# Coolant Systems for Lathe and Mill Use

– one user's experience and recommendations

I am not a coolant expert. But I have done enough research to know there are three basic approaches to providing cooling and lubricant to the cutting tool and material during machining:

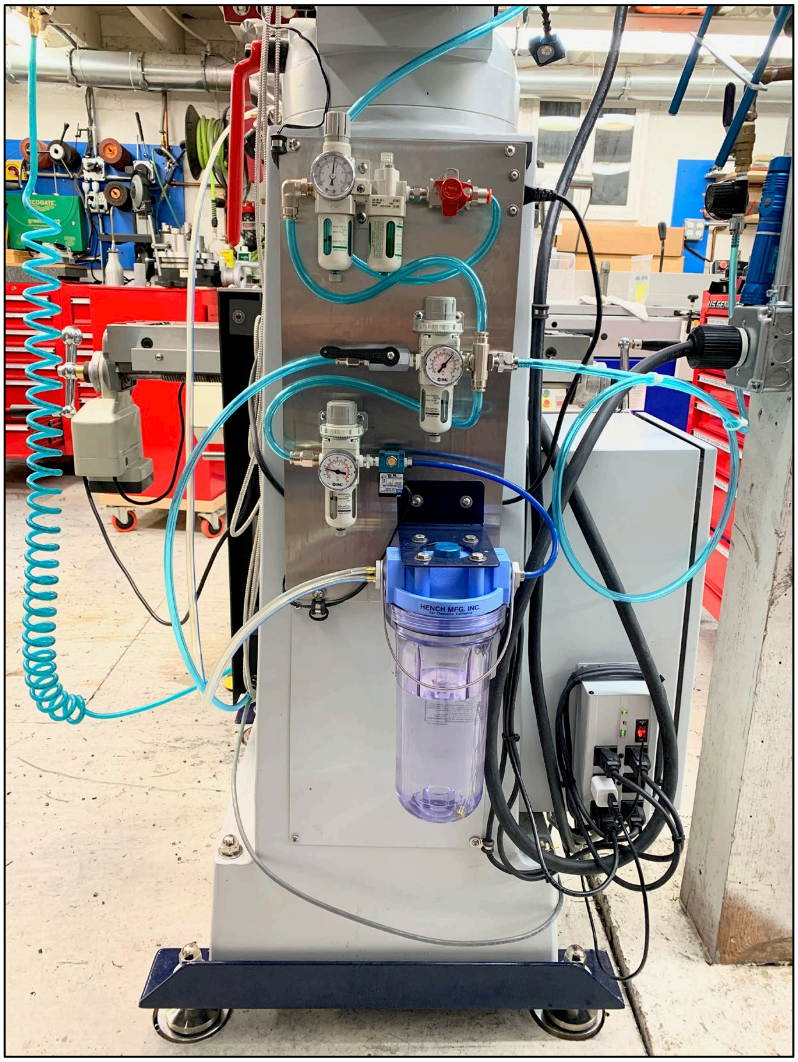
- Flood coolant – a constant stream of coolant is delivered to the cutting area, sometimes through the cutting tool, but more often via a nozzle with convenient positioning control. The coolant liquid flows over the tool and material, sometimes in a trickle, but more often under pressure if the machine has an enclosure. The coolant liquid and chips flow away from the cutting action, and the coolant drains off the vise and table into a sump that is often located in the base of the mill and is then recycled. These systems can be messy, require skimmers and filters to cleanse the coolant liquid before recycling in the coolant pump, and need ongoing maintenance of the coolant chemical formulation due to contamination and evaporation.
- Mist coolant – the coolant liquid is finely atomized into a mist that is delivered along with compressed air to the cutting action. The mist is so small that it behaves like fog. This type of system is only appropriate for tightly enclosed milling centers where the mist is not allowed to escape. The very fine fog-like mist that is generated is a health hazard, and thus this type of system has largely been phased out in favor of the MQL type.
- MQL or Minimum Quantity Lubrication – the coolant in this setup is delivered to an atomizing and mixing device that uses compressed air and a specialized jet-stream orifice that fractures the coolant liquid into tiny droplets. The droplets are tiny, but unlike the Mist systems, the droplets are not so small that they enter the atmosphere, circulate in the shop creating a health hazard, and distributing a fine coolant particulate that collects on everything left uncovered in the shop. A properly adjusted MQL system will not require the use of masks or respirators by the operator, and the coolant is localized to the cutting area. The amount of coolant delivered is just enough to provide the necessary lubrication, and when combined with the compressed air stream and a properly aligned nozzle will direct the chips and swarf away from the ongoing cutting action.

I prefer the MQL system for my manual machining equipment. There are two types of MQL systems, and both employ the use of compressed air to atomize and deliver the coolant to the cutting tool and material:

- The least expensive MQL systems rely on the vacuum created in the atomizing fixture to siphon the coolant liquid from the coolant storage bottle/container. The Noga Minicool system is typical of the better-quality systems in this category. Many users have had terrific experience with the Noga system – I have not. An entry-level Noga Minicool system is typically in the $100 range. Other less expensive systems are available, however many of these types of systems are not well enough designed to ensure the coolant delivery is MQL – most in fact are Mist systems with all the attendant health and environment hazards that accompany those systems.
- The other type of MQL system uses air pressure to force the coolant liquid out of the coolant bottle/container and up to the mixing and atomization device. Among these, the Fogbuster is probably the best known and widely used and is what I use in my shop. An entry-level Fogbuster system is more expensive (typically $350) than the Noga system, but I have found the Fogbuster to be more reliable and controllable, and it can be easily controlled on/off with a solenoid tied into the mill or lathe control systems.

With that as an overview, the following section goes into additional detail on how I have configured my Fogbuster system for my mill and lathe.

The coolant canister looks almost identical to a residential water filtration unit. The difference is that it has a screwcap on top for adding coolant to the canister, and it has specialized fittings for the air connections. One of the advantages of this pressurized coolant system is that the coolant canister can be mounted anywhere – a Noga syphoning-type system requires the coolant container/bottle be below the mixing head. For my mill installation, I mounted the Fogbuster coolant canister on the back of the mill since in my shop the mill has plenty of accessibility on the back side for filling the canister. In other shops it may be more convenient to locate the coolant canister elsewhere for ease of access.



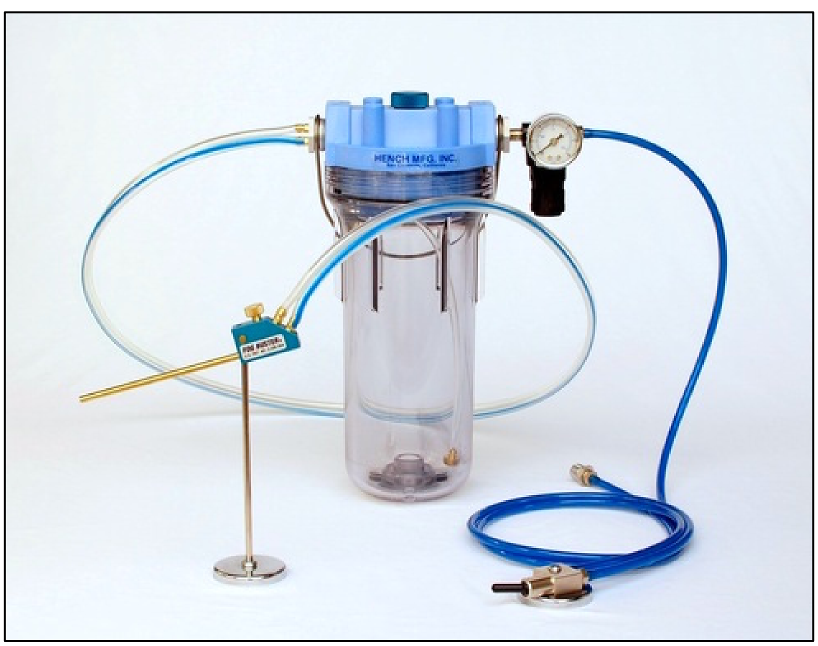

As you can see in the photo above, I have an elaborate compressed air control system as part of this installation. Air comes into the system from the right side of the photo to a 3-way splitter. The raw air at 160 PSI is delivered to three separate regulators.

1. Going upward from the splitter, the air is delivered to a regulator and lubricator where the pressure is reduced, and the air impregnated with oil for delivery to the power drawbar system on top of the J-head.
2. Going to the left, the air is delivered to a second regulator/filter and out the side to a coiled hose for the handheld blowgun used to spray away swarf.
3. Going downward, the air is delivered to a third regulator and on to a solenoid that is controlled via a switch at the control station, and then on to the Fogbuster coolant container via the dark blue hose.

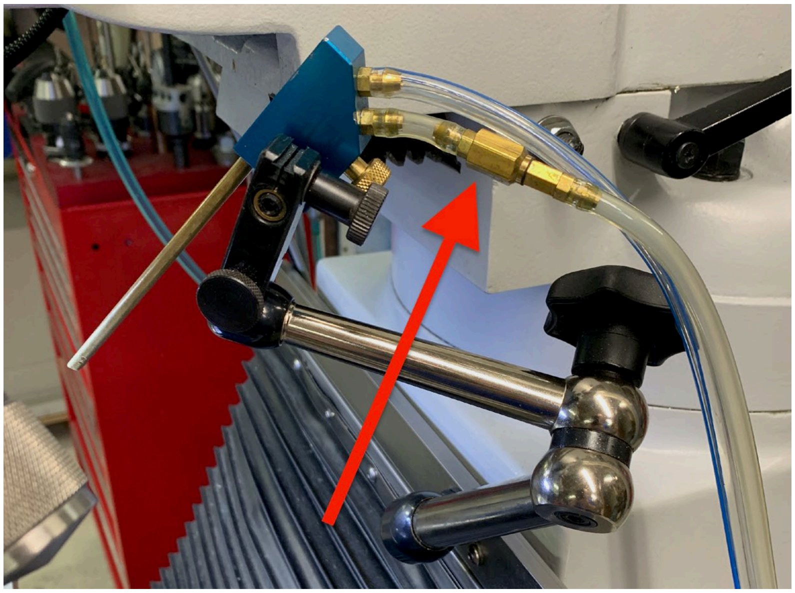
From the Fogbuster coolant container, two hoses emerge on the left side (the two hoses are fused together into a single element) of the coolant canister, one delivering compressed air, and the other delivering pressurized coolant to the mixing/atomization component mounted above the mill table.

I have a similar setup on my lathe as can be seen in the photo below. Air coming into a solenoid (dark blue hose) that is controlled by a switch on the lathe to turn the coolant on/off, from there to a regulator and then into the coolant canister. The double-hose coming out of the coolant canister delivers compressed air and a separate pressurized stream of coolant to the mixing/atomization device.

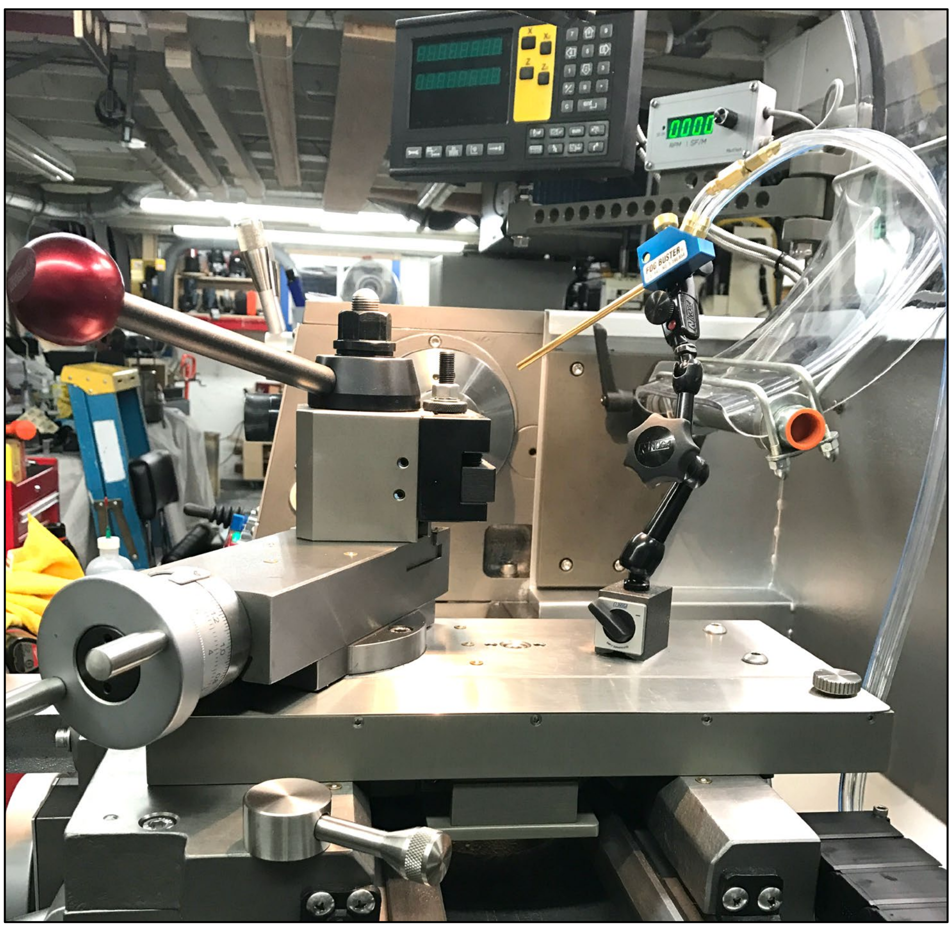

The Fogbuster kits come with the coolant canister, a regulator, an air switch, the necessary hoses, and the mixing and spray nozzle device with a simple magnetic-base stand as shown below.



Adding a check valve at the coolant entry port to the mixing/atomization unit will ensure coolant does not flow back into the coolant canister when the air pressure is off – this facilitates near instant availability of coolant when the air is switched on. You can see the check valve in this photo.



As you can also see from the photo above, I prefer to have my Fogbuster delivery nozzle and mixing control valve mounted on an articulated holder – in this case a spare Noga indicator holder that has been secured to a mounting bar I added to the mill column. Similarly, I prefer the same setup on the lathe, but using a magnetic base to provide additional positioning flexibility.



Fogbuser offers several different stands for the nozzle/mixing head, all of which I find inconvenient and difficult to quickly position. Many users prefer to use a Loc-Line type of system to hold the spray head as shown below. This provides a lot of positioning flexibility for the spray nozzle without a lot of hassle. James Clough has an excellent video on how to make your own Loc-Line setup for a Fogbuster which can be viewed here.


On both my mill and lathe, the Fogbuster is turned on/off with a switch integrated into the control system. You can see the coolant switches illustrated in the two photos below. If the coolant switch is on, the Fogbuster solenoid is triggered which delivers compressed air and coolant to the nozzle.


Most of the time I use denatured alcohol as the coolant mixture for the Fogbuster. It has the advantage that it evaporates quickly and leaves no residue. It works very well, providing both cooling and lubrication with aluminum, brass, and other softer metals. I also use it most of the time when machining stainless steel with smaller end mills and drills – but I will revert to a needle-type handheld drip applicator for cutting fluids when tapping. Infrequently, when performing a lot of aggressive machining on steel or face milling stainless, I will switch out the alcohol for a water-soluble coolant liquid specifically intended for use with MQL systems. My go to coolant for ferrous metals is Coolube 2210XP.