CNC Milling

The Product Realization Lab has several different types of CNC milling machines, including three 3-axis Haas vertical machining centers and the 3-axis Roland. These machines can be used to make very beautiful projects, but they are much more complicated, expensive, and dangerous than manual milling machines. Their use requires a good understanding of both the fundamentals of CNC and the details of operating each specific machine; this section contains the documents that illustrate these concepts.

CNC Milling in the PRL

The lab is equipped with several different CNC mills. To help you choose the right machine for your needs, this document lists the strengths and weaknesses of each of the machines. The PRL currently has four 3-axis CNC mills. In order to machine complex shapes, all of these machines require code to be generated from a CAD file (made in Solid Edge) and a CAM program (Virtual Gibbs). You can also program "on the fly" at the machine consoles, but this is impractical for complex parts. Some of the machines have "canned cycles" (preprogrammed shapes such as ellipses, circles, etc.) that are very simple to program at the console.

Haas VF-0

The VF-0 is very accurate, provides automatic tool changes, and includes 3-axis control; however the interface is somewhat complicated and you must cut a "Haas license" on signstock before you are permitted to use the machine for your own projects.

Advantages

- Accurate to within +/- 0.0003 inches!
- 3-axis control and tool changes are automatic.
- Holds up to 20 tools.
- Largest bed size in the PRL: 20" by 16" by 20" (xyz).
- Spindle speeds up to 7500 rpm.
- Flood coolant.
- Controller is nearly identical to those on the Haas Mini Mills.

Disadvantages

- You must make a "Haas license" before you can use the machine for your own projects.
- Only 64K of onboard memory, so your programs must be small or they will have to be run via DNC, which is very easy to do.
- Set-up is more complicated. The VF-0 has the potential to do serious damage to you, your parts, and itself, so creating a secure set-up can require significant time.

Haas Mini Mills

The Mini Mills are very accurate, provide automatic tool changes, and include 3-axis control; however the interface is more complicated and you must cut a "Haas license" on sign stock before you are permitted to use the machines for your own projects.

Advantages

- Accurate to within +/- 0.0002 inches!
- 3-axis control and tool changes are automatic.
- Holds up to 10 tools.
- Medium bed size: 16" by 12" by 10" (xyz).
- Spindle speeds up to 6000 rpm.
- Flood coolant.
- 1 MB of onboard memory. Larger programs can be run via DNC.
- Controller is nearly identical to that on the Haas VF-0.

Disadvantages

- You must make a "Haas license" before you can use the machine for your own projects.
- Set-up is more complicated than on manual machines. The Mini Mills have the potential to do serious damage to you, your parts, and themselves, so creating a secure set-up can require significant time.

Roland

The Roland Camm-3 Mini Mill is a full 3-axis portable mill. It is very simple and quick to learn.

Advantages

- Accurate to within +-0.01mm.
- Spindle speed up to 10,000 rpm.
- Very simple, easy and quick to learn.
- Sees very little student use, so securing time on the Roland is easy.

Disadvantages

- Only plastics may be machined on the Roland.
- Only holds one tool. To use separate tools, you must send separate programs.
- Always runs DNC - it has no brains onboard.
- The Roland is metric, so finding specific endmills can be problematic.
- Small bed for machining (roughly 20" by 7").

History

Ver 1.0	Heather Andrus	11/9/95	original text
Ver 2.0	Bryan Cooperrider	5/15/97	corrections, additions and Roland
Ver 3.0	Katherine Kuchenbecker	10/01/01	addition of Haas machines
Ver 3.1	Katherine Kuchenbecker	3/07/02	removal of Crusaders!