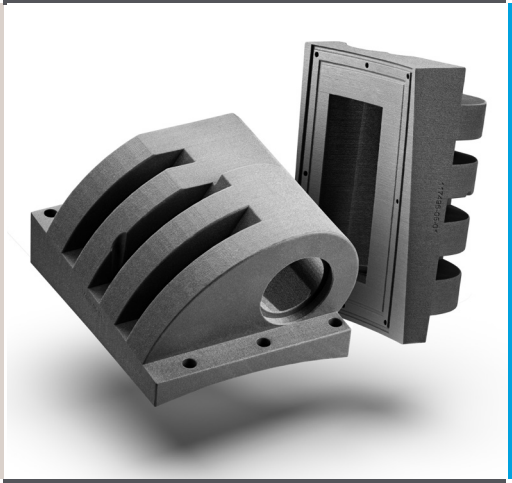


Transforming Industrial Machinery Production with SAF™ Technology

A Stratasys Case Study

Case Study

goengineer
www.goengineer.com

3D PRINTER SALES
info@goengineer.com
800.688.3234

CONSUMABLES HELP
supplies@goengineer.com
855.470.0647

3D PRINTER SUPPORT
AMsupport@goengineer.com
855.470.0647

When it comes to the manufacturing of industrial equipment – be it scientific instruments, factory equipment or power tools, to name just a few – a multitude of different intricate parts are needed to ensure the product will function as intended.

For industrial manufacturers of such equipment, there is a clear and common need for parts — however complex they may be — to drive the robustness, consistency, accuracy, and repeatability to deliver the performance expectations and functionality of the product. Failure to ensure this could result in malfunction, which in turn could lead to extra costs and damage to the brand's image.

But the challenge for industrial machinery manufacturers doesn't end there; the need for such parts to be produced both timely **and** cost-effectively will always be an equally inherent objective.

With traditional manufacturing techniques, there is an immediate and accepted recognition that long lead times and high costs will typically be part of the process. Therefore, traditional manufacturing options often hinder the industrial equipment manufacturers' quest to streamline efficiencies across their production operations.

Reaching new frontiers in additive manufacturing

Thankfully, there is an alternative in the form of Stratasys' industrial-grade SAF™ technology, a new form of powder-based additive manufacturing (AM) technology. SAF is the culmination of over a decade of R&D.

Using a single pass print-and-fuse process, industrial equipment manufacturers finally have the ability to produce robust end-use parts with the level of control, accuracy and repeatability expected from injection molding. SAF also enables the 3D printing of tens of thousands of consistent functional production parts; not to mention the cost-per-part is unmatched in comparison to injection molding or CNC. When you add to the mix that those ten thousand parts can all be completely unique and customized, then for manufacturers the business case cannot be ignored.

In a sector that continues to evolve and where adaptability is key, SAF technology provides industrial equipment manufacturers the inherent benefits of a technology that delivers production resiliency and agility.

Cometh the hour, cometh the machine

Stratasys has delivered its SAF technology via the H350™ 3D printer, engineered to deliver the accuracy, repeatability and process control industrial equipment manufacturers need.

Just like the manufacturing requirements of Stratasys' own customers, the development and production of the H350 itself demanded consistent end-use parts with a superior level of accuracy and consistency to ensure the 3D printer was fit-for-purpose.

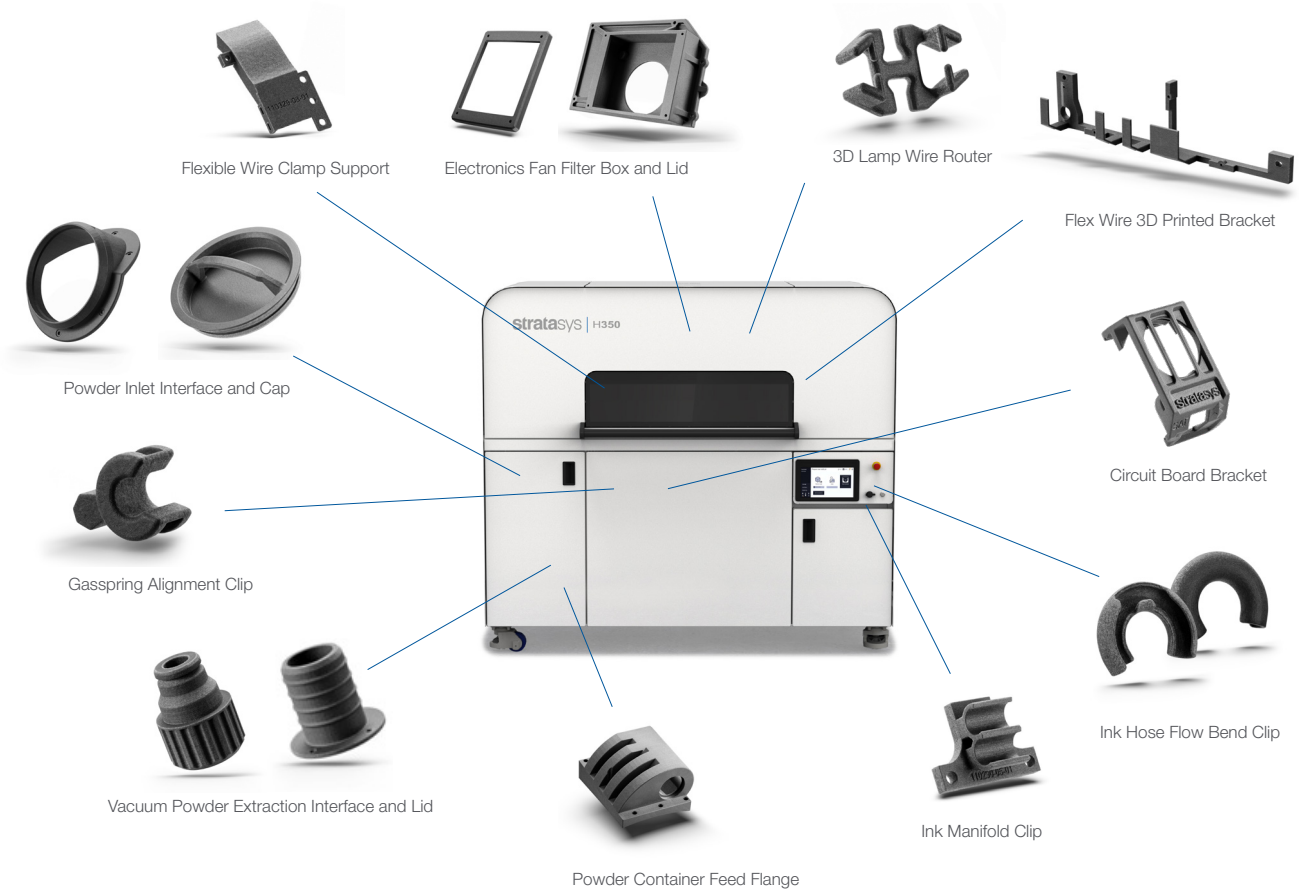
Since each printer must operate in a uniform manner, it was critical that all of these parts function at the same high level, with a high degree of consistency. If one of these industrial components was out of tolerance, the H350's wouldn't perform properly. This would negatively impact the printer's ability to achieve high production throughput and repeatability build-to-build and reproducibility printer to printer.

In addition to part quality, a short turnaround for these industrial components was a significant factor so pressing deadlines could be met.

Taking this into account, and perfectly underscoring Stratasys' utmost belief and confidence in the attributes of SAF technology, the H350 proudly incorporates a range of different industrial machine components that are created, and 3D printed by the company using the H350.

In total, every H350 3D printer comprises of thirty production-grade PA11 parts, each of which exhibits repeatability, excellent mechanical properties, and exact consistency. Currently, these internally produced components are added to each new printer. This demonstrates the confidence in the H350's high-yield end-use parts since they are accurate, repeatable and durable.

Customized industrial-grade parts printed on-demand.



Printing with the H350 enabled a faster time to market and saved unnecessary production and transportation fees. As compared to days or even weeks with traditional manufacturing, accurate end-use parts for the H350 were produced and ready for implementation within hours.

The end-use parts produced on the H350 for the H350, comprise:

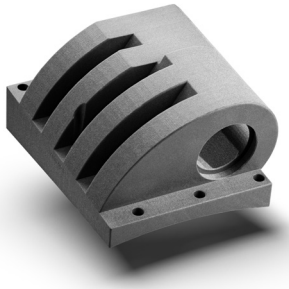
It's all in the details

The Powder Inlet Interface, the design for which was fine-tuned after multiple iterations. The part is located on the front of the powder container and interfaces with a hose on the powder barrel. This enables the machine to be filled with powder. To prevent powder leakage, the part must properly attach to the powder hose. The accuracy of the hole's position is vital so the holes can align with the screw locations on the printer. A groove is located underneath that can be attached to a gasket, providing a tight fit once installed. The dimensions of this production-grade part must be met within tight tolerances, and repeatability is essential.

Intricacy is key

The Ink Hose Flow Bend Clip, routes ink hoses in and out of printheads. The purpose of this part is to prevent the hose from kinking while maintaining a sharp bend. Although this is a standard industrial concept, the part was customized so it could accommodate the required angle in the limited space. This intricacy was achieved on the H350 through exact design specifications and the ability to print precisely.

SAF technology outperforms traditional manufacturing



The Powder Container Feed Flange is composed of an angled surface which interfaces with the curved powder container. This part doesn't contain any flat surfaces and is angled on all three axes. With traditional manufacturing technologies such as CNC Machining, these specific geometric requirements would be highly difficult to achieve. Additionally, the part must accommodate tolerances between the powder container and powder feed tube. As these complexities are supported by SAF, this part was accurately produced.

Maintaining exact dimensions and narrow fits

The Electronics Fan Filter Box has an inner opening that must be the correct size to properly attach a retrofittable lid. It is extremely important to maintain accurate dimensions so the part will fit back into the H350. This specific part is comprised of a large flat surface, coupled with vertical stiffeners. It is notoriously difficult to create big, flat parts with powder bed fusion technology. In most systems, this part would warp or need to be built at a compound angle, however, the H350 maintained the intricate structure and easily built the part flat due to the equal distribution of thermal energy during the printing process.

Small parts in constrained spaces

The Ink Manifold Clip comprises two concave areas that support copper pipes for printheads. The design flexibility enabled by SAF allowed this part to be customized for a small space. It was then retrofitted into existing hardware. The optimized part can then be repeated and printed precisely as required.

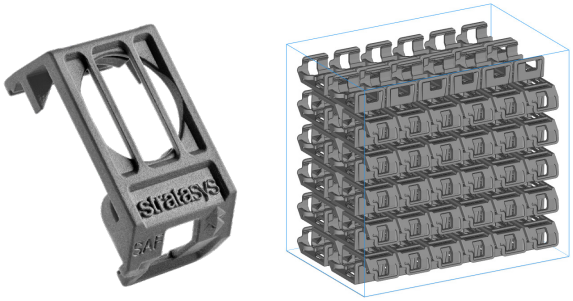
Emphasis on ductility and flexibility

The Flexible Wire Clamp Support, clamps, routes and guides flat cables. This ranges from circuit boards to printheads. It is especially complex since the cables must be clamped down over a ridge. The cables are then routed into a small, curved shape to allow slack for movement and must be guided correctly in and out of this bracket, promoting proper flexibility. The flat cables are especially delicate that operate in a challenging environment so this must be a smooth plastic part that remains stable even at higher temperatures. The high ductility of the PA11 powder supports this requirement. The H350 produces parts that have excellent mechanical properties, including high elongation at break, providing high ductility and flexibility.

Parts perfected for production

The 3D Lamp Wire Router, which is composed of a unique structure, is situated in the print carriage. To remain compliant, the wire for the lamps is redirected away from the sharp edges. The part is situated in a hot space, so it is essential that the material is adaptable to high temperatures, allowing the part to function in any element, ideal for production.

Re-establishing the modern-day supply chain



The PCB Stepper Controller Board was originally ordered from a supply chain vendor. Due to delays brought on by COVID-19, the original board was discontinued. This led the team to rethink the solution and utilize a new electronics board which required air cooling. In order to implement the cooling function, a needed to be mounted on the board.

The design team relied on the H350 to print a Circuit Board Bracket which could easily secure the fan to the board. The bracket was stiffened, and tolerances were tightened so it could be clamped correctly on the board. This bracket occupies a minimum amount of space and doesn't require any screws or tools – which simplifies product assembly. Without the capability to print parts on-demand with the H350, this problem would not have been resolved. Additionally, the bracket was extremely cost-efficient, with 132 brackets nested in the same build. This led to a spend of only $4.15 USD per part.

Consistency, impact-resistance and complete control over the production process

By printing these end-use parts on the H350, the builds were finished within a matter of hours, which saved weeks for the parts to arrive. With regards to the circuit board bracket, supply chain setbacks no longer posed a threat to complete production of the printer.

In addition to producing the parts on-demand, it was essential that they exhibited consistency, accuracy, and repeatability. This was successfully achieved with the H350. The unwavering confidence in the strength and durability of these parts is exemplified by their implementation in every H350 3D printer.

For more information about the H350 and SAF technology, please visit:

https://www.stratasys.com/en/3d-printers/printer-catalog/saf/h350/