

# Micro-Dispensing Cuts Lubricant Usage By 99%, Results In Higher-Value Dry Chips

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**Imagine being able to increase part production by three times while using a fraction of the cutting fluid, coolant, or lubricant; or, if you prefer, imagine gaining similar improvement in tool life.**

## New Technology

Now, further imagine how much employee safety would improve with no airborne lubricant or coolant mist. And if that isn't enough, dry chips and no part cleaning required.

Micro Dispensing has been around for many years. Improvements to lubricants have made it a reality that can be a mistake to overlook. What makes Micro Dispensing so different is that a small amount of lubricant is required - less than 1% of the air/lubricant mix. The lubricant is virtually consumed in the machining operation leaving no residue on the machine surfaces or work piece, with no airborne mist.

Two factors help to make Micro Dispensing so effective: 1. High velocity air delivered directly to the tool/work piece interface, and 2. High performance lubricants that contain extreme pressure additives.

## High Efficiency Fluid Dispensing

Advances in nozzle design have greatly improved the performance of Micro Dispensing by increasing the velocity of the air stream directed at the tool/work piece interface while minimizing the tearing effect on the lubricant. Previous nozzle technology induced rapid decompression at the nozzle tip as the air/lubricant mixture was delivered. This created a "tearing" of the lubricant into droplets with very little mass that reduced the "hitting power" of the droplet. Additionally, since the droplet mass was "lighter than air", this resulted in more of a "fog" than a directed stream of high performance lubricant.

Initial testing determined that there was a severe drop-off of lubricant delivered to the work piece beyond 3 inches - less than

30% of the lubricant actually made to the test surface at a distance of 6 inches from the nozzle! That means that 70% of the lubricant either remained airborne as "fog" or on floors, machine surfaces, everywhere except where it was intended. New nozzle technology was recently introduced by Trico Mfg. Corp. that makes the delivery of the lubricant to the same test surface over 90% efficient. The droplet size was also increased to where any stray or excess lubricant will not remain airborne as "fog".

New lubricants have very high lubricity properties that make them extremely effective at reducing the friction that causes premature tool

wear and reduced material removal rates. When properly configured, it is difficult to see the lubricant on the tool or work piece. Many of these lubricants are comprised of more than 90% base with the remaining 10%, or less, high performance additives. Synthetic and vegetable base oils are blended with additives, such as extreme pressure (EP) additives, resulting in a lubricant with a very high performance to quantity ratio.

When applied with a high velocity dispenser friction, and thus wear and operating temperature, is significantly reduced. In one particular test, effective friction reduction was achieved up to a removal rate of approximately 180 feet per second when used with carbide tools on aluminum.



▲ The high-velocity air/lubricant mixture clears chips while lubricating.

▲ Switching from cutting oil to a vegetable base lubricant reduced the number of taps required by 80%.

## Multiple Applications

**Tapping** is an area where Micro Dispensing excels. In one application, after switching from cutting oil, vegetable base lubricant reduced the number of taps required in a 500 piece tapping operation from 5 to just 1. Where it previously required that the hole be tapped twice, a single tapping operation worked well resulting in a 25-33% reduction in process time on the job. Since no cleanup was required, additional savings were gained prior to plating the finished parts.

**Sawing** is another application for efficient cutting tool lubrication utilizing Micro Dispensing technology. By directing the nozzles into the saw blade at precise angles the blade remains clean and well lubricated. Custom nozzle blocks for specific blades, materials, and speeds have increased performance even more. The lubricity of these oils, combined with the high velocity application specific to Micro

Dispensing have proven to be very effective in band saw applications involving structural shapes up to 6 inches. Interrupted cut operations are improved due the ability of the lubricant to remain on the saw blade.

**Milling** is good fit for Micro Dispensed lubrication. The high velocity of the air/lubricant mixture ensures both excellent chip clearing and lubricant application. Both feed and speed rates can be significantly increased without reducing tool life. High tool surface speeds make traditional coolant or cutting oil applications less effective than Micro Dispensing.

**Turning** of most metals is greatly enhanced through the use of high performance lubrication such as Micro Dispensing. Reduced tool wear or increased material removal rates are, in many cases, an immediate result. Lathe work areas are significantly cleaner and safer since there is no residue or airborne mist created. Drilling operations can be more efficient since the lubricants are carried into the hole effectively. Proven results in reduced cycle times, increased tool life, and reduced chip welding (and thus improved finishes) are realized.

#### Reduced Operating Costs

Producing virtually dry chips increases scrap value. Since Micro Dispensed lubricant comprises less than 1% of the air/lubricant mixture, post-machining lubricant residue is virtually non-existent. Parts that require heat treating, plating, painting, or anodizing may no longer require cleaning after machining operations where Micro Dispensing technology has been utilized. Part cleaning solutions last longer, and part finishing costs are reduced. Machine surfaces, shop floors, and tools are cleaner, improving safety and efficiency.

Micro Dispensing technology can be considered an alternative to flood and spray cooling in many applications. When all three methods are utilized, the arsenal is complete for many machine shops. A direct comparison was done on a milling operation by first using spray cooling and then switching to Micro Dispensing. Spray cooling required over 2 gallons of coolant while Micro Dispensing used less than 2 fluid ounces to do the same job!

Since such a small amount of lubricant is delivered, and, when configured properly, there is no airborne mist or residue produced; operator and environment

safety is enhanced. Many lubricants designed for Micro Dispensing application are biodegradable and have proven to be both effective and safe. By utilizing vegetable oils, such as corn or soybean, environmental safety is ensured should spillage or overuse occur. In many cases, vegetable oil based lubricants have higher levels of performance than mineral oil based lubricants.

#### Evaluate Dispensing Method

While no one lubricating or cooling method exists for all metal machining operations, by

understanding the benefits and limitations of flood cooling, spray cooling, and Micro Dispensing, wise choices can be made for every operation in the shop. Take time to meet with your metalworking fluids supplier and have them explain the benefits and limitations of their products. If you haven't taken a closer look at what's available today, you could be losing money.

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