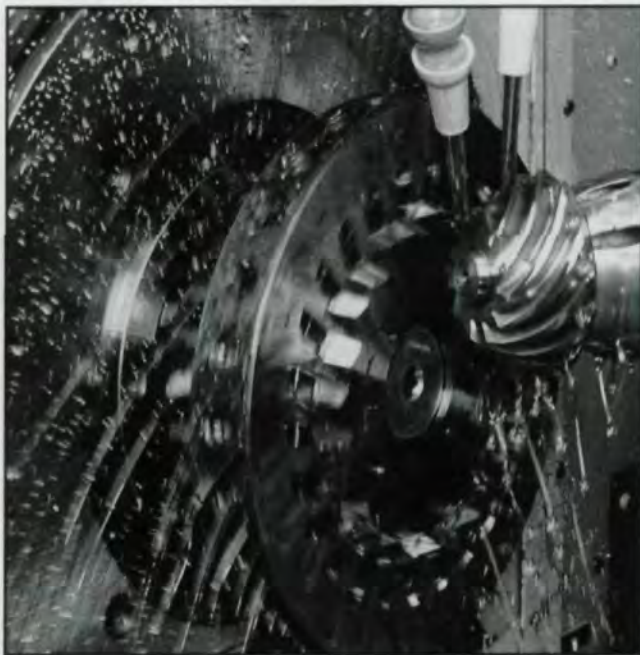


# Eco-Friendly Cutting Fluids

*Synthetic ester technology eliminates the choice between safe, easy disposal and cutting efficiency. Now you can have both.*

John Sliner



Synthetic ester-based cutting fluids have coefficient of friction values under boundary lubrication conditions in the .08-.10 range, four to six points lower than petroleum-based oils. Photo courtesy of The Gleason Works.

## The Benefits of Synthetic Ester Additives

- *Low volatility, high flash point, good thermal stability*
- *Resistance to evaporation, burning, sludge and gum forming*
- *Superior heat capacity and thermal conductivity*
  - *Good response to other additives*
  - *High level of boundary lubrication*
  - *Chemically non-reactant to metals*
    - *Biodegradable*

**O**kay, so you want to make some high-quality gears for your customers, and you want to make a profit for your company, but you don't want to make a mess of the environment. What can you do?

The chlorinated and/or sulfurized additives in most lubricants and coolants may help you make gears efficiently, but they cause health and safety concerns for your employees; they smell bad, they're messy and expensive to clean up, and their dark color means low visibility. The EPA has now listed certain chlorinated compounds as SARA-reportable substances, making proper disposal very expensive, and failure to do so can bring the EPA inspectors to your front door.

But . . . the fact is, until recently lubricants containing those chlorinated and sulfurized additives were the most efficient, cost-effective solution to your cutting problems. They function at elevated temperatures by chemically reacting with metal surfaces to form inorganic films which prevent adhesion between the tool and workpiece, and they work well in the severe conditions and precise requirements of gear cutting operations. The choice has been between cutting tool efficiency and negative side effects.

Not any more. Now it's possible to have environmentally safe *and* efficient cutting fluids at the same time.

A case in point: A major earthmoving equipment manufacturer has solved the problem by switching to cutting fluids with no sulfur or chlorine additives for its gear hobbing operation. The switch has not only solved some environmental and disposal problems, but also improved cutting efficiency.

The company had been cutting forged 18836 steel transmission gears using a heavily sulfochlorinated oil, with all the usual accompanying problems: heavy oil mist, messy clean-up, poor visibility, strong, objectionable odors and expensive disposal of cutting oils.

Since the company switched to Quaker Chemical's NSC series cutting oil, operators have reported less oil misting, a more pleasant odor and improved visibility. Hob life has improved by about 10%, and hob gouging problems have decreased significantly. Cleanup is simpler and easier and disposal problems are minimized since the main lubricant is biodegradable.

What's the secret? Synthetic ester technology.

Synthetic esters are derived from animal and vegetable sources, are biodegradable and they do not chemically react with metal surfaces. They differ significantly from petroleum-derived mineral oils both in their chemical structure and their physical characteristics. Even a highly refined



petroleum oil contains hundreds of compounds that together contribute to its characteristics, making it a chemically complex, volatile substance. On the other hand, a synthetic ester is generally more chemically homogeneous, making for improved quality control parameters and more finely tuned performance characteristics.

Esters are formed by a chemical reaction between an alcohol and an organic acid. Through proper selection of these substances by type and purity, fluids are obtained that have low volatility, high flash points and good oxidative and thermal stability. They tend not to evaporate, burn or form gums or sludges as petroleum-based oils do. Esters also have superior heat capacity and thermal conductivity. In addition to their inherently good lubricity, esters have good response to additives to enhance anti-wear, extreme pressure and anti-corrosion properties.

Synthetic esters also offer a high level of boundary lubrication based on their affinity for metal surfaces. When measured on a pendulum-type tester that measures coefficient of friction under boundary lubrication conditions, the values for standard petroleum base oils at room temperature are in the .13-.14 range. The esters tested achieved values in the .08-.10 range. A lower coefficient means less friction and better lubrication.

Quaker Chemical Corporation has applied synthetic ester technology to developing sulfur- and chlorine-free machining and grinding fluids. The company has developed a line of water-soluble and straight oil type products which use a blend of synthetic esters and a non-traditional extreme pressure additive based on inorganic ester chemistry to provide a high degree of film strength and excellent lubrication performance in a wide range of applications.

In machine testing, this Non Sulfur-Chlorine (NSC) technology provides at least equivalent performance to traditional sulfo-chlorinated oils. The heaviest duty versions of both types of products can achieve full load (3,000 lbs without wear or seizure failure) on the Falex pin and vee block test.

Now the choice is no longer between an efficient cutting fluid and a safe, clean shop environment and minimal disposal hassles. Synthetic ester technology has made it possible for gear manufacturers and other users of heavy-duty cutting oils to have both. ◉

**For more information about Quaker Chemical Corp., circle Reader Service Number A-49.**

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## Who is SARA and Why Does She Care What You Do with Your Used Cutting Fluid?

*SARA is the Superfund Amendments and Reauthorization Act. The Environmental Protection Agency has recently placed a number of chlorinated paraffins, such as those found in certain cutting oils, on the SARA 313 list. This is a list of toxic chemicals subject to reporting under Section 313 of the Emergency Planning and Community Right to Know Act (EPCRA).*

*Any company that uses 10,000 lbs. or more of a SARA 313-listed material in a calendar year is required to submit a Toxic Chemical Release Inventory Report to the EPA by July 1 of the following year. The first reports on listed chlorinated paraffins will be due July 1, 1996.*

*This report, called Form R, is about 10 pages long and details all emissions to air, water and land. Filers are also required to report on how the material is waste treated, where it's disposed of and what steps the user is taking toward pollution prevention and waste minimization. Failure to file a Form R and other violations of EPCRA can lead to fines of up to \$25,000 per day per violation.*

*More information about SARA and EPCRA is available from the EPCRA hotline at 1-800-424-9346.*

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