

Fixturing Suggestions

When CNC machining, it is important that the cutting forces are considered before designing the fixturing. For example, two 6-32 screws are not sufficient to hold an aluminum block in place during machining. What may be a suitable fixturing setup for cutting a plastic part is likely to be unsuitable for machining the same part in stainless steel. Keep these considerations in mind while designing the fixturing. It is a good idea to check the fixturing setup with a TA before beginning a CNC operation.

If both sides of the workpiece are to be machined, a precise method of flipping will need to be identified. A common way is to drill and ream two holes for precision ground pins along the axis around which the part is to be flipped. These pins can be used to accurately position the workpiece when it is flipped. The pins are also useful as fixturing, as they will take up some of the lateral machining forces.

The following is a short list and description of common fixturing methods:

Vise

The easiest way to fixture a workpiece is to use the vise located on each mill. Although useful for many applications, the vises have obvious limitations, especially when CNC machining. If you do decide to fixture your part in the vise, talk to the TA to make sure it has been trammed before you begin.

Soft Jaws

The vise jaws can be replaced with "soft jaws." These are aluminum vise jaws that are intended to be cut into, unlike the hardened steel vise jaws normally found on the vises. Soft jaws can even be specially modified to hold specific shapes in the vise.

Double Stick Tape

Double stick tape can be used with thin materials that have a significant surface area for taping. In general, materials suitable for taping are sheet plastics and sheet aluminum. Some plastic material does not stick well to tape (Delrin). Never double stick anything that will be machined with flood coolant.

Internally Threaded Holes

If there are threaded holes through the workpiece, these can be used to bolt directly to a fixturing block. There must be enough tapped holes to provide sufficient strength to keep the workpiece in place, or this method can be used in conjunction with one of the other fixturing methods. The best way to use the internal thread method is to externally clamp both the workpiece and fixturing block to the bed of the mill and drill pilot holes in both at the same time. Later tap the workpiece holes and drill a through hole size in the fixture. Don't forget the fixturing block must still be clamped to the bed of the mill!

Bolt Through the Workpiece

If there are holes large enough to accommodate a bolt, bolts and washers can be used to keep the workpiece in place. Remember that all fixturing must be out of the way of the cutter.

Clamp Outside the Workpiece

Another easy way to fixture is simply to use step clamps along the outside of the workpiece to hold it in place. This makes perfect sense when all cutting will take place in the center of the clamped piece. This method can also be used when cutting along the outside of the workpiece, but it will require pausing the cutting operation while clamps in the path of the cutting tool are repositioned. This is a quick and dirty fixturing method. It doesn't make good sense when more than one of the same part is planned.

Webbing

When one uses webbing, the workpiece will be bolted outside the cutting area. The fixturing clamps are significantly outside the cutting area to avoid any collisions, and the workpiece is supported by numerous webs connecting it to the clamped material. Talk to a TA about appropriate web placement and size.

Nesting

Nesting is usually used to machine the inside of a complex or organic shape. The negative of the shape is machined and then used as a "nest" to hold the workpiece in place as the inside is machined. It is necessary to use some other adhesive to hold the nested workpiece in place, ie. glue or double stick tape.

History

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