



Titanium aerospace component machined using MAG Cyclo Cool metalcutting fluids specifically designed for high-heat alloys.

Green Coolant Technologies Advance

Higher prices for green coolants and lubricants may keep some builders from making the switch

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Going green makes sense, if the price is right. While the interest from manufacturers in using more environmentally safe, health-conscious “green” coolants and lubricants remains high, many shops may be put off by the initially higher price tags of the coolant technology, despite potential health benefits for workers and cost savings, such as extending tool life.

Newer vegetable-based green coolants can offer as much lubricity as standard oil-based products, but the coolants tend to cost more, often up to double the price of oil-based lubricants. With the economy still shaky, this has had an impact on adoption rates.

Coolants and Lubricants

“The big buzz the last couple years has been about going toward greener raw materials, more user-friendly systems,” notes Lee Hitchcock, research and development chemist, ITW Rocol North America (Glenview, IL). “We’ve been working on vegetable-oil-based coolants, things that last longer in the sump, and that are more resistant to bacteria and fungus. We’ve been focusing on the Accu-Lube line, a naturally derived lubricant that’s applied by applicators directly to the tool edge, in what we call ‘Near-Dry Machining’ or ‘Minimum Quantity Machining.’”



Photo courtesy Chemetall Americas

Semisynthetic lubricants are among the fastest-growing metalcutting fluids for Chemetall Americas.

Greg Foltz, engineering and development manager, Cimcool Industrial Products LLC (Cincinnati), says there’s a lot of interest in going green. “Green is definitely still out there,” says Foltz. “The USDA right now has a program under which you can get your metalworking fluids certified as being bio-based. They have a testing program that you have to go through, and then you can label them as a bio-based product. That’s starting to catch on a little bit.”

ITW Rocol has certifications on two vegetable-based coolants, which are labeled as USDA BioPreferred certified. Despite all the interest in green coolants, however, the price can be a stumbling block, Foltz and Hitchcock agree. “The issue overall with the use of vegetable oil and green products is still that they tend to be more expensive,” Foltz says.

“People like to use the term ‘green,’ but they have a hard time paying for the term green,” Hitchcock adds. “When you

develop out of naturally based oils, they’re inherently more expensive. That’s a roadblock we’re seeing in vegetable-based coolant adoption. Not only is the base oil itself double the cost, but the emulsifiers and the biostability package, everything you have to put in the formula itself, probably doubles the price of the product.”

Formulation issues, once a concern with green coolants, have largely been resolved. “There were initially some issues with making the fluids that contained vegetable oils stable and ensuring biostability, but I think everyone now has enough formulation knowledge to know how to make the products stable, and make them last long,” Foltz says. “That’s not too much of an issue now, and in some cases, you actually see some pretty significant improvements in lubrication.”

That means green coolants might offer some benefits that offset their costs. Because vegetable-based lubricants can offer more lubricity, they can protect tools better during the cut, helping them last longer. Foltz notes that Cimcool has seen the most interest in its green products in Canada. “They may be a little more environmentally conscious than the folks here,” Foltz says. Or maybe they are on to something.

David Gotoff, product manager, metalworking, Chemetall Americas (New Providence, NJ), says that an effective coolant system can offer very high value to manufacturers, as a typical operation will spend 10 times more replacing tooling than purchasing coolant. “A coolant program that can increase tool life by 20% or more will pay for itself several times over,” he says. “By reducing downtime and maintenance on the machine, reducing mist on the shop floor, eliminating dermatitis issues and odors, you have achieved exceptional value in both real dollars and environmental improvements.”

Semisynthetics Offer Blended Solution

Semisynthetic coolants, water- and mineral oil-based technology that allows the formulator to utilize a greater variety of functional additives over soluble oils, now rank among Chemetall’s fastest-growing products. “Good coolant programs must provide both cooling and lubricity,” Gotoff adds, “but in reality, the coolant must provide far more. There are five fundamental ‘non-cutting’ issues a coolant must address to function acceptably. These include controlling corrosion, controlling odor [bio issues], mitigating dermatitis, controlling foam, and not forming undesirable residues, in the sump or on the parts or work surfaces.”

Manufacturers typically have used soluble oil chemistry as the traditional approach when cutting metal, he adds.

“Combining water for cooling and oil for lubricity is a good approach. But we are seeing too often the soluble oils are too prone to biological degradation, the most common source of coolant failure. We prefer, where appropriate, to promote semisynthetic coolants, which provide equal or better lubricity with dramatically better features.”

Last June, the National Toxicology Program of the US Department of Health and Human Services ruled that formaldehyde is a known human carcinogen. “This is raising a number of questions for the metalworking community, as they specifically mention triazine, the most commonly used biocide in our industry,” says Gotoff. “Triazine will decompose under certain conditions and ‘donate’ formaldehyde, which then kills the bacteria and fungus. While it works well, the recent ruling certainly raises questions. Chemetall is proud of the fact that we have not formulated with triazine or any of the other formaldehyde releasing biocides in years.”

High-speed cutting operations often include high-pressure coolant systems, through the tool or otherwise, Gotoff says, that allow the coolant to flow to the cutting zone and flush away the chips. “This requires ultra-low-foaming coolants, which is a new trend in coolants,” Gotoff states. “Balancing the right lubricants with emulsifier packages will result in a low-foaming coolant.”

Low-Foam Cooling Required

High-pressure coolant-delivery systems are increasingly being deployed by customers to meet their needs for increased productivity and decreased cycle times, according to Brian J. Mattes, global senior R&D chemist, Master Chemical Corp. (Perrysburg, OH). “These systems challenge a fluid’s ability to resist foaming, and while low-foam products have always been a goal, now they are a must,” Mattes states. “Inherently low-foam coolants, like Master Chemical’s TRIM MicroSol 585XT provide safer operating environments, and also allow for increased cooling via improved heat transfer.”

New Environmental Regulations

Coolant and lubricant developers currently are dealing with several environmental regulation changes including those mandated by the Southern California Air Quality Management District (SCAQMD) to reduce volatile organic chemicals (VOC) levels in industrial fluids, of which metalworking fluids is a subclass, Mattes says. “Master Chemical has several formu-

las which meet or exceed these new criteria, which becomes official on January 1, 2012. All manufacturers are required to list VOC content on the labels for their products being sold into this region in 2012 and beyond.

“The EPA is reviewing TSCA [Toxic Substances Control Act] registration criteria, which will impact how chlorinated paraffins are managed in the future,” Mattes adds. “The results of this review will impact our business as these materials are widely used through the metalworking industry.”

Recycling, Fluid Filtration Maximizes Coolant Life

“There is a trend to go green, not only with vegetable-based coolants, but also with recycling programs,” notes Sonny Truett, Cyclo Cool product manager, MAG IAS (Hebron, KY). “Manufacturers want to reuse coolant rather than dispose of it, so they’re implementing coolant recycling programs. They want to reduce coolant waste and increase sump life with new coolants and raw materials; I know a company that throws away 1100 gal [4164 L] per day. Companies have to be technologically advanced and invest in new coolant technologies to do so.”



Photo courtesy Master Chemical Corp.

The TRIM OM 303 metalcutting fluid from Master Chemical is a nonchlorinated, medium to heavy-duty semisynthetic straight oil that works well with screw machines, roll form threading, and other high-lube operations.

Coolant and cutting fluid filtration systems are also critical to maintaining quality coolants in any metalcutting operation. “We see the trend to be a continuation of our custom-

Photo courtesy Prab Filtration Systems Division



The Mon-A-Matic vacuum filter from Prab Fluid Filtration provides 10-50 micron clarity with higher flow rates on both water-based coolants and mineral oils.

ers' desire to eliminate or minimize consumable media for liquid/solid [particulate removal] filtration," notes Tim Hanna, managing director, Prab Fluid Filtration Division (Kalamazoo, MI). "In order to meet the challenge of eliminating consumable media, Prab Fluid Filtration is introducing candle filter filtration that utilizes 'edge filtration' to clarify down to 2 micron with flow rates up to 100 GPM. Our new Candle Filter technology can be used on water-based coolants and light-viscosity oils. This is particularly important for EDM equipment."

Prab also offers its Mon-A-Matic semi-permanent media vacuum filter that provides 10-50 micron clarity with higher flow rates on both water-based coolants and mineral oils, Hanna adds. "While the price of this option is 25% over a normal vacuum filter, using nonwoven media, the extra up-front expense is quickly offset in the elimination of having to purchase media," he says, "as well as reduced maintenance of having to take off and dispose of the spent media in a normal vacuum filter." **ME**