ISSUE 5—FALL 2019

PARTBUYERS AUTHORITY

ADVANCED & ADDITIVE MANUFACTURING INNOVATION (and why it matters)

Reducing waste streams, understanding digitization and smart automation, using process analysis tools and visualization techniques are topics of keen consideration as manufacturers are diligent about producing higher quality parts at less cost.

MARKETING OPTIONS

Welcome to Our Fifth Edition

The first edition of the Part Buyers Authority was issued two years ago. Since then we have learned that people involved in the decision-making process of purchasing, designing or producing a part appreciate a succinct publication that tries to bring clarity to some of the Advanced & Additive Manufacturing (AM) technologies that are exploding on production floors today.

Our foreward for this issue is by Will Shambley, president of New England Foundry Technologies. Will consults globally on Advanced and Additive Manufacturing technologies in plastics, metal casting, metal forming, composites, and ceramics. Will has been involved in 3D printing of many materials from the beginning and has insight useful for those exploring as well as for early adopters of this technology.

The other authors for this issue discuss 3D metal printing, 3D plastic printing, 3D sand printing for metal casting, metal stamping, hermetic sealing, and the many manufacturing options now available at machine shops.

This is a collaborative environment – which means you have a voice too. Do you have a technology or type of part that you would like us to discuss? Complete our form at partbbuyersauthority.com.

We would welcome hearing from you and understanding the material and technology questions you have regarding part manufacturing.

Barb Castilano
Owner, Marketing Options
Founder/Publisher, Parts Buyers Authority

MARKETING OPTIONS

TABLE OF CONTENTS

FOREWARD

NEW ENGLAND FOUNDRY TECHNOLOGIES

WILLIAM SHAMBLEY

President, NEW ENGLAND FOUNDRY TECHNOLOGIES
and Additive Manufacturing Consultant

Manufacturing processes continue to evolve at an unprecedented pace these days. New processes are launched, validated, improved, and made obsolete so quickly that sometimes a part buyer may never even hear of a particular technique, even though it's become certified AS9100 for Aerospace and Defense production. At the end of the day, all tools have a purpose, and sometimes the tool that an engineer learns to design for isn't the best way to make that same part 10 years later. The only way to take advantage of this evolution is to work with service providers who keep their historical processes running while becoming experts in the next generation of their core technology.

Each of the authors in this edition fall into the category of business that simultaneously improves their standard operations while working as an early adopter of new technology. In the process they have built staff, culture, and process to support bridging their customer's production from one paradigm to the next.

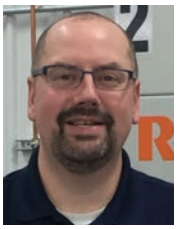
While 3D Printing, or Additive Manufacturing, has drawn the lions' share of the press as a "new technology" in recent years, it would now be more appropriate to say "Newly approved for AS9100 applications." Companies like Innovative3D Design have staff on hand that work with customer drawings, evolving them from "2D" to properly documented drawings for Additive Manufacturing – but they offer these services as part of a turnkey part production service that includes CNC machining, EDM, heat treat, and other more traditional operations. Trident Alloys and Paradigm Industrial both offer traditional manufacturing services, as well as the opportunity to explore 3D printed solutions for tooling & mold making.

Sometimes it doesn't take sparkling new technology to make a difference – it just takes a more thoughtful procedure than the current one. Banner Metals Group showed a new aerospace customer a 10x (yeah!) improvement in one quality metric and eliminated scrap through process changes. Experience developed by constantly tackling new applications has taught RH Seals a range of solutions for air, marine, military, and other tough-to-seal situations.

The old adage about problem solving when the only tool around is a hammer is spot on. Great providers have a full arsenal of tools, and they are also the ones looking out for air-nailers and battery powered hot glue guns.

Contact:
WILL SHAMBLEY
will@nefoundrytech.com

METAL ADDITIVE MANUFACTURING



INNOVATIVE MANUFACTURING 3D

CHRIS BECK
Manager of Operations/Co-Owner
INNOVATIVE 3D MANUFACTURING

There are some truly amazing projects happening in the metal Additive Manufacturing (AM) space these days. 3D metal printing is serving a wide variety of critical industries including: aerospace, medical, heavy duty diesel, automotive, oil and gas and US Government/DOD. Our 3D printing focus is on Direct Metal Laser Sintering (DMLS) also known as Selective Laser Melting (SLM) and sometimes referred to as Powder Bed Fusion Technology. This digital process uses a layer by layer material build-up approach using layers of powdered metal from 20 to 100 micron. This digital process can produce high precision metal parts in a very short time versus traditional tooling and manufacturing methods.

METAL AM MISCONCEPTIONS

Let's clear the air on all misconceptions about part quality built by the DMLS process. On average part densities are 99.5% and DMLS parts have the same or very close to the same mechanical properties as bar stock. Most heat treat and stress relief cycles are the same. Parts can also be coated or plated just like other metal parts. Many AM builds come with both vertical and horizontal test bars. Material test plugs and loose material samples can be sent to approved labs for customer testing. All parts we produce also come with material certifications. High quality parts produced by the DMLS process are being used daily in critical mission applications in a broad range of demanding industries.

WHAT PARTS MAKE THE MOST SENSE FOR THE METAL AM PROCESS

Most of the DMLS machines on the market have a build chamber of 10"x10"x12" LXWXH. Powder to fill these machines is very expensive, on average it costs $30-$150 per pound. With this technology you can make any geometry that you would like. But you really need to take the time to look at the part and the part processing to see if it makes sense. Big and heavy parts are typically not good candidates for DMLS as they take too long to make and post process.

The following is a list of common part challenges that tend to make ideal candidates for DMLS production:.

- **Material required** – parts that are made from materials that traditionally take a long time to machine from solid billet; for example Inconel and Titanium alloys
- **Machining** – parts with thin wall conditions that cannot be machined or casted
- **Complex geometries** – such as lattice structures or internal features that cannot be made any other way
- **Small features** – that take very small cutting tools to produce, tolerance dependent (+/- .005")
- **Near net shapes** – machining of 'truly critical features'
- **Off angle holes** – that cause an additional machining operation or 5 axis CNC Machine.
- **Parts with overhanging features** – that require lots of support structure
- **Full design freedom** – including parts with fillets and rounds on all surfaces (no sharp corners)

Continued on next page

INDUSTRY EXAMPLES THAT HAVE ADOPTED THE METAL AM PROCESS

Aerospace Market

- Turbine Blades, Air Foils and Stators
- Fuel Nozzles & Manifolds
- Aluminum Heat Sinks & Brackets

Medical Market

- Filtration Systems & Vacuum Sealing Tooling
- Stainless & Titanium Surgical Instruments
- Stainless and Titanium Wire Jigs, Tooling and Fixtures
- Titanium Implants that have controlled porosity for bone attachment

Heavy Duty Diesel

- Fuel System Components
- Brackets, Manifolds and Fittings to prove out investment casting designs
- Test Stand Hardware

Automotive Market

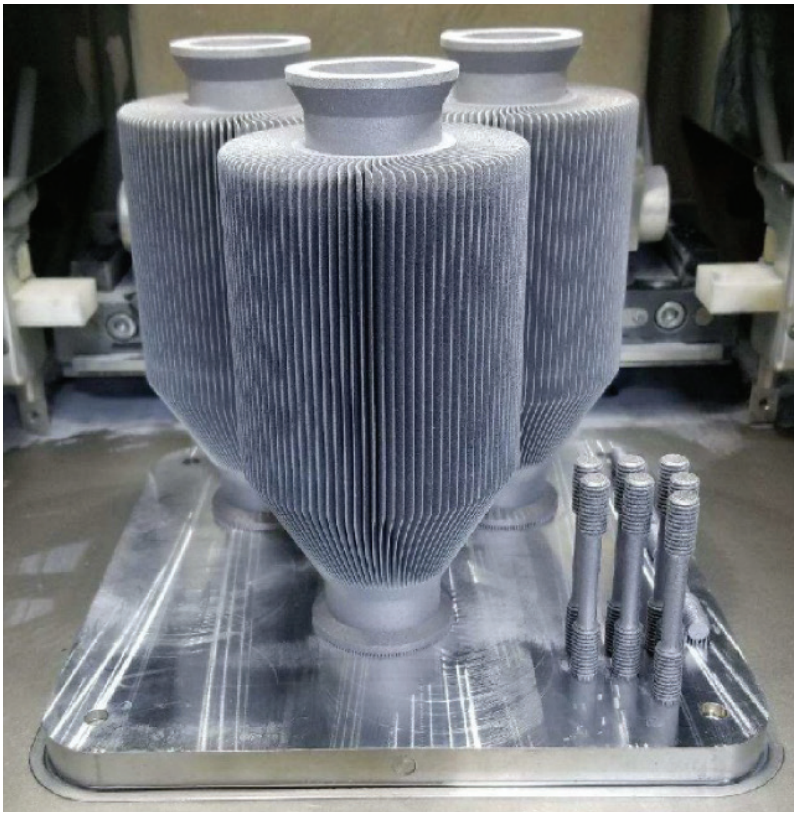
- Thin Wall Sheet Metal Prototypes
- Conformal Cooled High Pressure Die Cast Inserts
- Conformal Cooled Injection Molding Tools
- Prototype Gear Blanks and other hardware

Oil & Gas

- Deep Well Drilling Tools and combining multi-pieces into one complex assembly.

DESIGN FOR ADDITIVE MANUFACTURING

Traditional difficult part geometries can easily be made with the DMLS process. The question is whether it makes financial sense to produce it this way, as it does not make sense to print a part then grind and machine the entire part as post processing. In this scenario it usually makes more sense to machine the part from a solid billet. If speed is what you are looking for then the numbers may work. We like to get involved in the early stages to work with the designer to make geometry modifications for manufacturability. By adding chamfers and gussets to certain areas we can eliminate the need for support structure. The part price in DMLS is driven by build time and part volume.



METAL ADDITIVE PART PROCESSING

When processing a metal AM part it's important to review geometrical dimensioning and tolerancing. First we determine the features that can be held by the AM machine/process; surface roughness/finish and tolerancing are the critical issues. Next we look at the features that need to be machined and which surfaces will be attached to the build plate as those surfaces need to have material added to them for post process removal. We may have to account for heat treat, stress relief and HIP. Each one of those processes's can affect size in different ways. Finally, a review of any post process grinding and media blasting is important as they can also affect size.

DELIVERY

On average most parts are delivered within 1 to 2 weeks.

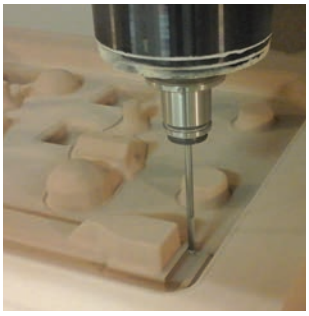
SUMMARY

Additive Manufacturing is here to stay. All large aerospace, medical and automotive companies are adopting this technology for quality and speed to market reasons. Machine work envelopes are getting larger and the development of multi-headed lasering equipment is decreasing build time making it more cost competitive. It's not a technology that will take over mass production anytime soon but it can definitely make a lot of sense for low volume, prototypes, support tooling and fixturing.

Contact:
CHRIS BECK
Chris.Beck@Innovative3DM.com

INNOVATIVE CASTING TECHNOLOGIES

THE POWER OF CHOICE



ICT provides more options in metal part production for critical applications. In the aerospace, transportation, and medical industry, there is no place for components that do not meet the very highest standards of quality as families and workers depend on the integrity, reliability, and safety of the parts ICT produces. Solving manufacturing challenges is easier with a company that offers you choices.

ICT 3D Metal Printing
Additive Manufacturing for complex parts you can't get with traditional manufacturing and no tooling costs!

ICT Patterns & Machining
100% In-House Pattern Making & Machining for accurate and quick complex machining.

ICT Dualtech Foundry
Automated No-Bake Ferrous & Non-Ferrous Processes for faster delivery of complex parts 1–100 lb.

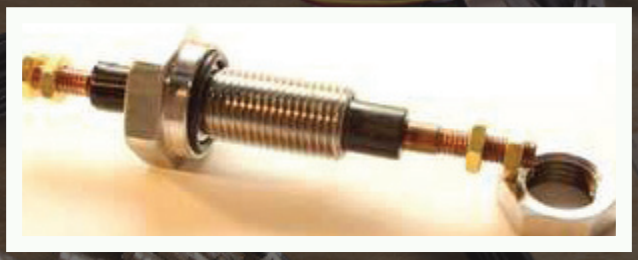
Visit our campus to explore all ICT has to offer to see how the power of choice offers you the best match for your metal part's application.

CALL TO REQUEST A TOUR

Innovative Casting Technologies

www.innovative3DM.com info@innovative3DM.com 317.560.5080
www.innovative-castings.com info@innovative-castings.com 317.738.5966

RHSeals
RELIABLE HERMETIC SEALS



RELIABLE HERMETIC SEALS – HIGHEST PROTECTION INSIDE & OUT

Industry leading hermetic seals—last longer in high temperature and high pressure environments, protecting satellites, sensors, engine and electrical control systems—better.

We serve a large range of demanding manufacturing industries:

- Marine
- Aerospace
- Military
- Glove Box
- Ground Transportation
- Oil and Fuel
- Medical
- Refrigeration Compressors
- Research and Development
- Chemical Manufacturing

ADVANTAGES

- Custom hermetic seals are our specialty
- Fast on-time delivery
- Prototypes, low & high volume orders
- In-house inventory of seals for next day delivery
- In-house engineering & testing for highest quality control
- Temperature ranges from -100C to 250C (-148F to 482F)
- Reliable seals from vacuum to over 11,000 psi (758 bar)
- Helium leak rates as low as 1X10-10 std-cc/s
- Made in the US at our Ohio production facility

RHSeals
RELIABLE HERMETIC SEALS

ADDRESS:
4156 Dayton Xenia Rd. Beavercreek, OH 45432

PHONE:
Ph: 888-747-3250 x4 | Fax 201-484-8112

EMAIL ADDRESS:
info@rhseals.com | sales@rhseals.com

What is a Hermetic Seal?

RH Seals
RELIABLE HERMETIC SEALS

MARK NUTTBROCK President
RELIABLE HERMETIC SEALS, LLC

Hermetic seals have been around for centuries, and they continue to evolve with technology and innovation. Hermetic seals used in manufacturing can be applied to many different industries; in fact, you probably come across hermetic seals in your day-to-day life.

These seals allow currents or signals to be transferred between two separate environments. The transfers are made without interruptions from moisture, gases, or other particles leaking. If any leakage occurs, they can wreak havoc on one or both environments. And, in some cases, any dust or other small particles passing through can cause explosions. By using hermetic seals, the risk for damages is minimized; hence, the need for a reliable hermetic seal.

So, what exactly do hermetic seals actually do?

Hermetic seals:

- Provide a passage of currents or signals through two environments
- Prevent leaks (solids, liquids, and gases)
- Come in a variety of shapes, sizes, and purposes
- Can be standardized stock products or custom products

Hermetic seals do not:

- Seal 100% perfectly - leak rates are miniscule, but not zero
- Withstand all temperatures, pressures, or all extreme environments – even the highest quality hermetic seals have limitations

TYPES OF HERMETIC SEALS

Types of seals have evolved over time and will likely continue to evolve with technology. For example, fiber optic technologies are relatively recent; thus, the need for hermetic fiber optic seals is also recent. Hermetic seals are not limited to present technologies. New hermetic seals are created all the time, and they can be created to meet new challenges.

Hermetic seals come in all different shapes, sizes, and materials, and the seals can be used in a multitude of industries. Some types of hermetic seals include (but are not limited to!):

- Connector Feedthroughs (any commercial, military, or custom connector)
- Wire Feedthroughs
- Multi-Conductor Cable Seals
- Fiber Optic Seals
- High Current Feedthroughs
- Explosion Proof Seals

Seals can be as small as a couple of millimeters, or as big as several meters. The size of the seal depends on the type, material, and use. Plus, seals can be made using epoxy, glass, or ceramic. All of these manufacturing options allow for hermetic seals to be versatile and widely used across industries. Epoxy seals are the newest type of hermetic seal, and epoxy offers certain benefits over ceramic or glass seals.

- Epoxy seals are usually lighter than glass or ceramic
- Lead time is shorter
- Tooling for epoxy seals is simpler
- Epoxies are often less expensive

INDUSTRIES

Each seal serves a different purpose and can be used in different industries. The industries are as broad as types of seals, and new industries discover a need for hermetic seals all the time.

- **Marine:** Hermetic seals in the marine industry must withstand many environments. Seals may be required to pass information through two differently pressurized environments, two different temperatures, or even one liquid and one gaseous environment.

• **Aerospace:** Aerospace demands continue to increase. As the limits of aerospace grow, so do the limits of hermetic seals. It was once a breakthrough for hermetic seals to make it on an airplane, but hermetic seals are now on Mars and the International Space Station.

• **Military:** The military was the first industry to regulate hermetic seals. These standards ensure compatibility, reliability, changeability, and performance standards. Hermetic seals can be found in military planes, ships, submarines, and research equipment. Because the military covers so many industries, it requires diverse seals. This means that the military requires wire and cable seals, connector seals, explosion-proof seals, and even more.

• **Ground Transportation:** Even with specialized needs for hermetic seals, these parts find a way into everyday uses as well. Cars, motorcycles, ATVs, and other ground vehicles utilize hermetic seals. Fuel tanks, batteries, suspensions, fuel injections are all systems that use hermetic seals. The vehicles you use daily require hermetic seals to function.

• **Oil and Fuel:** Hermetic seals, most often wire or explosion proof seals, make an appearance in the fuel industry. It is important to have hermetic seals in this industry as to not allow moisture or dust to disrupt the environment.

• **Medical:** Hermeticity in the medical industry has greatly evolved over time to meet different sterilization and operation requirements. From hermetic packaging to soldered or welded seals, hermeticity is everywhere in healthcare. There are X-Ray machines, CT machines, laboratory equipment, computers, and so much more. All of these devices require that data is transferred properly, and these devices may come in contact with different environments. Dust and moisture cannot pervade any seals; this could affect readings, accuracy, and the operations of the equipment.

• **Refrigeration Compressors:** Refrigeration compressors involve high pressure and condensation, both of which can harm machinery if these environments are not properly contained. Hermetic seals allow for currents to pass through two different pressurized environments without any leakage or disruption from moisture.

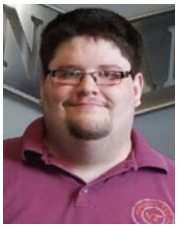
• **Research and Development:** Research and Development drives innovation, so it should come as no surprise that R&D pushes the hermetic seal industry to continually broaden and improve. A common seal used in R&D is a thermocouple seal, which provides temperature data. These seals provide temperature measurements where thermometers aren't practical.

IN SUMMARY

The concept of hermetic seals has been around for hundreds of years, and while hermetic seals have evolved over the years, the number of applications continues to increase. A quality, reliable hermetic seal is necessary no matter the type, size, material or use. Whether for an implantable medical device or the International Space Station, hermeticity is essential.

Contact:
MARK NUTTBROCK
sales@rhseals.com

ADDITIVE MANUFACTURING IN METAL CASTING



TRIDENT ALLOYS, INC

ETHAN EDWARDS Foundry Metallurgist
TRIDENT ALLOYS INC.

INTRODUCTION

When it comes to the foundry industry and the technology that has been used to create prototypes and production castings, there have been minimal changes. The technology of the foundry industry is one of the most researched areas within the respective engineering discipline and therefore it beckons the phrase "If it isn't broke don't fix it." 3D printing is beginning to change that line of thought by introducing new ways to manufacture a casting. The first being the use of 3D printed sand, which requires no hard tooling and can be easily changed to accommodate product design changes throughout the life cycle of the part. The second is the use of 3D printed plastic for hard tooling versus expensive wooden tooling. Both 3D printing methods are bringing new advantages to the foundry industry which are passed on to the parts buyers to take advantage of to reduce their costs and shorten lead times.

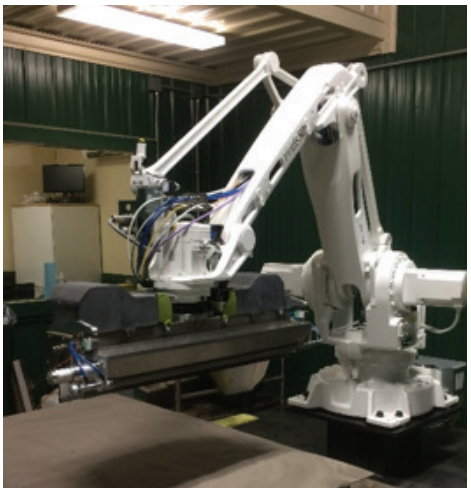


Figure 1: Trident Alloys' Neptune

3D SAND PRINTING

Many people are still unsure of what 3D sand printing is and how it relates to molding. The Viridis3D robotic sand printer, as seen in Figure 1, uses binder jetting technology in which furan binder is deposited in specific patterns to bond individual layers together to create the mold. This mold is comparable to existing no-bake technology in strength and surface finish – all without the need for an expensive wooden/metal/polymer pattern.

The process flow for 3D printed sand is very similar to traditional mold making, therefore any large production orders can be transitioned flawlessly if the need arises. The part begins as a 3D model or 2D drawing provided by the customer, once a satisfactory casting model is achieved (i.e. machine stock added, fillets added) solidification analysis can be used to design an efficient rigging system. The major advantage to this is that when the part goes to the foundry floor there is a high confidence that the casting will be sound as the solidification software has predicted/shown where risering was needed and a proper gating system calculated based on established formulas.

With 3D modeling the foundry engineer can create what works best for that particular casting by cutting the mold into several sections to allow for easier cleaning and handling or even removing mold material in areas that are unneeded to reduce cost and weight on the final mold. This can be seen in Figure 2, which shows a partially assembled mold that was printed in 4 separate sections.

The 3D printer can run autonomously with very limited outside action needed by an operator. With Viridis3D's current printer technology the rate of printing is 2.25 inches per hour on average and a curing time of 2 hours depending on the size of the mold printed, it is typical to print a mold and pour it the next day. One of the largest complaints with 3D printed sand

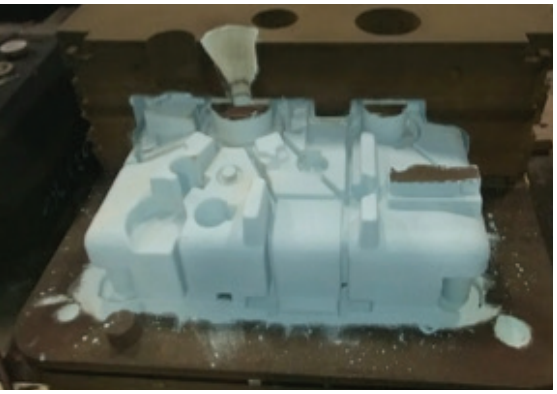


Figure 2: Partially assembled 3D printed mold

molds is the surface finish, this is due to the layer by layer print creating horizontal lines on all surfaces. There is a solution that involves careful sanding of mold wash and reapplication to get a much smoother finish that is more aligned to traditional sand casting.

3D PRINTED PLASTIC TOOLING

We recently acquired a Stacker S2 3D printer, as seen in Figure 3, to allow us to print temporary and long term production tooling for our customers. Printed plastic is a technology that has been around for many years but is now becoming more mainstream in the foundry industry because of more economical machine pricing. With 3D printed plastic the foundry is able to rapidly develop first article tooling without the labor and costs associated with wooden tooling. Plastic patterns can be designed for replacement parts as well as the extended production runs. Because the plastic costs fractions of what wooden tooling costs the patterns are effectively disposable meaning no storage costs for customers and when the job comes around again

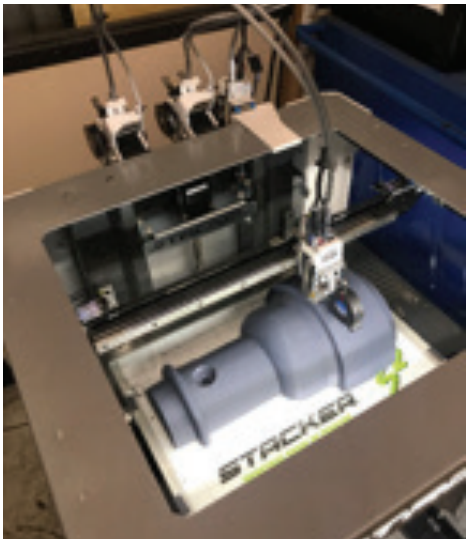


Figure 3: Trident Alloys' Stacker S2

a new pattern is printed and attached to existing cope/drag boards.

The 3D printed plastic process we use is known as Fused Filament Fabrication (FFF). This entails a heated extruder that extrudes the plastic in the desired geometry line by line from start to finish. The 3D printer is capable of printing very fine layer heights, less than 0.1mm in height, giving tooling equal to that of wood. All manner of pattern equipment can be printed from the pattern itself to individual pieces to be assembled into a much larger pattern or coreboxes, an example of which can be seen in Figure 4.

ADVANTAGES

These technologies in regards to sand casting provides several advantages to the foundry that are passed along to the customer. The biggest advantage to 3D printing is reduced lead times. When using 3D capabilities the customer can expect to see a 2-4 week lead time from order placement to delivery. The

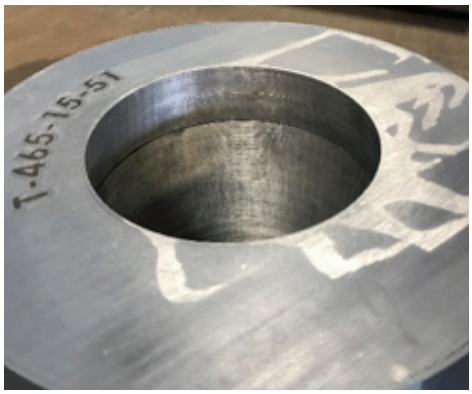


Figure 4: 3D printed plastic core box, showing interior cavity

foundry can use 3D printing to produce a casting in the time it would take to even receive the pattern from a pattern shop. The rapid prototyping nature of 3D printing allows quick modification to any design or casting material changes with no downtime since there is no pattern that needs to be modified. All that needs to occur are the changes made to the 3D model and a new sand mold or plastic pattern can be printed in the same day. The modifications can be implemented within minutes of the results from the first casting being seen.

Lastly, there is an abundance of cost savings for the customer as there is no hard tooling, no need for storage, and no repair/upkeep. Everything can be stored on a flash drive to be used again in short notice if that particular casting is needed within a couple weeks.

Contact:
ETHAN EDWARDS
seedward@tridentalloysinc.com

TRIDENT
ALLOYS, INC

GLOBAL PERFORMANCE
MAKES A WORLD OF DIFFERENCE

Trident was the first in the world with a Robotic 3D Printer for metalcasting because global markets require global thinking. If your production requirements are taking you to new points on the globe, consider the benefits of a leading-edge, digital foundry in the USA.

Trident Alloys leads in metalcasting Additive Manufacturing to give you the best options for your pumps, valves, propellers, and other critical part. Benefits to Robotic 3D printing of molds/cores:

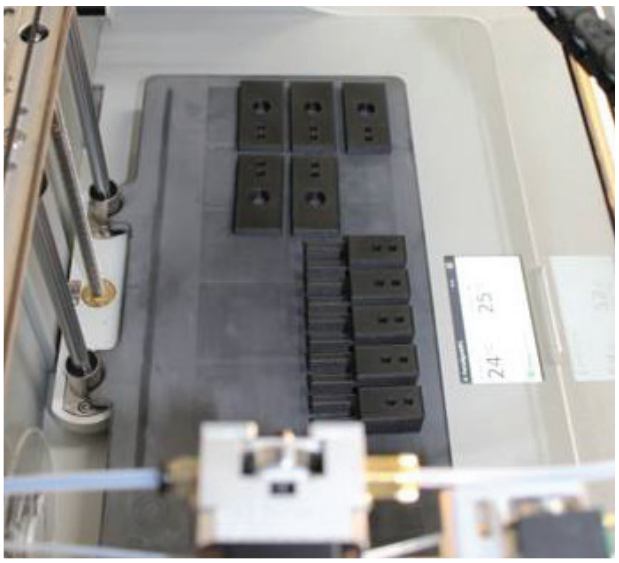
- **Reduced Lead Times**
  Castings poured in days not weeks.
- **Reduced Costs**
  No expensive hard tooling or pattern rework, as modifications are made quickly to digital CAD files.

Trident Alloys, Inc.
181 Abbe Avenue, Springfield, MA 01107
413.737.1477 info@tridentalloysinc.com

MADE IN THE USA

PARADIGM
MACHINE • WELD • REPAIR
INDUSTRIAL

ENGINEERS OF ALL SYSTEMS GO.



3D PRINTING & TRADITIONAL MANUFACTURING

Providing integrative additive and traditional production methods gives you the best of both worlds: speed and ability to manufacture complex geometries with the precision and materials of traditional processes.

COMPREHENSIVE IN-HOUSE SERVICES:

- Design Solutions
- Machine
- 3D Printing
- Weld
- Repair
- Contract Maintenance

Precision components, assemblies and solutions for industrial applications.

Paradigm Industrial
1345 Stanley Ave.
Dayton, OH 45404

Paradigmindustrial.com
info@paradigmindustrial.com
(937) 224-4415

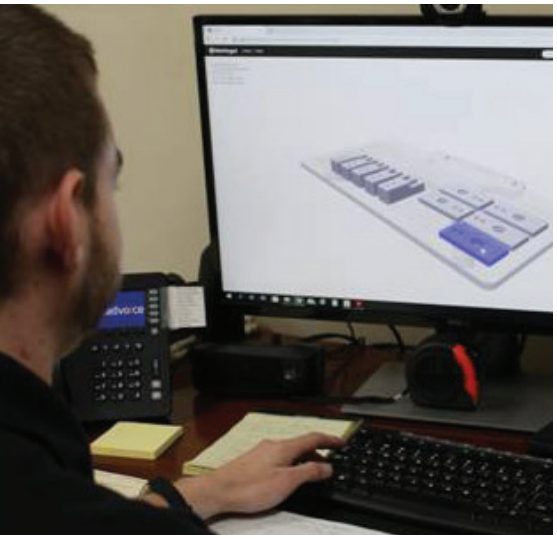
Developing an Additive Mindset

PARADIGM
MACHINE • WELD • REPAIR
INDUSTRIAL

ASHLEY WEBB
Owner
PARADIGM INDUSTRIAL

"Have you thought about printing it?"

I ask this question daily. I'm confident that most people I work around have heard me ask this question to both co-workers and customers. More often than not the answer is—no. In fairness, most of these conversations do not lead to a new job for our 3D printing equipment. Additive manufacturing still has many limitations. You can only print with certain materials and there is significant time involved in the additive process. In some cases, dimensional accuracy and finish quality for particular applications cannot be met by 3D printing. However, as time passes these limitations are decreasing as innovations are introduced by the numerous equipment manufacturers who have entered the additive marketplace.



I don't push 3D printing every day because we are a niche additive manufacturing company. In fact, we operate very traditional job shops at all three of our locations and 3D printing is a small percentage of the work we do. I ask about additive options daily because I see their ever-increasing capabilities and understand that much of what we consider traditional machining and fabrication will change over time. When I made the decision to purchase our first 3D Printer, we had no pipeline of additive work and no one at our company had any experience in this area of manufacturing. I made the investment because to be relevant in 10 years we would need both.

For many current requirements, additive manufacturing is relevant today and we do not have to wait a decade before we can produce a quality product that brings added value. But even if a 3D printed part can meet or exceed all of the specifications in the scope of work, it is still a different manufacturing process. In some cases, this alternative is not considered because the work automatically flows to vendors who use the same traditional manufacturing processes that have always been used for this particular product. In other instances, buyers are reluctant to try a new manufacturing method. The later is most prevalent when there is a proven process in place. In this situation, the security of knowing you can get a reliable part from the traditional procedure is more valuable than any potential benefits of using an additive process.

Here are some ways you can position yourself to remain open to additive manufacturing options and increase your confidence in parts these processes can provide:

Seek to understand vendor capabilities. If a supplier mentions additive options take a moment to ask about their 3D printing capabilities. Find out details such as work envelope size, material options, programming formats, and current machine utilization. Knowing these details can help you determine when it is a good fit to ask for a 3D printing quote. We really appreciate it when a customer is willing to take the time to learn about our equipment and what it can do. Furthermore, we both benefit when our customer provides models in the appropriate format.

We know this isn't always feasible, but when it is, we save time and the customer saves money.

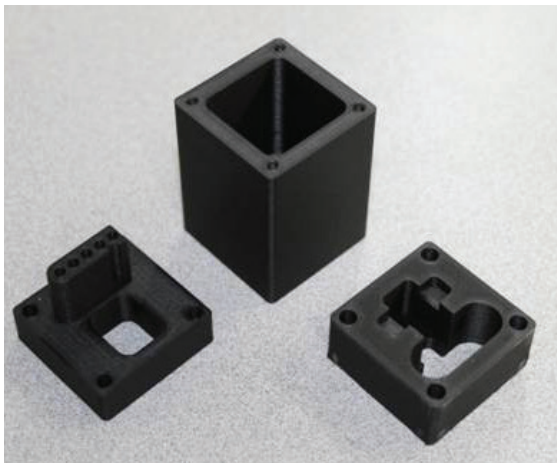
Focus on needs instead of specifications. Sometimes it is a good practice to take a step back and communicate with your supplier what you want to accomplish instead of what you want made. This obviously is not possible for every job, but when you can, make use of your vendor's expertise and let them help you find the best possible option for achieving your desired outcome. You may end up with a solution that is very different than what you expected prior to the start of your conversation. Working with a supplier that offers a full range of manual and CNC machining as well as 3D printing capabilities can help ensure you are presented with multiple options that will accomplish your objectives.

Request a comparison estimate. The next time you request an estimate for a machined part from a supplier you know has 3D printing capability, ask them to provide an estimate for printing the same parts if possible. If not, see if they can explain why it would not make sense to print the parts. This does not represent a significant amount of extra work on the part of your supplier, but it will help you start to gain an understanding of the difference between additive and traditional parts in terms of cost and function.

Ask for a printed version of your next part. If you place an order for machined parts, ask if your supplier can provide a 3D part along with your order. There is nothing like holding a machined detail in one hand and the same part that has been 3D printed in the other to compare the two processes. If the CAM model has already been produced for a traditional CNC operation and the cost of the 3D printed piece can be spread across multiple parts in an order, the overall additional cost may be minimal. There is a good chance that your supplier will cover some, if not all, of the cost to provide you a unique 3D printed sample that you can actually install and test for your particular application. What better way to show a customer how well a 3D printed part can perform?

An additive mindset requires openness to the process and tolerance for the risk that comes along with doing something new. Given that we are in a period of rapid technological advance with regard to additive manufacturing, there is significant opportunity to find competitive advantage for those willing to adopt this viewpoint. Finding a supplier who can partner with you to make additive options available while helping mitigate the risk of transition from traditional processes is very important. Additive manufacturing won't always be a fit, but to find out someone has to ask:

"Have you thought about printing it?"



Contact:
ASHLEY WEBB
ashley@paradigmindustrial.com

VALUE ANALYSIS LEADS TO BETTER AIRCRAFT SEAT PRODUCTION AT LESS COST

BANNER
BANNERMETALSGROUP
BRONSON JONES President & CEO
BANNER METALS GROUP

In the aerospace industry, there is no place for metal components that do not meet the very highest standards of quality. Flight crews and passengers depend on the integrity, reliability and safety of metal parts that go into a plane.

With over seventy years of experience servicing this demanding industry, it's not uncommon for others to turn to us for evaluation of an aerospace part they are having difficulty with – especially parts that are made off-shore.

CASE STUDY

Application: Aerospace

Part Description: Aircraft Seat Backrest (for flight attendants)

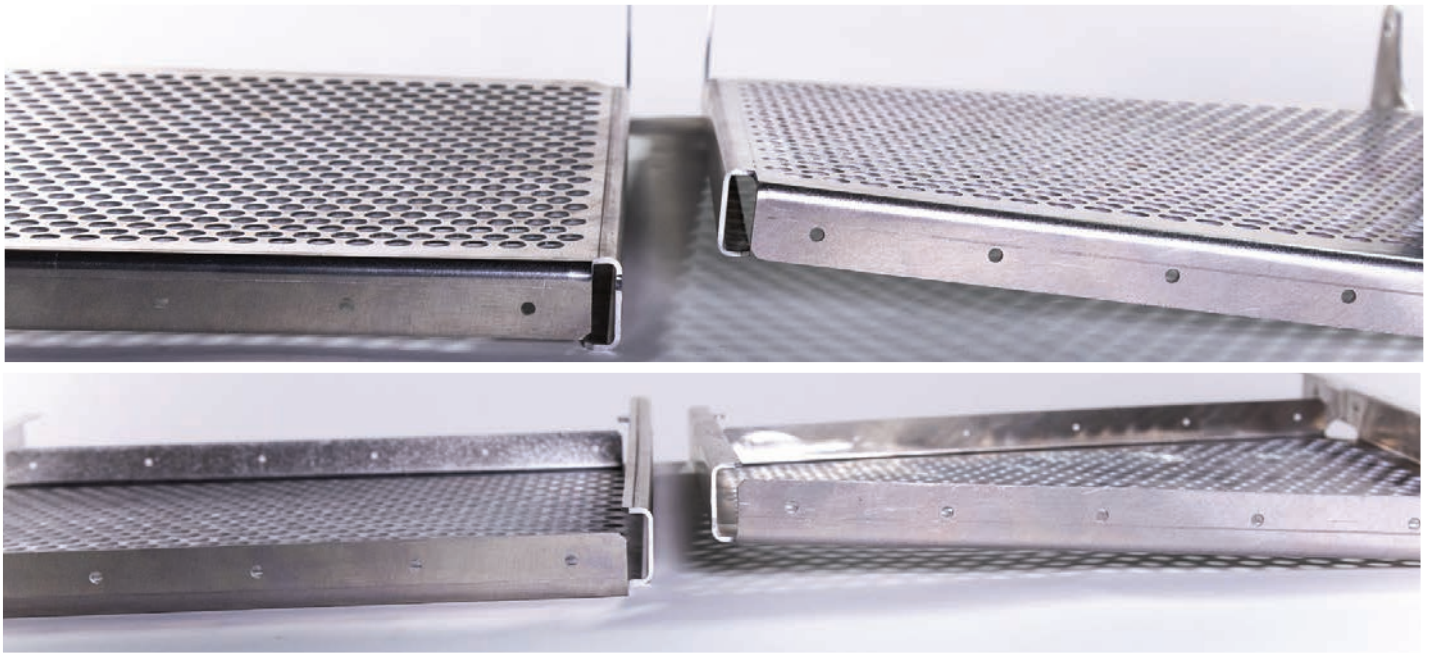
This particular aircraft part made by a low cost off-shore supplier, had a surface flatness requirement of .100" max.

As with all projects, we rely on Value Analysis/Value Engineering (VA/VE) as one of our most important tools to systemically analyze existing parts. VA/VE helps us to identify substitute materials and methods with less expensive alternatives, without sacrificing quality or functionality. VA/VE focuses entirely on the functional aspects of components and materials, and not their physical characteristics.

VA/VE was successfully employed to overhaul the production process of this aerospace part. VA/VE completely changed how the lightening holes were being made, which exceeded all specifications for surface flatness while greatly reducing scrap.

LEFT PHOTOS: Improved part with gang stamping of lightening holes

RIGHT PHOTOS: Original part resulted in extreme warpage and oil canning



ORIGINAL PROCESS:

- Laser machine to cut the outside profile, attachment holes and the 793 lightening holes.
- Bend into final shape with a bending machine

Challenge:

The laser process generated excessive heat which caused extreme warpage and "oil-canning" which exceeded flatness requirement up to .500". Additionally, the aerospace customer was experiencing a 50% scrap rate and non-value added inventory.

After a thorough VA/VE process and testing, it was determined that warpage would be eliminated with gang stamping of the lightening holes versus laser cutting. Additionally, this method would produce a part that would exceed the surface flatness specification of .100" max.

PROCESS AFTER VA/VE:

- Laser machine to cut the outside profile and attachment holes
- Gang Stamp the 793 lightening holes.
- Bend into final shape with a bending machine

VA/VE Improvement:

Gang stamping lightening holes eliminated distortion and kept the surface flat to .040" max, exceeding this important .100" requirement. The process of stamping holes eliminated heat-related distortion on the seating surface that was caused during the laser cutting process. This solution made a better part while eliminating all costly scrap. Additionally, the stamping process is more efficient and yielded a time savings which helped reduce the cost of this operation by 20%.

Banner then applied this process to two other similar backrests for even more savings and improved part quality.

CONCLUSION

It has never been a more exciting time for evaluating how existing parts are being made. The tools to enhance and reduce the costs of existing parts are improving all of the time. Adopting old adages such as 'if it ain't broke don't fix it' have no place in today's world of technology and continuous improvement requirements.

VA/VE uses a step-by-step methodology to reduce costs, improve product functionality or both. The outcomes can reduce costs, improve function, and reduce waste. It can also help to improve a parts manufacturability and assembly.

It is also common to use VA/VE in conjunction with the principles of Lean Manufacturing to take a broader view beyond reducing costs in both product development as well as production. Partnering with suppliers that are actively pursuing better ways of inspecting, evaluating and manufacturing will be in a better position to offer better ways of producing parts with higher quality and reduced waste.

Contact:
BRONSON JONES
cbjones@bannermetalsgroup.com

BANNER

BANNERMETALSGROUP

A FULL-SERVICE METAL PRODUCTS GROUP

WELDING

FABRICATION

ENGINEERING

LASER CUTTING

METAL STAMPING

CNC MACHINING

CERTIFIED COMPANY AS 9100 · CERTIFIED COMPANY ISO · International Traffic in Arms Regulations Registered ITAR

1308 Holly Avenue, Columbus, OH 43212

BANNERMETALS**GROUP**.com

614-291-3105

PART BUYERS AUTHORITY

Are you a manufacturer of metal, plastic, or composite parts?

If so, we encourage you to contribute as an author in our next issue of ***The Part Buyers Authority***, an industry online publication. Featured authors are positioned as the topic expert in your 2-page article. Your company will also receive a full page advertisement (for a total of 3 pages). As an additional benefit, competitors to you cannot contribute in the same publication to provide you with dedicated space to your expertise.

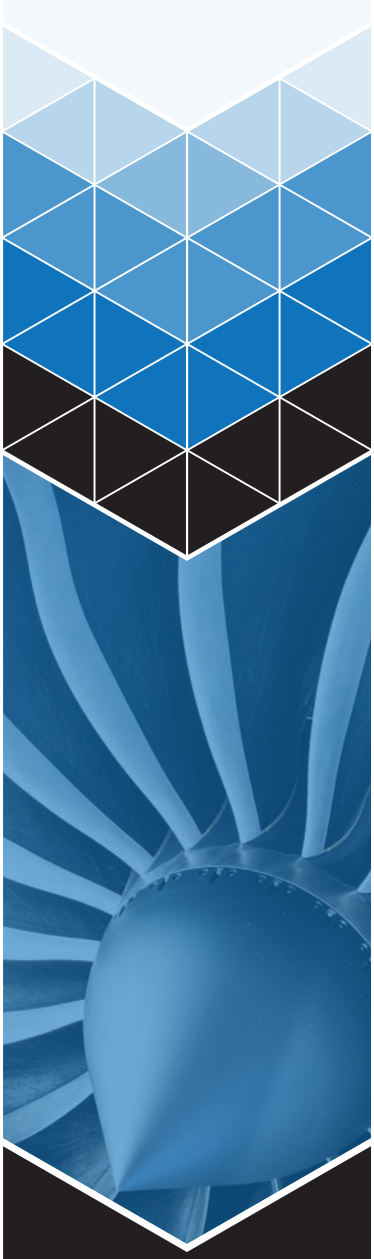
Our sole focus of ***The Part Buyers Authority*** is to provide technical information to assist anyone that designs, specifies or purchases metal, plastic or composite parts. Specifically we will address the changing technologies that affect the many ways that parts can be manufactured.

The Part Buyers Authority will be issued several times a year on topics of interest to buyers of parts.

SPACE IS LIMITED IN EACH ISSUE...
To contribute, please contact Barb Castilano by calling 937-436-2648 or email barb@moptions.com

MARKETING OPTIONS

7965 Washington Woods Drive, Dayton OH 45459
moptions.com



The Part Buyers Authority is a Marketing Options publication.

To subscribe visit
partbuyersauthority.com

Below is a resource listing that would be of benefit for those involved in purchasing, specifying, and designing parts. Have a resource you would like to see added to this list, or a topic, material, or process discussed? **Complete our form at partbuyersauthority.com**

Part Manufacturers

Alliant Castings ..... www.alliantcasting.com
Banner Metals Group, Inc. ..... www.bannermetalsgroup.com
Dysinger Incorporated ..... www.dysinger.com
Epcor Foundry ..... www.epcorfdy.com
Hazelton Castings Company ..... www.wecast.com
Innovative Casting Technologies ..... www.innovative-castings.com
..... www.innovative3dm.com
Kentucky Chrome Works ..... www.kentuckychromeworks.com
ODIN Casting ..... www.odincasting.com
Paradigm Industrial ..... www.paradigmindustrial.com
Reliable Hermetic Seals ..... www.rhseals.com
Southern Cast Products ..... www.southerncast.com
Tech Cast ..... www.techcastllc.com
Trident Alloys ..... www.tridentalloysinc.com
Yankee Casting Co. ..... www.yankeecasting.com

Suppliers of Technology for Part Buyers

Foundry Solutions ..... www.solutionsfonderie.com

Contract Packaging

Crown Packaging ..... www.crownpkg.com

Additive Mfg Consulting/Part Design Consulting/Engineering

Carl Berube, Celero Partners ..... www.celero-partners.com
Chris Wentworth, CMTC ..... www.CMTC.com
Will Shambley, New England Foundry Technologies ..... www.nefoundrytech.com
John Kuhn, Rimrock Corporation ..... www.rimrockcorp.com

Industry Associations

3D Printing Industry News www.3dprintingindustry.com
Additive Manufacturing ..... www.additivemanufacturing.media
Additive Manufacturing Users Group (AMUG) ..... www.amug.com
America Makes ..... www.americamakes.us
American Foundry Society ..... www.afsinc.org
ASM International ..... www.asminternational.org
Ductile Iron Society ..... www.ductile.org
Investment Casting Institute ..... www.investmentcasting.org
National Tooling & Machining Association ..... www.ntma.org
North American Die Casting Association ..... www.diecasting.org
Precision Machined Products Association ..... www.pmpa.org
Precision Metalforming Association ..... www.pma.org
SME ..... www.sme.org
Steel Founders' Society of America ..... www.sfsa.org

NOTES

MARKETING OPTIONS

YOUR INTERNATIONAL
MARKETING
RESOURCE GROUP

7965 Washington Woods Drive, Dayton OH 45459
office: 937.436.2648 fax: 937.436.6156
moptions.com