of Metal Cutting Fluids

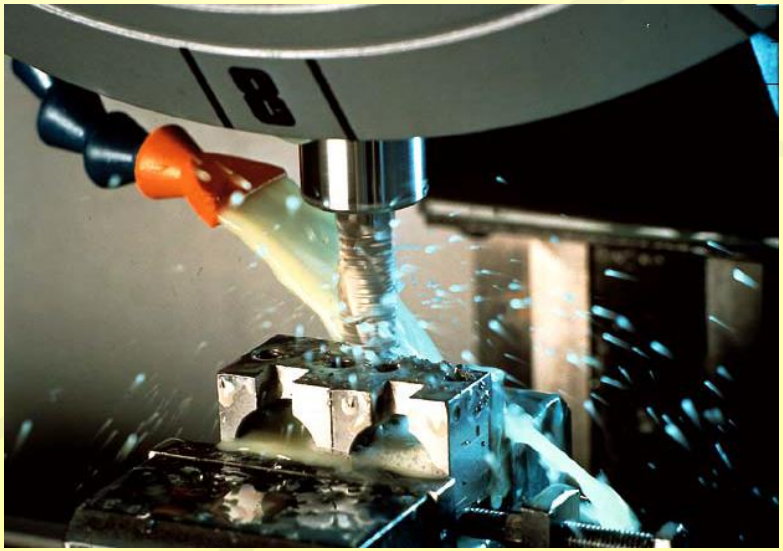
- **Lubricating**



thereby reduce friction between the tool and the work piece

Function of Metal Cutting Fluids

- **Cooling**



To reduce and transfer heat build-up in the cutting zone and in the work piece.

Additional Function of Metal Cutting Fluids

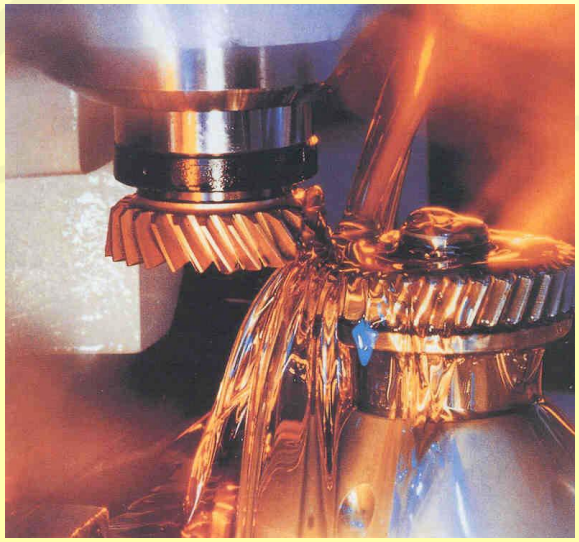
- Ship removal: Remove ships away from cutting zone
- Rust and corrosion protection
- Lubricating: thereby reduce friction between the tool and the work piece

Excellent Properties of Metal Cutting Fluids

- To reduce and transfer heat build-up in the cutting zone and in the work piece.
- Lubricating and thereby reduce friction between the tool and work piece.
- Remove ships away from cutting zone.
- Lubricating provided by the fluid molecules applying pressure to separate the tool and work piece.
- Rust and corrosion protection.
- Anti-foam and anti-mist
- Safe for workman
- Environmental friendly

Types of Metal Cutting Fluids

- **Neat Cutting Oils**



Lubricating, reduce friction

Types of Metal Cutting Fluid

- **Water-based Cutting Oils**

Cooling and reduce temperature

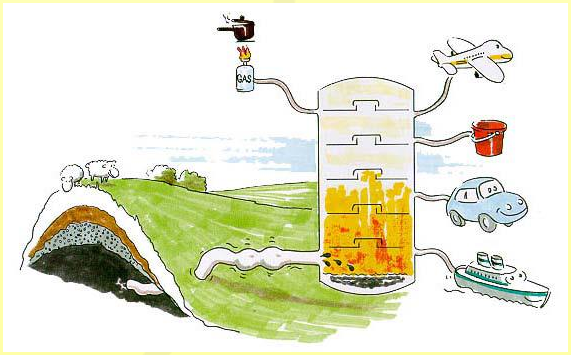
❑ Water-based Cutting Oils

- Milky
  - ✓ Base oil 70-90%
  - ✓ Milk color
- Semi-Synthetic
  - ✓ Base oil 3-40%
  - ✓ Translucent
- Synthetic
  - ✓ No base oil
  - ✓ clear

Composition of Metal Cutting Fluid

❑ Neat Cutting Oil

- Base oils : Mineral oil
- Additives
  - Anti-Mist
  - Anti-Oxidation
  - Fat for reduce friction



Advantages of Metal Cutting Fluids

❑ Neat Cutting Oil

- Lubricating and extreme pressure
- Corrosion protection for work piece and machine
- Prolong tool life (Low speed)
- No rancidity problems
- Easy to maintenance

Disadvantages of Metal Cutting Fluids

❑ Neat Cutting Oil

- Poor heat transfer
- High cost to maintenance
- Short tool life (High speed)
- Oil-mist occur
- Stains with brass and copper (yellow metals)
- Skin irritation
- Dirty

Composition of Metal Cutting Fluids

- **Water-based Cutting Oils**
  - Base Oils : Mineral oils for lubricating
  - Emulsifier additives
  - Water
  - Dye

Composition of Metal Cutting Fluids

❑ Water-based Cutting Oils

- Additive
  - ✓ Extreme pressure
  - ✓ Corrosion protection
  - ✓ Anti-staining agents.
  - ✓ Alkaline agents
  - ✓ Biocides
  - ✓ Anti-foaming agents

Advantages of Metal Cutting Fluids

- **Water-based Cutting Oils**
  - Rapidly transfer heat
  - Long tool life
  - Increase cutting speed
  - Good finish surface
  - Save cost

Disadvantages of Metal Cutting Fluids

❑ Water-based Cutting Oils

- Can not use for heavy duty because poor lubricating
- Short term for protect corrosion
- Reacted with paint and seal (synthetic type)
- Short sump life because easy to bacteria smell (milky type)
- Skin irritation
- Difficult to maintenance and waste management

Factor for select Metal Cutting Fluids

- Types of tool/machine
- Material parts
- Types of cutting tool
- Applications
- Quality of work piece
- Speed
- Sump life
- Cost

Maintenance of Metal Cutting Fluids

- **Neat Cutting Oil**
  - Quality Check
    - ✓ Viscosity
    - ✓ Water Content
    - ✓ Contamination
    - ✓ Flash Point
    - ✓ Quantity of additives
    - ✓ Total acid number (TAN)
  - Clean the tank and filter system

Problems of Water-based Cutting Oils

- Foam
- Bacterial and Fungi
- Allergy
- Separation of emulsion
- Monday smell
- Clogging of filter system
- Oil-mist
- Wear of slide way
- Remove paint
- Corrosion

Factor for prolong sump life of Water-based Cutting Oils

❑ Quality of water

Water Hardness	(ppm)as CaCO3
Soft	0-50
Moderate soft	50-100
Slightly hard	100-150
Moderate hard	150-200
Hard	200-300
Very hard	Over 300

- pH 6.5-8.5
- Chloride < 100 ppm

Factor for prolong sump life of Water-based Cutting Oils

- Correctly method to mixing coolants
  - ✓ Pour coolant concentrate into the water
  - ✓ Continuously stir and always mixed outside of the machine

Removing contamination from the cooling system

- Remove chip away from cutting zone
- Remove tramp oils

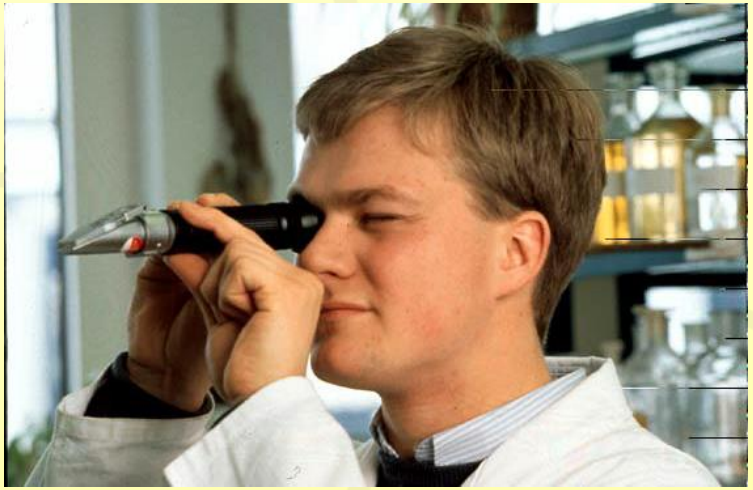
Vacuum Pump

Belt Skimmer

Disk Skimmer

Oil Separator

Concentration of Water-based Cutting Oils



Check concentration of emulsion by Refractometer

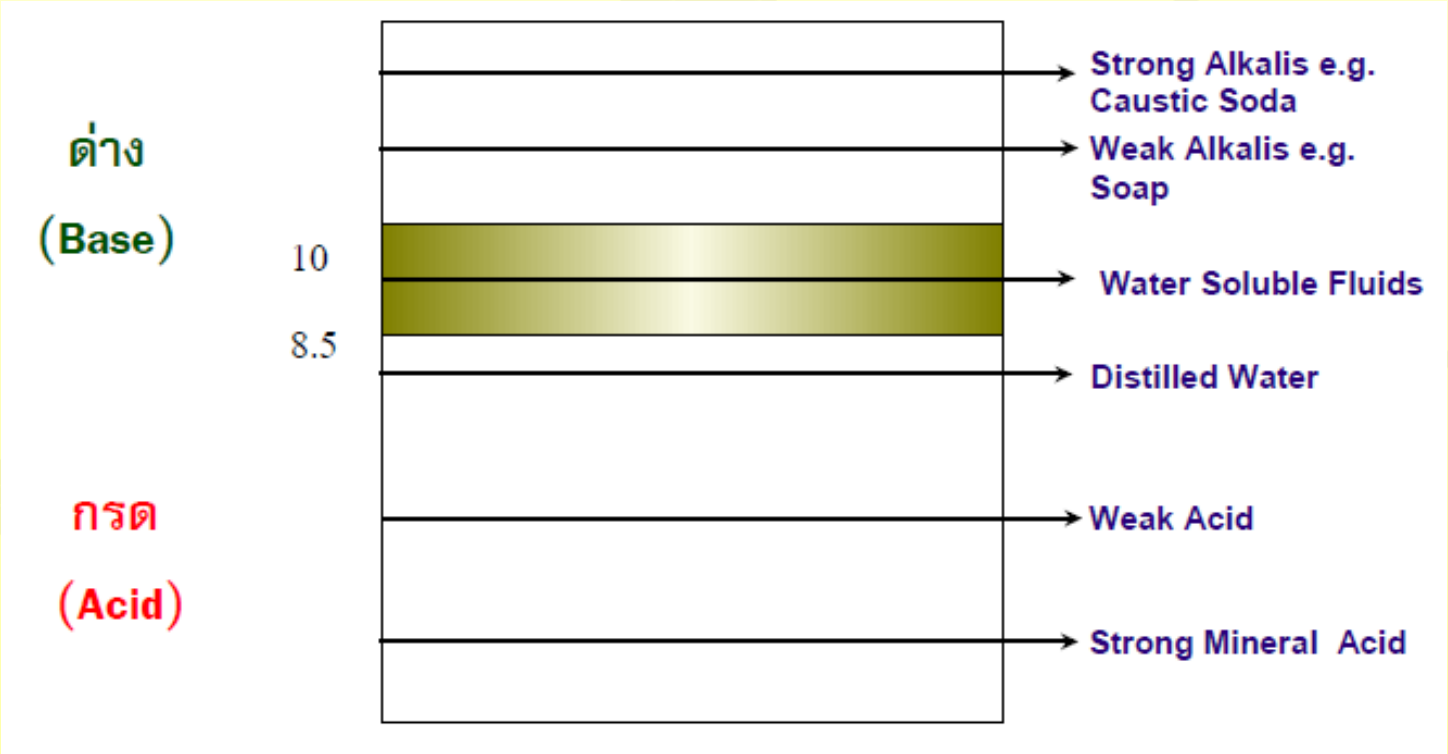
High concentration of Water-based Cutting Oils

- Allergy
- Remove paint
- Leakage of rubber seal
- Clogging of filter system
- Mist and foam
- Waste cost

Low concentration of Water-based Cutting Oils

- Corrosion of work piece
- Corrosion of machine
- Poor finish surface
- Short tool life
- Bacteria and fungi
- Separation of emulsion because low pH

pH check of Water-based Cutting Oils



By pH paper/strip or pH meter

pH value higher than 10

- Skin irritation
- Some chemicals will dissolve
- Separation of emulsion

Cause

- High concentration
- Contamination of alkaline

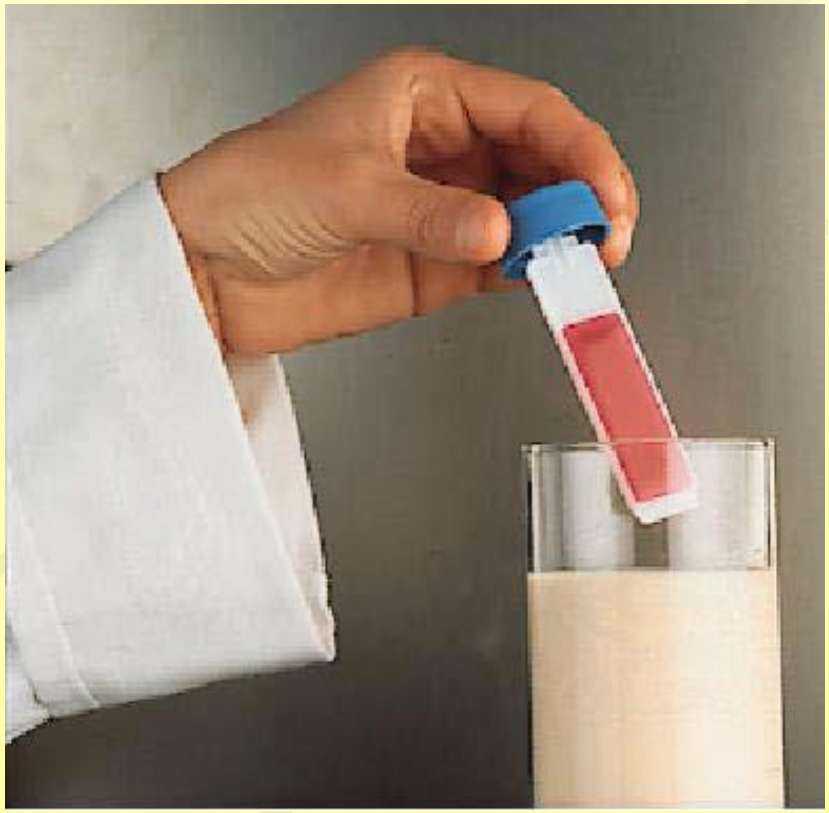
pH value lower than 8.5

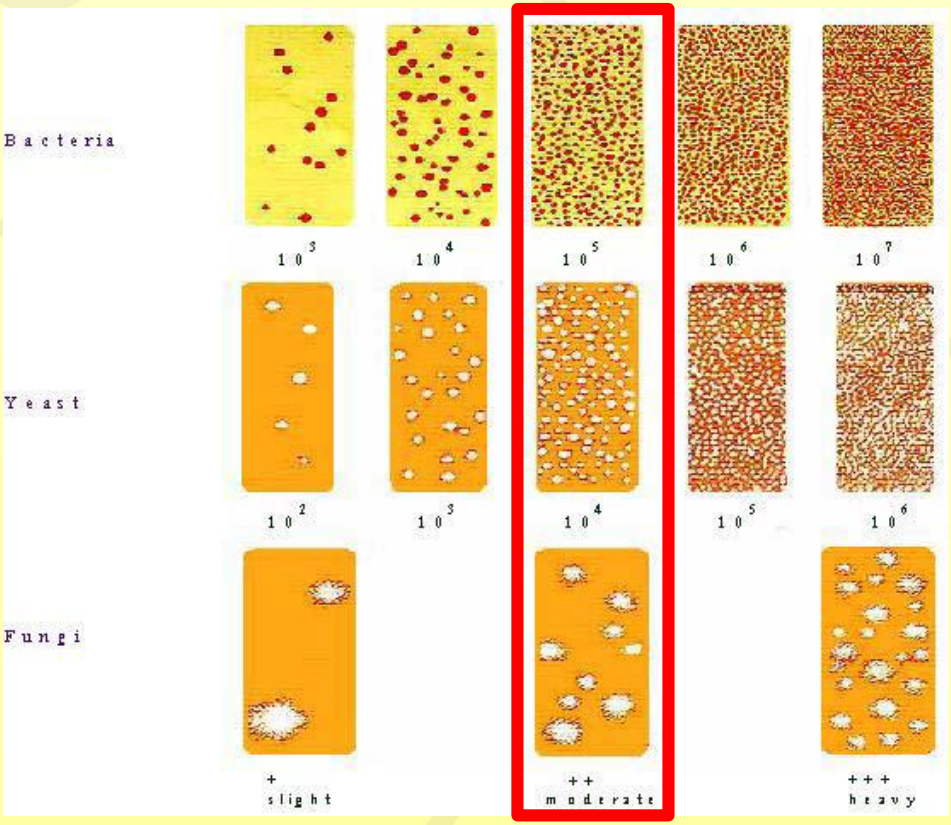
- Low concentration
- Bacteria smell
- Corrosion
- Separation of emulsion

Cause

- Bacteria occur
- Low pH of water

Check Method of Bacterial Fungal Yeast



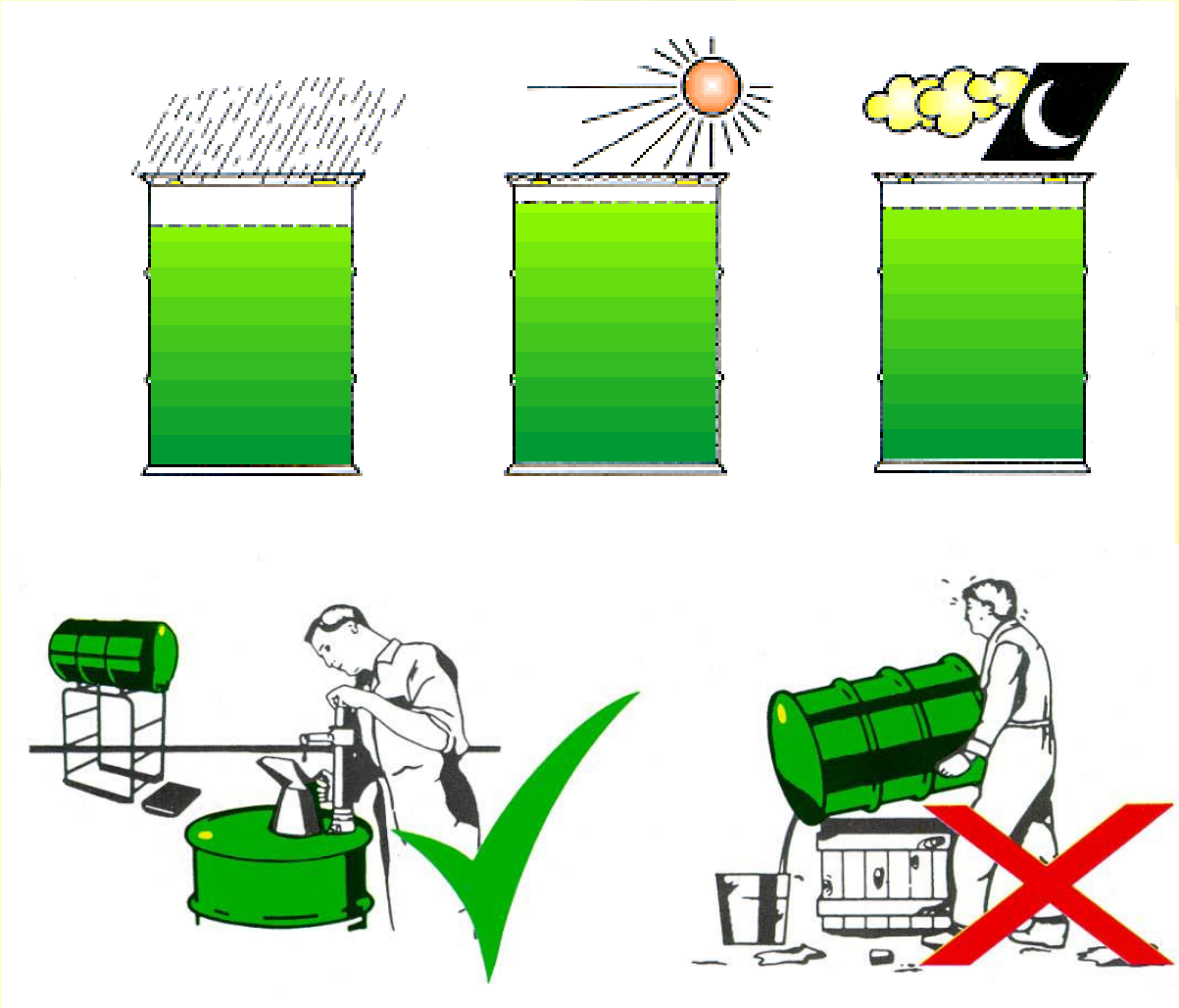


Bacteria and Fungi occur in system

- Bacteria
  - Rancid : Bacteria smell
  - Skin irritation
  - Corrosion
  - Separation of emulsion
  - Slime or sludge

- Fungi
  - Flocculation of emulsion
  - Clogging of filter system

Maintenance of Water-based Cutting Oils



Keeping the Fluid Clean

- **Do's**
  - ✓ Keep the machine clean
  - ✓ Keep fluid contact surfaces clean
  - ✓ Label all containers
  - ✓ Deal with leaks of contamination lubricants

Keeping the Fluid Clean

- **Don’ts**
  - Allow foreign bodies and debris to fall into machines of fluid system
  - Add clan fluid dilutions in dirty mixing vessels
  - Return fluid spills to the machine sump
  - Return swaft to the fluid system
  - Pour other wastes into the fluid system
  - All the machine to stand idle for long periods

Cleaning Out Machines

- **Do's**
  - ✓ Ensure regular monitoring and clean of the machine
  - ✓ Make use of good-quality machine cleaning fluids
  - ✓ Follow the recommendations for use of machine cleaning fluids
  - ✓ Remove tramp oil
  - ✓ Do use protective clothing when handling fluid concentrate and for machine cleaning

Cleaning Out Machines

- **Don’ts**
  - × Take shot cuts during machine cleaning

Storing Fluids

- **Do's**
  - ✓ Store fluids under cover and in a bunded area
  - ✓ Avoid rain collecting in the container bunds
  - ✓ Use stock rotation regime
  - ✓ Carry out a COSHH assessment for each metalworking fluid
  - ✓ Make appropriate arrangements to prevent/control exposure

Storing Fluids

- **Don’ts**
  - × Use fluids that are past their expiry date
  - × Expose fluids to temperatures below 5°C
  - × Store water-based diluted fluids, because they will start to degrade

Thank You