Metal Working Fluids

SELECTING THE CORRECT FLUID FOR THE APPLICATION

The selection is based on factors like;

Major Factors :

■ material to be machined ■ the process to be used ■ the tool material ■ the quality requirements ■ amount of machining required ■ type of filtration ■ water quality and chemical restrictions.

Also Consider :

■ fluid life ■ waste treatability ■ cost of disposal ■ resistance to microbial attack ■ corrosion protection provided ■ type of residues left on the machine tools and work pieces,■ foaming characteristics ■ part requirements (tolerance, finish, rust protection) ■ machine requirements (lubrication, seals, paint, cleanliness, visibility of work area).

TYPES OF METAL WORKING FLUIDS

Type	% Petroleum Oil in concentrate
■ Non-dilutable straight oils	100%
■ Water soluble oils	50-90%
■ Semi-synthetic fluids	2-50%
■ Synthetic fluids	0%

Some products contain EP Extreme Pressure additives. EP formulations contain chlorinated, sulfurized, or phosphorus-type extreme\ pressure ingredients.

CUTTING OILS; COMMON SHOP FLOOR PROBLEMS

a) Neat Oils		b) Soluble Oils	
Problem	**Check For**	**Problem**	**Check For**
a. 1. Reduction in Cutting Efficiency	1. Wrong Grade 2. Wrong topping up 3. Over Heating 4. Contamination 5. Higher Production rate	b. 1 Oil Separation	1. Hardness of water 2. Water Purity 3. Storage conditions 4. Method for preparation of emulsion 5. Bad odour indicating microbial contamination
a. 2. Rust Formation on job or machine bed	1. Moisture in System 2. Deterioration during storage 3.. Oil reacting with metal 4. High Humidity 5. Extreme Temp. variations	b. 2. Rust Formation on job or machine bed	1. Stability of Emulsion 2. pH (Higher pH required) 3. Chlorine content of water 4. Microbial contamination 5. Workshop conditions
a. 3 Overheating	1. Reservoir & oil level 2. Inadequate flow rate 3. Check Nozzle size (may be small) 4 Nozzle Pressure	b. 3 Foaming	1. Air Leakage in system 2. Free Fall 3. Concentration of emulsion
a. 4 Foaming	1 Contamination	b. 4 Emulsion Inversion	1. Concentration of emulsion 2. Method for preparation of emulsion 3. Over soften water
		b. 5 Overheating	1. Reservoir level 2. Inadequate flow rate 3. Check Nozzle position 4. Reservoir capacity 5. Concentration of emulsion 6. Flow obstruction

TEST & PROCEDURE	PURPOSE CORROSION
Copper (ASTM D 130) 3 h at 100°C	Measures fluid's nonferrous compatibility.
Turbine Oil Rust (ASTM D 665) **A-Distilled Water / B-Synthetic Sea Water**	Measures the ability of inhibited mineral oils to aid in preventing the rusting of ferrous metals in the presence of water.
Aqueous Cutting Fluid (IP125)	Measures corrosion protection of aqueous cutting fluids.
Filter Paper Chip Breakpoint (IP287)	Evaluates rust inhibition properties of aqueous cutting fluids compared to a reference fluid.
Humidity Cabinet Rust (ASTM D 1748)	Measures ability of preservative oils to protect metal parts from rusting under conditions of high humidity.
Salt Spray (MIL-B-117-64)	Steel part corrosion protection measured after exposure to 5% salt spray for 24 hours.
Cleveland Condensing Humidity Cabinet (ASTM D 2247)	Measures antirust properties of metal preservative fluids on steel panels. Considered more severe than ASTM D1748 humidity test.
EXTREME PRESSURE	
4-Ball Wear (ASTM D 2266) 40 kg, 1200 rpm, 75°C, 1 h; **Average Coefficient of Friction; Max. Scar Diameter (mm)**	Evaluates antiwear and antiweld properties of lubricants.
Timken (ASTM D 2782) **OK Load (lb)**	Measures abrasion resistance and load carrying capacity of lubricants.
4-Ball EP (ASTM D 2783) Seizure (kg), Weld (kg), LWI (kg)	Evaluates extreme pressure and antiweld properties of lubricants.
Falex EP (ASTM D 3233)	Measures load carrying capacity and wear properties of lubricants.
STABILITY	
Foam (ASTM D 892, IP312) **Tendency/Stability (ml)**	Determines foaming characteristics of lubricating oils at specific temperatures.
Panel Coker 4 h at 260°C, continuous splash	Determines relative stability of lubricants in contact with hot metal surfaces.
Demulsibility (ml oil/ml water/ml emulsion)	Measures separation of oil and water emulsion over time.
Emulsion Stability (IP263)	Measures emulsion stability in water.
Aquarium Biostability aqueous environment.	Measures foam, bacteria, fungus and odor over time in controlled
MISCELLANEOUS	
Color (ASTM D 1500)	Visual determination of fluid color based on colorimetric readings.
GM Quenchometer (ASTM D 3520)	Determines heat removal speed of a quench oil in terms of a Relative Cooling Index compared to a standard.
Tapping Torque Efficiency (ASTM D 5619)	Measures tapping efficiency in selected metals compared to a reference fluid. Uses Falex #8 Tapping Torque Tester
Tapping Torque Efficiency by Arrow 500 CNC (Lubrizol test)	Measures tapping efficiency in a variety of metals compared to a selected reference fluid. Also measures torque thrust during drilling operations.
Stick-Slip (Cincinnati Milacron test)	Measures static & dynamic coefficients of friction in slideway lubricants
Bijur Filtration	Determines compatibility of lubricants with Bijur setup (specific to Bijur filter design).
Falex #8	Evaluates fluid efficiency by measuring torque required during tapping operation in steel.
SLT (Draw Bead Simulator)	Evaluates friction generated in a drawing process. Reports relative COF compared to 1200 SUS naphthenic base oil.
Reichert	Measures load-carrying and wear-resistance properties of lubricants.