The benefits the customer found with the new setup was five times less wheel corner wear, twice the pressure available, elimination of burn, elimination of nozzle damage and misplacement, elimination of a post process burr removal operation, and 40% reduction in cycle time.

Cool-Grind Technologies has extensive experience with coolant application for the grinding of taps, drills, reamers, and inserts, from carbide, steel and PCD materials.

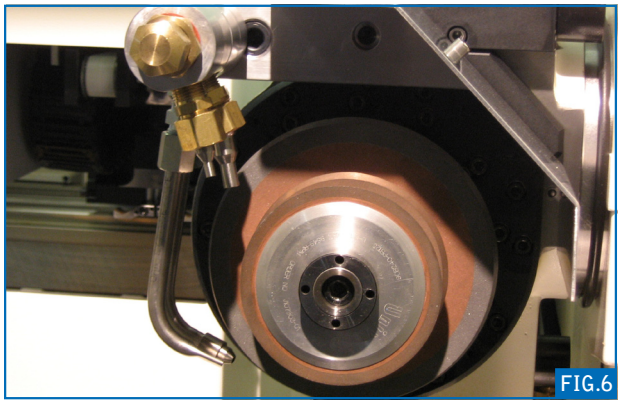

FIG.6

HOW WE CAN HELP YOU

Cool-Grind Technologies can offer you three different levels of support to make your process work with the required levels of quality and economics. Level 1 is supply of the basic nozzle to your specified aperture once you have done the design work. Level 2 includes technical design assistance at an agreed hourly rate, and includes analysis of data, review of setup and essential CAD work. Level 3 consists of a visit to your facility to audit your current process and setup, analyze and conceptually design an improved nozzle and pumping system, provide a report, design and build nozzle hardware, and install.Once a specific grinding application has been verified, additional kits can be supplied for installation by the customer.

Cool-Grind Technologies has over 2000 sq. ft. of manufacturing capabilities. Housing CNC machines, Lathe's, Milling machines, and Manual machines, all controlled and operated by 5 professional employees.

COOL-GRIND TECHNOLOGIES LLC

COOL GRIND

"NOZZLES FOR A COOLER GRIND"
WWW.**COOL-GRIND**.COM

CONTACT DETAILS

Dr. John A. Webster
Cool-Grind Technologies
673 Chaffeeville Rd
Storrs, CT 06268, USA
Cell: 860 208 5196
Office: 860 429 8822
Fax: 860 429 5179
Email: cool-grind@sbcglobal.net
Website: www.cool-grind.com

AUTHORIZED DISTRIBUTOR

Jeff Kaplan
Banyan Global Technologies
105 Briarcliff Drive
Greenville, SC 29607
Cell: (864) 382-0695
Fax: (586) 435-0528

CUTTING TOOL GRINDING
COOLANT NOZZLES

COOLANT APPLICATION OVERVIEW

Grinding is generally a thermally dominated process, which if done incorrectly can lead to surface damage to the work material, and unsatisfactory process economics due to inadequate removal rates and/or excessive wheel wear. The power consumed by the process is partitioned into the wheel, work, chip and coolant. The amount that enters the workpiece must be cooled quickly to prevent high local temperatures and phase transformations from developing. Phase transformations are often responsible for tensile residual stresses, white layer formation, reduced fatigue life, cobalt leaching, and surface and sub-surface cracking. Cooling of the process is achieved by the application of a cooling and lubricating fluid, as well as selecting process parameters that reduce the heat being generated.

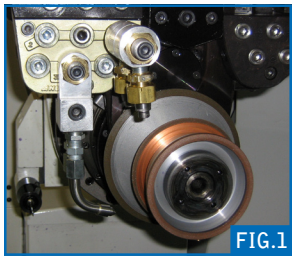
FIG.1

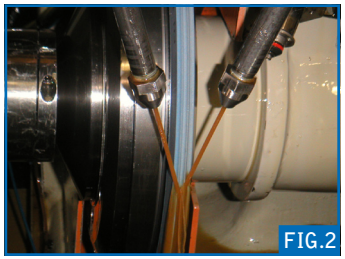
FIG.2

Over the last 16 years, Dr. John Webster (a.k.a Dr. Cool) has developed a tried and tested philosophy for optimizing the application of coolant into a grinding processes, with more than 250 successful field applications installed and close technical relationships with more than 20 universities around the World. The pressure, flowrate, temperature, and direction of flow all influence the cooling ability of the fluid. The pressure controls the velocity of the fluid, the flowrate and temperature controls the rate of heat transfer into the fluid. The direction allows the fluid to remove the air-barrier that travels with the wheel. The flowrate is dependent on the type of grinding wheel and the spindle power consumed during the process.

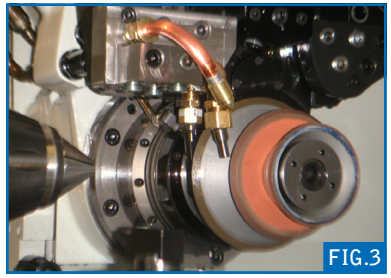
FIG.3

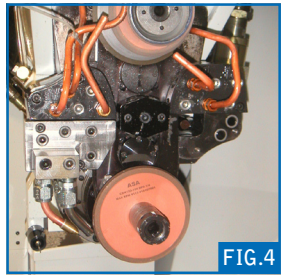
FIG.4

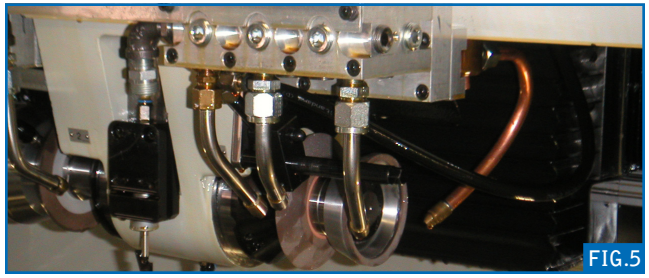
FIG.5

NOZZLE DESIGN

Webster has studied and flow-tested many conventional nozzle designs and found the designs to be limited by internal turbulence (giving high dispersion), large exit apertures (preventing sufficient pressure due to excessive flowrate), close proximity to the grinding zone giving potential for damage (due to the dispersion), low pressure rating (especially plastic flexible nozzles), deflection when pressure applied (especially small metal pipe and plastic nozzles), and tortuous bends from manifold to the grind zone (due to position and design of the manifold).

Dr. Cool nozzles are based on round and rectangular coherent jet technology, and produce a laser-like stream of coolant at high pressure. When applied at the optimum coolant flowrate and pressure, these nozzles can give the following advantages over plastic, bent tube, or fabricated nozzles:

- *Reduced dressing compensation required and lower natural wheel wear*
- *Thermal damage of the workpiece material is reduced, allowing higher productivity to be pursued*
- *More of the applied flowrate will be effective, such that the overall applied flowrate is often reduced*
- *Reduced push-off due to lower hydrodynamic forces and reduced grinding power*
- *Reduction in entrained air, misting, foaming and vapor problems.*
- *Reduced disturbance of the jet from the air barrier surrounding the wheel*
- *Robust set-up using generic, non-profiled, and easily reconfigurable nozzles by using releasable compression fittings*
- *Reduced tendency for the wheel to load with work material or binder*
- *Increased coolant pressure at the nozzle, due to reduced flowrate*
- *Easier aiming into the critical areas of thermal energy using a laser aiming technology*
- *Greater distance from the nozzle to the grinding zone due to the high coherency*

EXAMPLE

Fig.3, 4 & 5 above show an ANCA TX7 grinder with fluting, gashing, notching and back-up setups using small diameter copper tube. The setup (Top of Fig.4) requires multiple bends to position the jet into the process from the horizontal facing manifold, and suffers from high dispersion, rotation of the tubes in the compression fittings, difficult setup and no wheel wear compensation. The coherent jet in setup (Fig.3 & bottom of Fig.4) a new adapter and manifold system that faces the NPT threads downwards, allowing one bend per nozzle and easier setup. Also shown are two sizes of swivel nozzle that are ideal for cooling 9 o'clock grinding positions.

continue on next page »