Education and Metal 3D Printing

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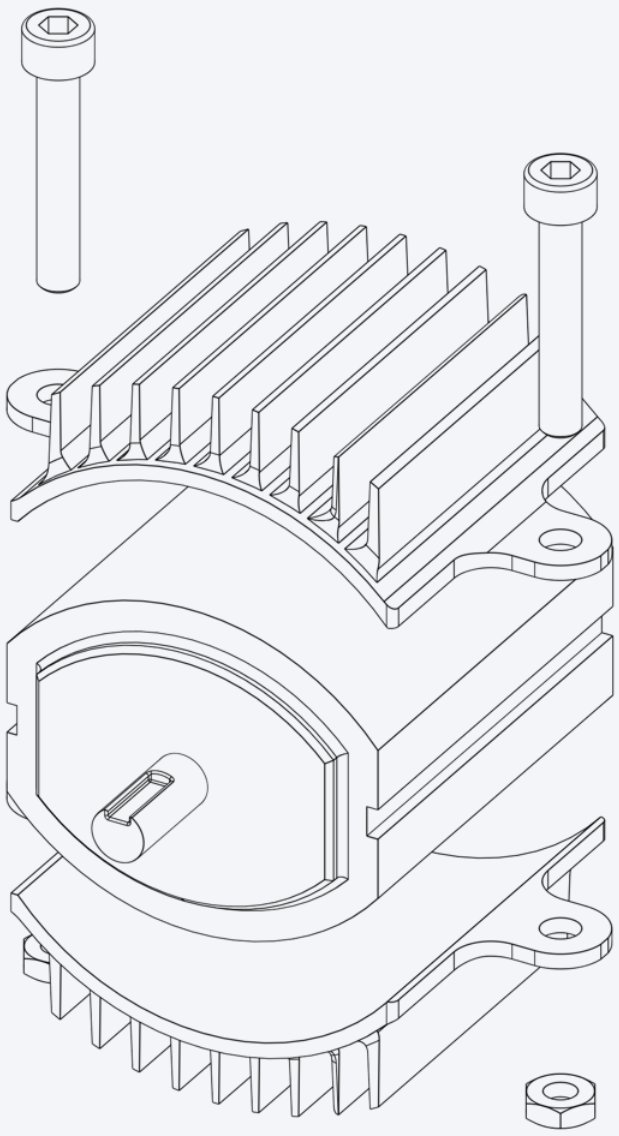
With metal 3D printing rapidly emerging as a key manufacturing technology, it is critical educational institutions include it in their curricula to avoid leaving students at a disadvantage as they enter the workforce.

In addition to ensuring students have experience with the digital tools - like CAD, FEA and generative design - used in additive manufacturing, investing in metal 3D printing systems allows students the opportunity to gain invaluable hands-on experience, and actually produce the parts they design.



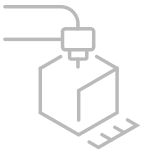
Challenge

Since nearly every part designed by students will be produced in extremely small quantities, traditional manufacturing methods that require hard tooling - like casting, forging, stamping and injection molding - are impractical in terms of both cost and time.

But it's not just the manufacturing method that can influence student part designs - in some cases, the limiting factor may be the on-campus shop itself.

Highly complex designs requiring multiple setups or five-axis mills may be beyond the capabilities of both students and the shop itself, forcing students to either redesign their part, or manufacture it as separate parts for later assembly.

Because on-campus shops have a limited number of machines, it can lead to shop bottlenecks and long delays in manufacturing parts, as well as limiting students' ability to iterate on their designs.



Solution

Desktop Metal systems are designed for accessibility, making it easy and affordable for colleges and universities to invest in technology that is emerging as a market leader while ensuring students are exposed to technology that will be common in the workplace.

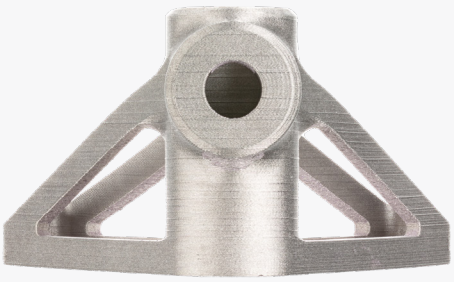
With no need for a dedicated operator or extensive training needed, the systems are easy for students to use. In some cases, students can begin creating complex metal parts in just minutes.

Because it eliminates the need for tooling, metal 3D printing can help on-campus shops keep costs low, whether they're making a single part or hundreds, while also enabling students to design and print complex parts that would otherwise require a master machinist knowledge to create.

Additive technology also significantly increases student's ability to iterate on designs, by enabling them to print multiple versions of a part in a single print and test them in as little as a week. The systems are capable of running nearly 24/7 with little intervention from operators, helping to ease machine shop bottlenecks and making machines available for students who need them.

Education Examples

[A]



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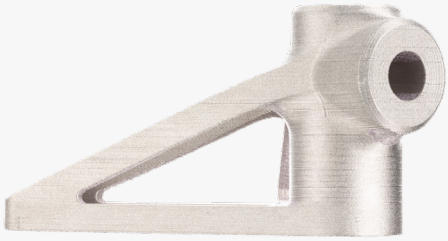


[B]

[A] Battle Bots Backstop

This part is a structural member used to hold a rotating saw blade on a fighting robot.

As part of a Discovery Channel program, students were given less than a month to design and build a fighting robot. Using the Studio System™, they were able to print a bracket capable of resisting the intense bending and lateral motion experienced during battle while providing the stiffness, strength, weldability, and fire resistance required.

The Studio System™ allowed the team to quickly produce this complex part in metal, lowering part cost and lead time, while greatly simplifying the manufacturing process - they simply loaded the file onto the printer and had a part ready to be installed in just a few days.

[B] Motor Housing

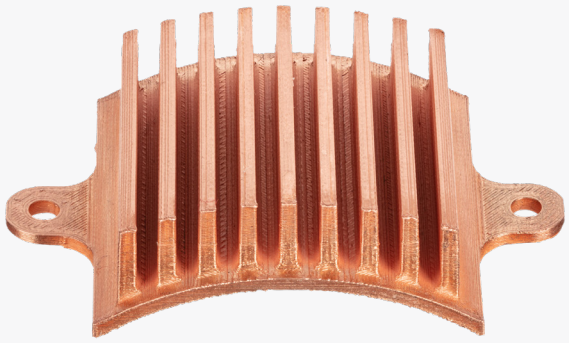
This motor housing is used to hold a NEMA motor in place in a running machine.

With very limited time to design and manufacture their machine, a student design team turned to 3D printing to quickly iterate on their design to incorporate different motor sizes in different mounting scenarios. Fiber™ enabled each iteration to be printed in just a few hours at an affordable cost, allowing for multiple revisions.

While the machine is operating, it is subjected to significant stresses and heat, making PEEK with Carbon Fiber reinforcement an ideal material choice for the motor housing.

Education Examples

[C]



[D]

[C] Custom Heat Sink

This is a custom heat sink that attaches to the outside of an electric motor. Printing allows for the heat sink to perfectly conform to the motor shape, allowing heat to more efficiently be pulled from the motor.

Machining the tall, thin fins is challenging due to chattering as the fins are being cut. This would be beyond the manufacturing capabilities of most students, but can easily be printed. This allows students to produce complex copper parts that would normally not be possible, or would need to be outsourced.

Copper is the optimal material choice for heat sinks given its excellent thermal conductivity. The Studio System™ is ideal for producing low-volume, custom heatsinks.

[D] UHF Radio Housing

This is a housing for an ultra high-frequency radio for use on a CubeSat. The complex and small features of this part make it ideal for printing on Fiber as it would be very difficult to machine from a block of PEKK.This part needed to be fabricated out of PEKK due to the extreme temperatures in space, specific outgassing requirements for the material and ESD compliance requirements.

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