

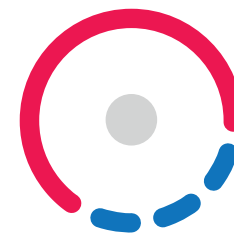


### How Can Cool-Grind Help You?

Cool-Grind Technologies can offer you 2 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 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 4 professional employees.

[cool-grind.com](http://cool-grind.com)



# COOL-GRIND

## AUTOMOTIVE CASE STUDY



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# AUTOMOTIVE CASE STUDY

## Coolant Application Overview

Grinding is a thermally dominated process, which if done incorrectly can lead to surface damage to the work material, and unsatisfactory process economics. 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, dissolved oxygen, 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.

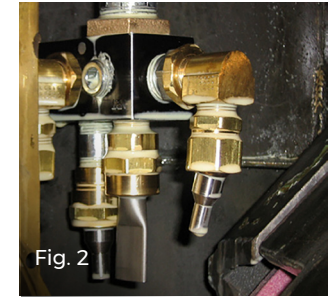
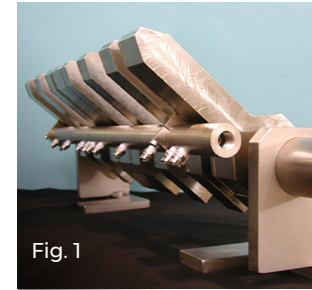
Over the last 20+ years, Dr. John Webster (a.k.a Dr. Cool) has developed a tried and tested philosophy for optimizing the application of coolant into a grinding processes, with more than 250 successful field applications installed and close technical relationships with more than 20 universities around 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 flow rate 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.

## Nozzle Design

Cool-Grind 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 and reduced burr formation.
- 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 flow rate.
- Easier aiming into the critical areas of thermal energy using laser aiming technology.
- Greater distance from the nozzle to the grinding zone due to the high coherency.

Fig. 3 above shows a Landis CNC camshaft grinder that is setup for grinding hardened steel with a high-speed vitrified CBN wheel, in water-based coolant. The issues that the customer faced was high residual stresses and although a small percentage of camshafts were experiencing surface cracks, all camshafts needed to be inspected. The problem was traced down to low main nozzle pressure due to excessive nozzle aperture, and a cleaning nozzle that was running at less than 100 psi causing loading of the steel camshaft material into the wheel surface. The solution was to fit a Cool-Grind coherent-jet main nozzle (Fig. 4), and an integral high-pressure cleaning and 800 psi positive displacement pump.



The benefits the customer found with the new setup was the elimination of wheel loading and a much cooler grinding process. The main nozzle pressure was raised to over 100 psi due to the smaller aperture, and the scrap rate fell to zero defects in 80,000 parts, eliminating the 100% inspection and therefore saving \$300k per year. Cool-Grind Technologies has extensive experience with coolant application for the grinding of camshafts (Fig. 1 & 6), bearing (Fig. 2), transmission shafts (Fig. 5) and crankshafts, from cast iron and hardened steel materials.

