



Climb Milling vs. Conventional Milling

Roughing cuts and cutting hard materials should be done with “Conventional Milling.”

Finish cuts can be done with “Climb Milling.”

Climb milling is, as the name implies, the cutting edge of the tool that is literally climbing up the side of the part.

Conventional milling has the cutting edge of the tool digging into the side of the part (see Figure 1 below).

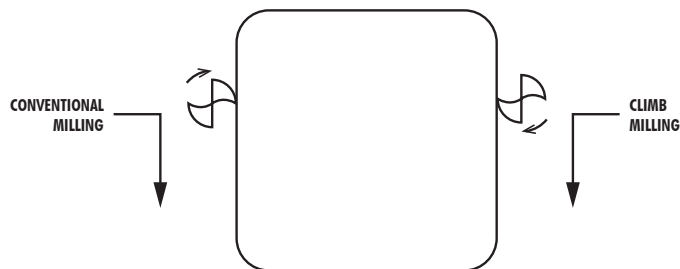


FIGURE 1

Cutting Information

1. All machines have an amount of backlash. Machines with ball screws have the least amount of backlash. Because ball screws have a minimal amount of backlash (almost nonexistent), you can climb mill successfully with them. Any machine that has a leadscrew (not ball screw) is going to have problems if you use climb milling.
2. When using climb milling, the force of the cutting edge into the material is pulling the table against the backside of the leadscrew thread. By doing this, each cutter flute engagement is taking up any backlash that is in the machine, and then releasing the backlash. Basically you are vibrating the machine axis back and forth thousands of times per second. This causes vibration in the cutter and the machine. Vibration leads to chatter. Chatter leads to a poor finish. Chatter can also make your cutter vibrate loose in your end mill holder over time.

3. When using conventional milling, the cutter load is pushing the table against the front side of the leadscrew thread. This force takes up any backlash in the machine and allows you to make cuts with a much lower chance of vibration.
4. Vibration can still occur and it is generally created when your cutter is sticking out too far from the holder, or your method for clamping your part is not rigid enough.
5. Another factor in reducing vibration is your cutter size. The larger the cutter diameter, the larger the impact force of the cutter flute on the part. In many cases on our Sherline machine, you would be better off using a 1/4" end mill to do a profile cut instead of a 3/8" end mill. Smaller flutes, smaller impact force, faster RPMs, lead to smoother cuts.

Pros and Cons

Conventional milling is easier on your tools, your part, and your machine because of the lack of vibration caused by the constant take-up and release of the backlash in the machine. However, conventional milling tends to bring chips from the cut back around on the cutter and force them into the finished surface. The finish sides of your part will have chips embedded into it.

Climb milling is going to cause vibration due to the backlash in your machine. However, on light finish cuts, the chips that come off of the cutter tend to go away from the finished surface, and you get a much cleaner finish.

Thank you,
Sherline Products Inc.