Trizact™ Diamond Tile 677XA
Lubricant Use and Filtering

Technical Application Bulletin **September 2003**

There are many lubricants in the market and most are designed for specific materials and processes. When lapping substrates with 3M™ Trizact™ Diamond Tile 677XA abrasives, 3M recommends using an aqueous based lubricant. We have found that amine/glycol based lubricants produce the highest level of performance on crystalline and silica based optical glass. Recycling of lubricants used in conjunction with Trizact Diamond Tile 677XA is possible, and highly recommended, for most substrates and processes. Trizact Diamond Tile 677XA is a fixed abrasive so unlike slurries, there is no abrasive in the lubricant to wear out. With simple filtering and handling techniques, lubricant can be used for several weeks.

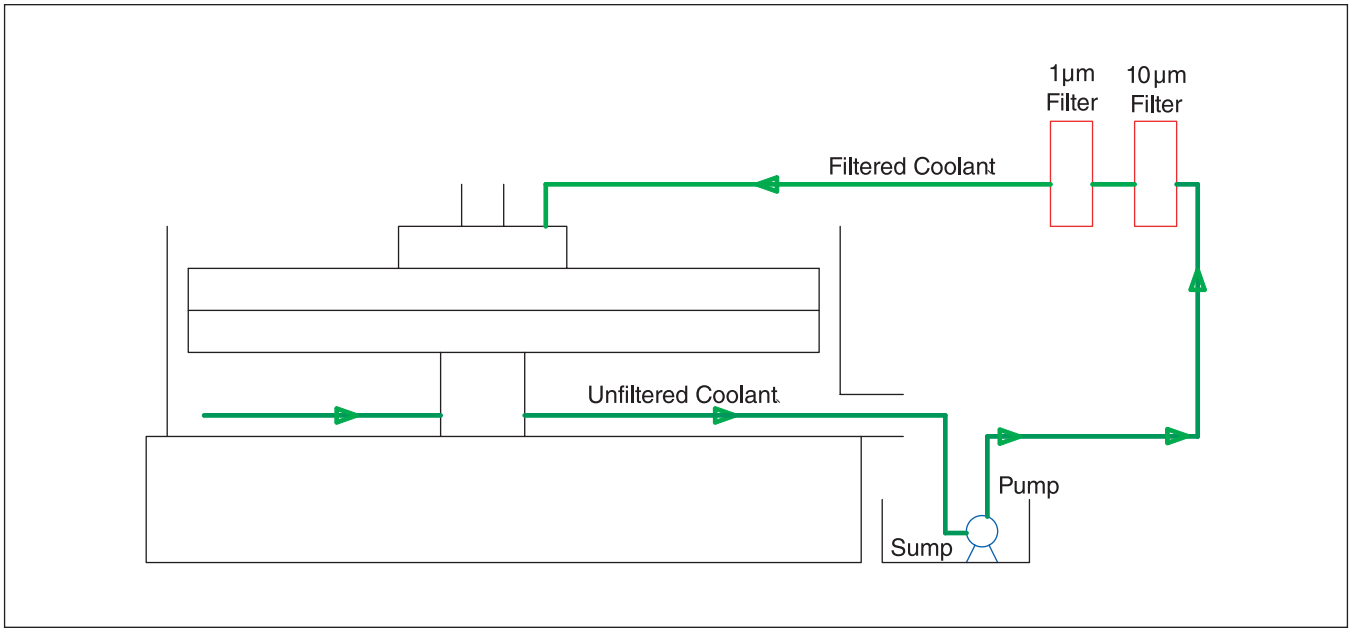
Lubricant flow rates should reside near levels defined by the equation; lubricant flow rate = 0.393 x (pad OD² – pad ID²) with flow rate expressed in ml/min and pad OD/ID in inches.

Filtering of recycled lubricant is very important when converting lapping equipment from a slurry process to a fixed abrasive process using Trizact Diamond Tile 677XA. If loose abrasive slurry residue contaminates the lubricant, it will drastically reduce the life and performance of Trizact Diamond Tile 677XA. For this reason, proper filtering equipment and techniques must be used when recycling lubricant.

There are many types and sizes of filter housings and filter media. Filter housings are sized based upon the flow rate and pressure of the pump used in the process. When specifying a filter housing, consider the media used in it. For instance, bag filters are generally more economical than cartridge filters because they have a larger particulate holding capacity.

To efficiently remove residual slurry contaminates from the lubricant, a dual stage filter system is recommended. A 10 micron filter followed by a 1 micron filter will sufficiently remove residual slurry particles from the system. A filter schematic of this system is pictured below.

Filter Schematic



It is important to note that the above filter system is only effective if the slurry delivery line(s) from the filter to the machine are thoroughly cleaned or replaced. If not replaced or cleaned, the line(s) will re-contaminate the filtered lubricant with residual slurry particulate, causing reductions in the life and performance of Trizact™ Diamond Tile 677XA.

A secondary method of filtering or separating the lubricant is required to remove particles generated during the lapping process. The average particle generated when lapping crystalline or silica based glass materials with Trizact Diamond Tile 677XA is 1 micron in size. These particles are produced during the abrasion process and come from both the substrate material and from the pad material. Some of the particle effluent, or "swarf," will be captured in the filter media used for filtering residual slurry particles, but many will simply pass through such a system. Sub-micron filters could be used to remove the swarf but sub-micron filters can be expensive and limited in performance and capacity. As an alternative, an easy method of removing swarf is to simply allow the particles to settle out during an off shift in production. Pumping lubricant from a sump left undisturbed for an 8 hour period will reveal a thick layer of particulate sludge that can be easily removed from the bottom of the tank. Having a spare sump to share between machines saves time and effort by eliminating the need to re-pump the lube into the original sump.

Swarf removal frequency depends on machine time utilization, material type and stock removal. During steady state lapping with Trizact Diamond Tile 677XA, stock removal rates remain relatively stable. However, as swarf generation steadily increases the lubricant viscosity, a point is reached when stock removal rates decrease. Acceptable reductions in stock removal rate depend on the performance requirements of the process. At some level of particle concentration, however, declining stock removal rates will necessitate removal of the swarf from the lubricant. With the swarf removed, stock removal rates will recover to steady state levels as long as proper lubricant concentrations are maintained. Acceptable fluctuations in concentration depend on the lubricant, process, and performance requirements. Lubricant levels can be monitored using a refractometer. Additional swarf separation techniques and equipment, like centrifuges, exist and should be utilized when available and appropriate.

Industrial Business

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