Castrol Industrial Americas
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Technical Bulletin

DUMP AND RECHARGE?

There once was a time when "dump and recharge" was an easy answer to metalworking fluid problems. And just how does one go about dumping used metalworking fluids? Hey! ***Dilution*** is the ***solution*** to ***pollution***.

Sorry! As regulations tighten down to further protect our precious resources and our environment, this type of thinking no longer fits into the "list" of technical recommendations.

Waste disposal of used, water based metalworking fluids is at the forefront of issues concerning the metalworking industry. As regulations continue to force the awareness level of environmental concerns and the cost of waste disposal upward, fluid users are choosing products for their longevity and ease of disposal. Very often, the trial and selection of a metalworking fluid is based in part on the disposal of the used fluid. The "bottom line" remains that the less waste generated, the less cost incurred.

To better understand the regulatory aspect of waste disposal as it applies to used metalworking fluids, let us review some basic environmental engineering terminology.

BOD

BOD is an acronym for Biochemical Oxygen Demand. This measurement technique has been established by regulatory agencies and professional organizations, and is referenced in the *Standard Methods*. Most organic materials are considered to be biodegradable. Certain compounds (e.g., cellulose, lignin, and many synthetic petrochemicals) are very resistant to biological breakdown, and can usually be considered non degradable, or recalcitrant.

In this test, a sample of wastewater is aerated and then placed in a BOD bottle containing a nutrient solution seeded with active microorganisms. A measurement of dissolved oxygen (DO) is also taken at this time. The bottles are then stoppered and incubated at a standard temperature (20°C) for a period of 5 days, after which a final dissolved oxygen measurement is taken. A comparison of the initial and final DO levels is the basis for the BOD calculation. The primary cause of oxygen uptake in the water is the metabolism of organic materials by bacteria. Generally, the more organic matter present, the greater the rate of bacterial growth, and bacterial growth generally parallels the rate of oxygen uptake. Therefore, the importance and reasoning of the BOD test is for those metalworking fluid users discharging their waste to a Publicly Owned Treatment Works (POTW). The BOD results allow the POTW to adjust parameters, such as bacterial seeding, oxygen levels, and retention times, to accommodate any changes in organic discharge loads.

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COD

COD is an acronym for Chemical Oxygen Demand. The COD test is used to measure the organic content of natural waters, municipal wastewaters, and industrial wastes.

Functionally, the oxygen equivalent of the organic matter is measured using excess amounts of a strong oxidizing agent (potassium dichromate) in an acidic medium. The amount of organic matter present in the sample is determined by taking the difference of the amount of dichromate left at the end of the test and the original amount. Following an appropriate conversion, the difference is reported in terms of the equivalent oxygen required to oxidize the organic matter present in the sample. COD testing is used extensively because it takes relatively little time (3 hours) in comparison with the BOD test. There are, however, some shortcomings to this test. The COD test cannot be used to differentiate between biologically oxidizable and inert organic matter. It also cannot provide results that indicate the rate at which the organic material will be oxidized biologically. Finally, certain inorganic constituents, such as chloride, can interfere with the test.

FOG

FOG is an acronym for Fats, Oils, and Greases. These materials are quantified using a solvent (Freon), and one of two commonly used *Standards Method* extraction procedures - gravimetric or Soxhlet Extraction. It should be noted that these procedures are slightly different, and will yield differing results. Always be sure to reference the appropriate method, and use it consistently throughout waste evaluations.

In this test, the waste fluid is first mixed with the solvent, then allowed to undergo phase separation. The solvent layer is then segregated, via one of two extraction methods, and dried to determine the quantity of solvent extractable materials. This quantity is reported out as mg/l FOG.

It is important to note that both polar and nonpolar materials can be read as solvent extractables. Nonpolar materials can include the hydrocarbon based oils that we typically associate with FOG levels. Polar materials can include things such as fatty acids and surfactants, so what we typically think of as an "oil free" synthetic product, can produce a significant FOG result. A silica gel absorbent material can be utilized to separate out the polar materials from the nonpolar, thereby producing a more accurate FOG result.

TSS

TSS is an acronym for Total Suspended Solids, and refers to the solid floating/dispersed material found in an effluent sample. This material is generally considered to be filterable.

Other, less frequently encountered terms include: priority pollutants, Total Toxic Organics (TTO), heavy metals concentration, and pH value.