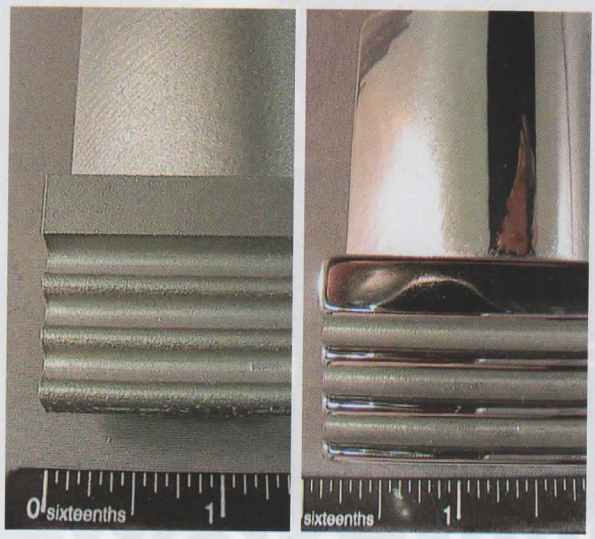
Adapting Mass Finishing Techniques
for Post Processing of 3D parts

Steven Alviti's Bel Air Finishing have been manufacturing and supplying mass finishing equipment for 40 years, as the demand for end-use 3D printed parts increases Steve has penned a guide through the world of surface finishing for additive manufacturing.

WORDS : STEVEN ALVITI, OWNER OF BEL AIR FINISHING CORP.

There are numerous challenges in achieving quality surface for additive manufactured (AM) parts. Those challenges can stem from the chosen method of 3D printing – FDM, DMLS, SLS, SLA - by nature AM parts are created by layering of material. The size and deviation of these layers as well as the orientation of the parts in the working envelope are significant factors that affect the surface finish on the manufactured part. Complications can also arise from the material choice itself; the range of particle size, the way the material reacts to the AM process, etc.

There are abundant benefits of 3D manufacturing; the ability to create complex geometries with intricate detail, parts with complicated internal passages, etc. However, just like anything else - where you gain on one front, you may lose on another. In the case of 3D printing, the cost associated with all the benefits is achieving a quality surface finish. Many industry leading companies and research labs are looking to understand the available finishing techniques, their limitations, and the costs associated with making a qualified 3D part within industry surface requirements.



▲ **ABOVE:** A metal AM part before and after Bel Air's finishing is applied.

DOS & DONTS

If you want to successfully use 3D technology for manufacturing components that require fit, form and function... you must consider the surface finishing requirements before starting the design:

DO - Consider your surface finish requirements before you choose your 3D printing method and technology.

Speed of a build and resulting surface finish seem to be at the opposite ends of the spectrum. The surface of a part can vary between a Ra (measurement of surface roughness) of 100 to 1000 micro inches. The surface of the printed part is directly affected by the printing technology and the material grain size. The lower the Ra the more likely and faster you can get to your required surface specification

DON'T - Design a part with the "3D Hype mentality".

Hype suggests that you can take a five-piece assembly turn it into a "one shot build" with your printer. If you consider surface finish requirements and understand that conventional finishing methods will not be applicable, you may find that you need to breakdown and simplify your design. For instance, your "one shot build" may be divided into a two-part build with a single assembly. This may allow you to use standard finishing techniques to handle dimensional requirements and still have a more efficient process of production.

DON'T - Design a part with conventional manufacturing thought process.

Chances are that you will have dimensional challenges and/or surface finishing problems when you take your part from the printed build and attempt to integrate it into its functional assembly. You will probably need to build your corner, angle and surface geometries in an unconventional manner. Loss of material at a surface, other than a corner, can range between .001 in. to .005 in.

DO - Take the time to understand and experiment with conventional finishing methods.

Have some specifically designed shapes made in several machine technologies and have the surfaces finished by conventional methods to analyze the results and limitations before you purchase or before you design a part.

DO - Take the time to define your surface requirements before you design.

Understanding the 3 dimensional topographic features of your build are necessary to define the surface as well as the conventional simple Ra measurement. A part after finishing, can have an Ra that meets the print specification but it can also have left over divots from your build. Typical convention surface call outs do not take this into account. ■