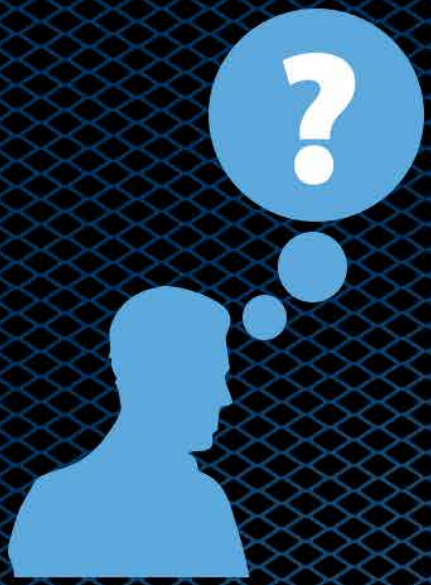
TIPS FOR CHOOSING A PROTOTYPING MACHINE SHOP



PROTOMATIC

Life-saving precision.

TIPS FOR CHOOSING A PROTOTYPING MACHINE SHOP

CHOOSING the right prototyping machine shop for your next project is quite possibly the most important decision you will make in the entire process. This is particularly true for entrepreneurs with little experience in dealing with CNC machine shops.

Along with the shop having the personnel and machinery to produce exactly what is needed, it is also vital that there be an open dialog, particularly between you and the engineers you will be working with closely. It is wise to have in-depth discussions with everyone on the team about your project and what your ultimate objectives are. For your ideas to become a precision-component reality, the "people element" can't be overestimated.

With that said, here are the Top 10 things to look for in a CNC machining shop.

TIPS FOR CHOOSING A PROTOTYPING MACHINE SHOP

What are the backgrounds of the engineering staff?

1

Not all engineers have the same skills and not all are suited for prototyping projects. Unless an engineer has had a diversified education or a wide range of experiences, their familiarity with all of the processes that are available in the manufacturing industries is limited. Be sure the engineers working on your project bring a variety of problem-solving abilities.

Does the shop have extensive CAD expertise?

2

Computer Aided Design (CAD) is a must and any design engineer should be adept with the software. If you don't currently have a CAD product for your business, you will eventually need to get one. It is recommended that you select a prototyping machine shop that uses the same or a very similar CAD product. If you do not know which is best, then select a shop that uses one of the industry leaders, such as Solidworks™. Solidworks™ provides compatibility for multiple platforms such as Computer Aided Machining (CAM). This compatibility will lower CNC programming costs significantly since downloaded machining instructions will not require a redrawing of the part features.

How familiar are they with basic engineering practices?

3

Engineering methods available at the prototyping shop should be evaluated. Topics should include Statics (stress and strain), Dynamics (Moments of Inertia), Finite Elemental Analysis, Geometric Dimensioning and Tolerances, and advanced knowledge of materials.

Are they proficient with a variety of materials?

4

As a start to the selection process, evaluate the engineers' ability to work with many materials and their knowledge of properties. These include characteristics such as melt temperatures, density, magnetic characteristics, chemical resistance, welding characteristics, formability, deformation, wear resistance, chemical resistance, composition and physical strength of the alloy.

For example, ask the engineer to describe the differences between 303 and 304 stainless steel. Their answer should be along the lines that 303 has sulfur in it and is easier to machine than 304. Ask them about welding. The answer should be that 303 is not recommended for welding while 304 provides a very good, tough weld.

Do they have insights into your industry?

5

It is important to select a supplier that knows your industry's requirements. This can make the difference in getting critical insights unique to the industry that you are targeting. For instance, manufacturing requirements and restrictions, coupled with an intrinsically safe design, are required for medical marketing success. Likewise, a good prototyping machine shop will know that automotive or aerospace applications each have special needs. It is important to distinguish the differences.

How familiar are they with a variety of manufacturing methods?

6

There are literally hundreds of manufacturing methods available in various industries. The following list is an outline of the more common processes. Some processes are better at different stages of product development. Design engineers who are familiar with a multitude of manufacturing methods are able to select the best technique for the application, allowing the entrepreneurs to focus on more important areas such as marketing, distribution and sales.

For example, Protomatic engineers and manufacturing personnel are knowledgeable in many manufacturing methods such as:

- Anodizing and plating (corrosion protection)
- Assembly
- CNC machining (billet or finished machining and casting)
- Deep drawing
- Die casting (light metals, zinc, aluminum and magnesium)
- Surface finishing
- Forming
- Heat treating
- Hyroforming
- Investment casting (lost wax)
- Metal casting processes
- Molding (plastics/foams/rubbers)
- Painting
- Passivation (corrosion enhancement of stainless steels)
- Permanent mold plaster cast
- Rapid prototyping
- Fasteners
- Sand cast
- Screw machining (Acme, Brown and Sharpe, Swiss Lathes)
- Sheet metal fabrication
- Stamping
- Stereo lithography approaches (SLA)
- Vacuum forming
- Welding (different methods, rod, gas, vacuum, etc.)

Are the machinists experienced?

7

Most machine shops do not employ degreed Professional Engineers (PE's) for operating the machines. However, those who are running the equipment at a good prototyping machine shop will have a wealth of experience and probably have seen thousands of applications. Ask about the backgrounds of the machinists who will be working on your project.

What about logistics?

8

Most machine shops do not have extensive sales support. For that reason, you may have to go to their location for the product development. This may need to be done periodically since communication is paramount. Often, in place of face-to-face visits, internet meeting websites such as GoToMeetings.com are useful for discussing prints and print changes. Be sure you and they are comfortable working in that manner.

9 Who is ultimately responsible for the design?

Keep in mind, the design belongs to you. You paid for it. It's yours. Therefore, it is important to keep in mind that you are ultimately responsible for the Design Verification and Validation of the product.

10 Are you talking the same language?

Machine shops typically provide an "Equipment List" which simply identifies the equipment available in the plant. For entrepreneurs who have been machinists or come from a manufacturing engineer background, it is a simple task to visualize the capability of each type of machine and, by brand name, the output quality. Others without the background may think it is obscure information.

The following page gives the terminology basics to help get you off on the right foot.

TERMINOLOGY BASICS

Saw - Band
- Maximum size part can be cut by height and depth.

Saw - Rotary/ Chop
- Size is determined by diameter of saw blade and table size.

Lathes
- Used for making round parts, typically with two axis of motion.
- Limited by maximum outside diameter (OD); maximum length.
- Through hole size is the maximum-diameter bar that can fit through the chuck.

Swiss Lathe
- Best for long shaft parts, with both turning and milling operation.
- Through-hole size typically stated in OD mm. 12, 16, 20, 32, 38mm are common.

Screw Machines
- These machines specialize in volume production round parts.
- Equipment can have multiple spindles (6 typical) and fairly complex operations.
- Described by:
  - Through hole size
  - Maximum part length
  - Number of spindles

Mills
- Used to make square shaped parts or complex shaped parts.
- Described by:
  - Three axis of motion (For vertical milling centers (VMCs))
  - X-Axis (Typically moving left to right from the operator)
  - Y-Axis (Typically moving closer or farther away from the operator)
  - Z-Axis (Typically the vertical motion of travel)
  - A-Axis (One rotational axis)
  - B-Axis (Second rotational axis)

TERMINOLOGY BASICS (continued)

Multi-Axis Machines (also called mill-turn machines)

- Make combinations of round (turned, stick tools) and square features (milled, rotary tools) on the same machine. They offer increased accuracy since several operations are performed without a part transfer and re-fixturing.
- Described by:
  - Maximum outside diameter (OD)
  - Maximum length
  - Through-hole size
  - Number of spindles (main (1) or main and sub-spindle (2))

Robots

- Robots are complex motion machines.
- Robots with multi-axis motion are able to perform many tedious tasks such as pick and place, welding, and painting.
- Described by:
  - Number of axis (5- or 6-axis is typical)
  - Arm reach (distance of reach in inches or meters)
  - Arm capacity (total weight including End of Arm Tooling (EOAT)

Welding

- Described by:
  - Method of welding (MiG, TiG, E-Beam, Laser, Spot, Friction)
  - Current - Stated in amps (aluminum requires more than steel)

LET'S GET TOGETHER

Protomatic is the CNC contract manufacturer with the people and equipment it takes to develop precision medical and aerospace components that can save lives.

We know that our medical CNC machining and aerospace CNC machining results in parts that are mission critical. So we take personal ownership in every project.

Turning ideas into reality has always been our cornerstone. Whether we are actually manufacturing a component; or going from a napkin sketch to electronic design, to CAD and CAM files that lead to manufacture, you'll get the same standard of quality: Life-Saving Precision.

As you go about choosing a CNC machine shop, we ask that you consider us. For an introductory discussion, please contact our Managing Director, Doug Wetzel.

Doug Wetzel
Protomatic, Inc.
2125 Bishop Circle West
Dexter, MI 48130

Doug@protomatic.com
734-426-3655
www.protomatic.com

PROTOMATIC

Life-saving precision.