Castrol Industrial Americas
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Technical Bulletin

DISPOSAL OF METALWORKING FLUIDS

Used water soluble metalworking fluids nearly always contain some mineral oil by the time it becomes necessary to dispose of them. Many fluid concentrates are manufactured with oil as a component, but even oil-free synthetics generally become contaminated with tramp lubricating and hydraulic oils as they are used, thus requiring some form of treatment to remove the oil and oil soluble components before draining into a sanitary sewer.

TESTING FOR OILS, FATS AND WAXES

One method for determining the oil content of waste effluents is the Freon Extraction test. Freon is not water soluble. But when it is mixed into a cutting fluid, it is capable of picking up the oils, fats and waxes. Remove the Freon solution from the wax, evaporate the Freon, and the dissolved oils, fats and waxes are left as a measurable quantity.

METHODS FOR REMOVING OILS AND OIL SOLUBLES FOR DISPOSAL

Some water soluble metalworking fluids are formulated to reject tramp oil contaminants, floating them to the surface of the fluid for easy skimming. After separating settled solids, reuse of the fluid, with suitable make-up, is a conservative and economical step. However, where disposal of the used fluids is necessary, we offer the following chemical methods that have been successfully proved for treatment of emulsions.

Caution: These treatment methods use strong chemicals. Wear safety goggles or preferably full face shield as a precaution against accidental splashing. Keep eye wash equipment in area. Avoid skin contact with acids and alkalies.

ACID SPLIT

Simple procedure for most emulsions:

1. Accumulate fluid in a holding tank.
2. Add 50% hydrochloric acid solution or commercial muriatic acid to reduce the pH to 3.5-4.0. Depending on the alkalinity of the used emulsion, 2% to 10% of the acid may be required to reach the desired low pH.
3. Agitate gently to disperse the acid.
4. Allow the mixture to set without further agitation while oily components float to the surface.
5. Separation of the oil and oil soluble components should occur within 24 hours, usually much sooner.
6. Skim floating oil for disposal as waste oil in accordance with local, state and federal regulations.
7. Neutralize remaining clarified watery liquid by carefully adding 50% sodium hydroxide solution (liquid caustic) to adjust the pH to 6.8-7.2.
8. The clarified and neutralized watery phase should be acceptable to local sanitary districts but check before dumping to be sure you are in compliance with local ordinances.

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ACID/ALUM SPLIT

For more complete “polished” emulsion break:

1. Accumulate fluid in a holding tank.
2. Add aluminum sulfate (alum) or ferric sulfate at a concentration of 0.5% wt. to 2.0% wt., stirring gently to dissolve.
3. Immediately add 50% hydrochloric acid or commercial muriatic acid to adjust to pH 3.5, stirring very gently, just enough to disperse the acid. Stirring too vigorously will upset the coagulating characteristic of the alum reducing the outstanding efficiency of the acid/alum combination.
4. Allow the mixture to set quiescent, without further agitation while the oily components separate; 2 to 12 hours should produce a satisfactory degree of clarification.
5. Skim floating oil for disposal as waste oil in accordance with local, state and federal regulations.
6. Remove settled sludge by means of a bottom drain or better, pump the clarified watery layer into a second tank leaving the settled floc behind.
7. Add sodium hydroxide solution (liquid caustic soda) to the clarified acidic water to neutralize to pH 6.8 to 7.2.
8. The clarified, neutralized watery phase should be suitable for dumping with the provisions noted in Step 8 of the Acid Split Procedure.

EPSOM SALT SPLIT

Emulsion break without using strong acids and alkalis:

1. Accumulate waste fluid in a holding tank.
2. In a separate tank, prepare a 40% aqueous solution of magnesium sulfate (Epsom salts). For example, add 50 pounds of Epsom salts to 75 pounds (9 gallons) of water. Stir until completely dissolved and clear.
3. Add Epsom salt solution to fluid at a concentration of about 10% and stir gently to disperse.
4. Separation of oil and oil soluble components should occur within 24 hours.
5. Skim floating oil for disposal as waste oil in accordance with local, state and federal regulations.

The watery portion should be suitable for dumping to a suitable drain for final treatment by a municipal sewage treatment plant.

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CHLORIDE SALT SPLIT

For coarse, creamy type emulsions:

1. Accumulate waste emulsion in treatment tank. A vertical cylinder tank equipped for mixing by air bubbling is ideal.
2. In a separate tank, prepare a water solution of calcium chloride by adding at a ratio of 4 pounds of calcium chloride per 1,000 gallons of emulsion to be processed.
3. Add calcium chloride solution to the treatment tank and agitate by air-bubbling for one hour.
4. The addition of a mixture of 4 pounds of ferric sulfate in 10 gallons of warm water with further air-bubbling for 30 minutes to disperse the mixture will enhance splitting.
5. Turn off air and allow mixture to set quiescent. A satisfactory degree of separation should occur within 24 hours.
6. Skim floating oil for disposal as waste oil in accordance with local, state and federal regulations.
7. The watery portion should be suitable for disposal by dumping to a municipal sanitary waste treatment facility.

FINAL COMMENT

The four methods described above are time-tested and proven under commercial conditions. Not all of these methods may produce satisfactory results with your unique mixture of cutting fluids and contaminant, so pre-testing on a small batch is strongly advised before large scale treatment is undertaken. In addition, there are a number of commercially available proprietary acidic coagulants and other methods of waste treatment that may be worth your consideration.

Whatever treatment method you choose, it is wise to check with local and/or state authorities to be sure the treatment process and waste effluent you produce are legally and economically acceptable.