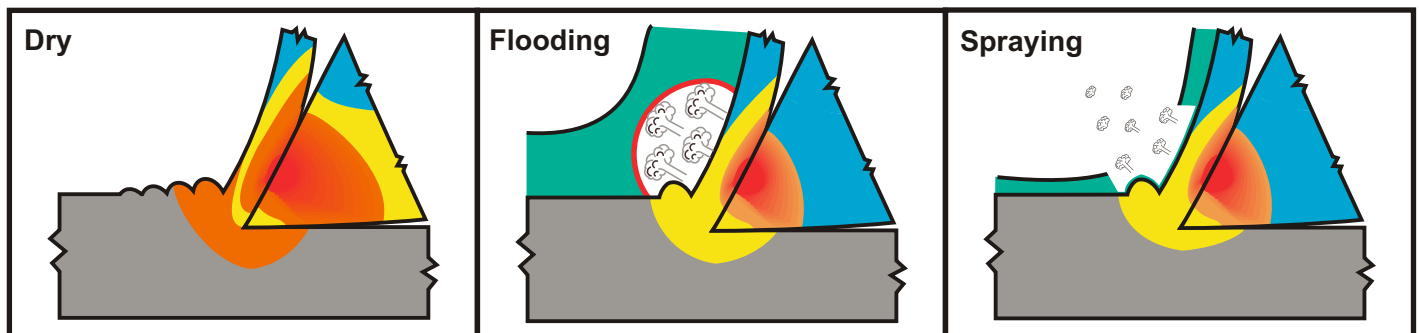


Spray cooling basics

The need for providing coolant to metal removal operations is readily accepted in machining industries. All metal cutting applications generate heat due to metal deformation and chip friction at the tool chip interface. Coolants allow for this heat to be minimized or removed from the operation. By removing the heat generated in the operation, tool life increases and part finish is improved.



Tool Chip Interface

"Spray Cooling" for the purpose of this paper shall be defined as "the delivery of a coolant in a spray form using compressed air." This technology was discovered and became available to metal cutting operations in the 1950's. Previous to this "flood cooling" was the accepted way of providing cooling and lubricating to the cutting tool. Flood cooling, although more effective than dry machining, also has negatives associated with its application. Dermatitis due to operators contact with unstable coolant chemistry, workplace cleanliness, chip processing and sump maintenance costs all could be improved significantly in many machining applications through the use of spray coolant. Many secondary machining applications could be improved with the addition of spray coolant.

Spray delivery of coolant with improved synthetic formulas can provide higher heat transfer from the tool chip interface than typical flood applications of water soluble coolant. With higher dilution capabilities, modern synthetic coolants provide the necessary heat removal/tool lubrication performance to maximize cutting tool performance. Being able to maintain coolant dilution ratios more precisely with once through coolant usage, insures that the best coolant mixture is being delivered for the operation being performed. When necessary, dilution ratios can be adjusted when either more lubrication or more cooling performance is called for.

With the variety of metal cutting operations that are performed every day it is important to not lose sight of the role spray cooling can play in improving machining applications. With modern day equipment, applications ranging from tool room to high production can be covered. Improved nozzle design and proper coolant pattern adjustment allow users to maximize speeds and feeds and remove chips while improving part finish and tool life.

Three factors determine the appropriate cooling or lubricating requirement in metal removal operations. Material machinability, machining process and cutting tool material all must be considered when determining where spray cooling is appropriate. When these factors call for high heat removal spray cooling can provide the necessary cooling and lubricating for the cutting tool.

When all variables, both direct and indirect are factored in, many flood coolant applications can be converted to spray cooling, improving the metal removal operation.

Trico Mfg. Corp. offers a wide range of coolant delivery systems which can cover most applications. Economical siphon type to multiple line pressurized systems offer the user alternatives for almost all metal removal operations.



The siphon type units cover a range of applications from light to moderate with up to six nozzle capability. The use of multiple nozzles allows for adequate coverage when tool sizes are large or heat generation is great. Typical applications would be tool room, prototype areas, or smaller machining work cells. This type of delivery unit can cover secondary machining applications that are not equipped with coolant capabilities. Drill presses and milling machines are examples of machines that can be improved.

For more sophisticated applications or demanding metal removal processes, the pump or pressure type delivery systems are recommended. With the coolant being delivered with positive pressure, a wide range of coolant stream definition can be attained. Applications covered by these systems include dedicated secondary machines, transfer lines, large capacity tooling, through the tool and machining cells. The various nozzle/valve combinations allow for customizing systems specific to end user applications.

