



## Soluble Oil HD

Phillips 66® Soluble Oil HD is a chlorinated, heavy-duty metalworking fluid designed to emulsify easily and form a stable emulsion when mixed with water. It provides excellent cooling and lubricity for medium- to heavy-duty cutting and grinding of ferrous and non-ferrous metals, resulting in extended tool life and good surface finishes on the machined parts.

Soluble Oil HD is formulated with naphthenic base oils and fortified with emulsifiers that form a stable emulsion when mixed with soft, medium, or hard water. The high specific heat of water and the excellent metal-wetting ability of the emulsion provide excellent cooling and lubricity for most machining operations. This promotes longer tool life by reducing friction between the cutting tool and the workpiece and by dissipating heat. Anti-wear and anti-weld additives provide extra protection for heavy-duty machining operations.

Soluble Oil HD provides excellent anti-wear properties and good rust protection for both the cutting tool and the parts being machined. It contains a biocide to combat a wide spectrum of microorganisms, resulting in longer sump life and good odor control. It has very low foaming tendency, which is an advantage in high-speed machining and grinding operations.

**Note:** Although Soluble Oil HD contains a biocide, the biocide can become depleted in service. A biocide such as Bioban™ P-1487 or Bioban™ GK should be added in service as needed to combat the growth of harmful microorganisms in machine sumps and reservoirs.

## Applications

Soluble Oil HD is recommended for medium- to heavy-duty machining operations with water hardness up to 300 ppm. Typical applications include:

- Broaching
- Deep hole drilling (gun drilling)
- Gear hobbing and gear shaping
- Grinding
- Milling
- Reaming
- Sawing
- Tapping

## Features/Benefits

- Excellent cooling and lubricating properties
- Excellent anti-wear and anti-weld properties
- Helps extend cutting tool life
- Good surface finish
- Emulsifies easily with water<sup>(1)</sup>
- Forms a stable emulsion
- Good rust protection
- Good antifoam properties

<sup>(1)</sup>**Note:** When mixing, always add Soluble Oil HD to water; **never** add water to Soluble Oil HD. Typical concentrations (Soluble Oil HD in water) range from 3% to 10% for cutting operations and from 3% to 4% for grinding operations, depending on the type of metal and water hardness. Concentration may be monitored with a refractometer.

**CAUTION:** Containers of Soluble Oil HD should be stored indoors. They should not be stored at temperatures below 40°F (4°C) or above 130°F (54°C).

## Heavy-Duty Emulsifiable Metalworking Fluid





## Soluble Oil HD

Typical Properties	
ISO Grade	46
Specific Gravity @ 60°F	0.958
Density, lbs/gal @ 60°F	7.98
Color, Visual	Blue-Green
Flash Point (COC), °C (°F)	177 (351)
Pour Point, °C (°F)	-20 (-4)
Viscosity	
cSt @ 40°C	43.5
cSt @ 100°C	6.1
SUS @ 100°F	225
SUS @ 210°F	46.7
Viscosity Index	79
Emulsion Stability	Good
Foam Test, ASTM D892	Pass
pH, 5% (1:20) dilution	9.6
Rust Test, ASTM D665 A&B	Pass
Chlorine, wt %	2.2
Fatty Oil, wt %	3.3
Sulfur, Total, wt %	Nil
Sulfur, Active, wt %	Nil

Recommended Concentrations, Soluble Oil HD in Water (Volume %)			
Operation	High Alloy Steels	Aluminum Alloys	Nickel Alloys
Broaching, Milling, Tapping	10	7	10
Deep Hole Drilling, Gear Hobbing, Gear Shaping, Reaming, Sawing	5	5	7
Grinding	3	3	3

Refractometer Reading					
Dilution Ratio	1:10	1:15	1:20	1:25	1:30
Reading	10.3	7.2	5.4	4.6	3.0

## Health & Safety Information

For recommendations on safe handling and use of this product, please refer to the Safety Data Sheet via <http://www.phillips66.com/EN/products/Pages/MSDS.aspx>.