HP Multi Jet Fusion (MJF) Helps Norm Additive Develop Innovative, Lightweight Sensor Housing

Norm Additive engineers leverage design freedom and HP Multi Jet Fusion 3D Printing technology to enhance performance, simplify assembly and reduce cost

At a glance

Industry

Manufacturing

Sector

Hardware

Objectve

Re-engineer sensor and camera housing to improve performance, simplify assembly, enable customization, reduce cost, and eliminate supply chain risk

Approach

Leverage HP's MJF 3D printing's unique technology and DfAM to redesign sensor housing. Consolidate from 11 parts to 1 eliminating assembly and produce parts "on demand," greatly reducing supply chain expense.

Technology Solution

HP Jet Fusion 5200 Series 3D Printing Solution

Material

HP High Reusability PA 12, enabled by Evonik

Introduction

Sensors and cameras are vital elements of modern manufacturing. They provide key data from the factory floor, reporting on everything from machine performance to environmental conditions. Mounts, brackets, housings and enclosures serve an important purpose by securely positioning and protecting sensors and cameras, often in harsh environments. While traditional manufacturing methods often struggle to meet the diverse and demanding requirements of sensor mounts, HP's Jet Fusion 3D Printing Solution enables new designs that are elegantly complex, highly customized and lighter weight, improving performance while simultaneously simplifying assembly and reducing cost.

Background

"Our strategic ambition is to become Turkey's preeminent additive manufacturing entity," says Dr. Cenk Kılıçaslan, A.M. Director of Norm Holding, General Manager of Norm Additive. "We are focused on developing an integrated production ecosystem and expanding material choice with polymers, composites, and metals. By embracing cutting-edge technology, our solution aims to provide data-driven additive manufacturing processes with automated quality control, fortifying our commitment to technological advancement and operational excellence."

Norm Fasteners is headquartered in Turkey and is the nation's leading supplier of fasteners. Additionally, this prominent industrial manufacturer provides bolts, nuts, washers and other items, shipping approximately 56 million fasteners each day. Norm Fasteners employs over 3,600 people, operates in nine countries, and serves various industries, including automotive, white goods, health, construction, machinery, furniture and electronics.

In addition to high production capacity, Norm Fasteners offers R&D and engineering services, and operates in-house facilities for design, tooling, coating and hot forging. They employ 36 R&D engineers, operate four R&D centers, and hold several industrial design patents and utility model applications.

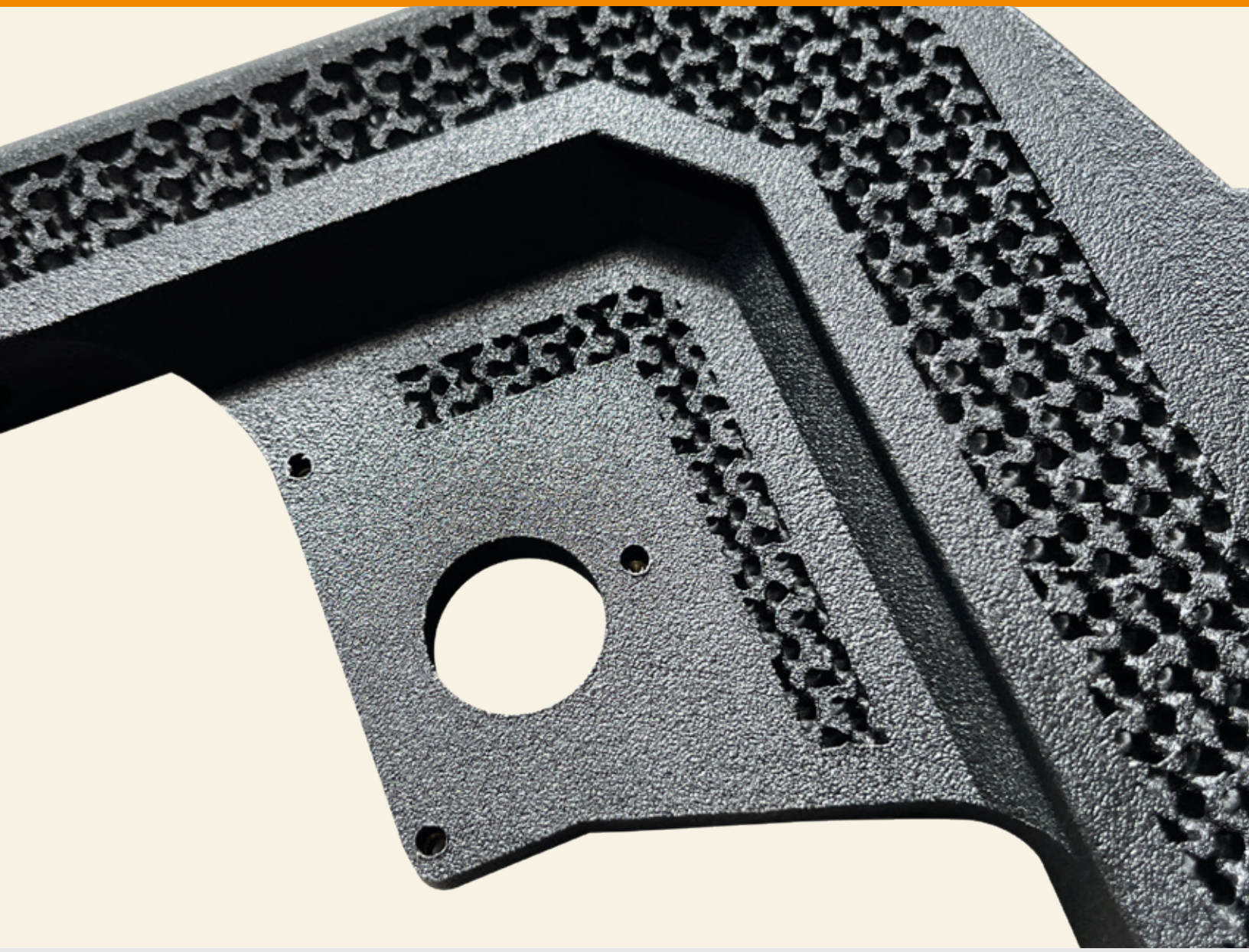
Norm Fasteners is committed to shaping the future with innovation and focuses on solutions that contribute to a sustainable world. They routinely collaborate with internal and external partners on R&D studies which are designed to develop innovative new products and services that can help achieve this important goal.

"As a newly founded additive manufacturing company, we acknowledge that we are still in the early stages of establishing our presence and capabilities within the industry," says Dr. Kılıçaslan. "However, our commitment to innovation, investment in advanced technologies, and strategic vision positions us on a trajectory to evolve and ascend in the competitive landscape."

Norm Additive is a subsidiary within the company, and utilizes cutting-edge 3D printing technologies to revolutionize part production. Their expertise spans both metal and plastic additive manufacturing. With help from HP's MJF technology, Norm Additive offers unparalleled design freedom, permitting complex geometries that can't be manufactured any other way. In addition to intricate prototypes, this also enables final parts that are lightweight, robust and highly complex, while also reducing cost and simplifying assembly.

Problem

Norm Fasteners operates many different types of sorting machines. These devices sort through a jumbled mess of fasteners and separate them based on size, type and other features. They typically use vibration to nudge items down a path, with strategically placed gates to divert them based on specific conditions. More sophisticated systems also use sensors, cameras and robotics to meticulously pick and place each piece in its designated bin.



Fastener sorting machines present unique challenges when designing mounts, brackets, housings and enclosures for cameras and sensors. The components need to be robust enough to withstand the vibration and potential impacts that are common in high-speed sorting environments, but must also be compact and lightweight enough to optimize machine operation. Additionally, they must protect cameras and sensors from dust and debris, while also providing easy access when maintenance or calibration are required. Thermal regulation is also crucial as enclosures can trap heat generated by the devices, causing malfunctions and failures.

One of the sorting machines featured a complex camera housing that was heavy, difficult to assemble, and costly to produce and inventory. It utilized 5 meticulously machined metal parts and was assembled using six precision-engineered bolts. The aggregate weight of the assembled component was approximately 2.5 kilograms (5.5 pounds.) Manufacturing the parts required a three week lead time. As a result, inventory levels were inflated to mitigate risk and ensure parts were on hand.

In the past, an effort was made to 3D print the part in aluminum. However, parts produced with that technology required supports, which were time consuming and costly to post process.

Solution

"In a strategic move to obviate the need for supports and substantially curtail costs, a comprehensive redesign was undertaken," says Dr. Kılıçaslan. "It was specifically tailored for the HP system."

Norm Additive was asked if the component could be re-engineered to improve performance and reduce cost. The team sought to develop a new design that meets several criteria:

- Achieves specifications—Meet or exceed specs for strength, impact resistance, finish and others
- Consolidated—Eliminate assembly through part simplification and consolidation
- Lighter weight—Reduce weight to improve performance and reduce supply chain costs
- Flexible—Gain the ability to implement a diverse range of sensors and cameras
- Cost effective—Cost savings on short run production, enabling just-in-time and "on demand" production

HP MJF solves problem

"Components crafted with HP's MJF have been observed adorning the machinery of select clientele within the region," says Dr. Kılıçaslan. "A comprehensive inquiry into this phenomenon revealed the commendable efficacy of the HP system, particularly with respect to its superior surface quality and ability to intricately fabricate complex parts."

HP Multi Jet Fusion 3D printing empowered Norm Additive's engineers to develop a lightweight "Sensor Holder" that offered exceptional performance characteristics, and exchanging metal for polymer allowed them to build lightweight, highly customizable enclosures more economically.

Design for Additive Manufacturing

"Norm Additive has developed sophisticated design methodologies that are tailored for light-weighting, heightened performance, and economically prudent manufacturing," says Dr. Kılıçaslan. "We streamline product development and unlock the full benefits of 3D printing by incorporating these design capabilities at various stages, from prototyping all the way to serial production."

Because HP's 3D printing process manufactures parts layer-by-layer in a bed of powder, parts don't typically require supports. As a result, engineers can utilize Design for Additive Manufacturing (DfAM) to completely rethink product design. More complex parts can be printed in one piece, eliminating assembly, and lattice structures can be added to reduce weight, among other features.

HP 3D Printing

"Multi Jet Fusion (MJF) technology facilitates the realization of intricate and lightweight structures, says Dr. Kılıçaslan. "It's a feat that proves challenging, if not unattainable, through conventional manufacturing methodologies."

HP's Multi Jet Fusion 3D Printing technology utilizes polymer powder, energy and its unique reactive agents to develop parts that exhibit excellent surface finish, while also being very strong and highly impact resistant. HP's digital workflow enables designers to quickly build parts in CAD and submit them for manufacturing, which not only enables faster iteration, but also facilitates customization.

PA 12

HP offers a wide portfolio of materials with MJF, including several variants of nylon PA 12. In addition to black, the material is also offered in white, which can easily be painted or dyed. More recently, HP unveiled HP 3D HR PA 12 S, enabled by Arkema, which establishes a new benchmark in surface finish with a lower cost per part.

Benefits

The primary aim of the project was to mitigate the challenges posed by assembly operations and inventory management, which were formidable obstacles for our customer," says Dr. Kılıçaslan. "Our innovative approach not only facilitated a discernible reduction in overall cost but also achieved a commendable decrease in weight, further enhancing cost-effectiveness.".

With the new design, Norm Additive met all of its success criteria:

Quality that meets specifications

"The meticulous layering and fusion processes employed by HP MJF contribute to an exceptional surface finish," says Dr. Kılıçaslan. "This is vital to ensuring a level of quality that meets exacting standards."

HP Multi Jet Fusion delivers smooth surface finishes thanks to a detailing agent used during HP's 3D printing process. This allows intricate details including small holes, lattices and other fine features to be produced with consistent accuracy. HP MJF parts are also known for their isotropic properties, meaning their mechanical strength is consistent across different directions. This makes them ideal for parts that require strength on all axes.

Installing the new holder in production machines required that it meet exacting specifications. With MJF's consistent part quality, the team at Norm Additive was able to mitigate and eliminate expected challenges, precisely fitting the new component.

Elegant yet simple design

"To successfully make the paradigm shift from metallic to plastic material we incorporated a specially tailored lattice structure throughout the new part's design," says Dr. Kılıçaslan. "It greatly enhanced structural integrity while mitigating the impact of reduced material strength."

By combining multiple parts into a single design, HP MJF users can unlock several important benefits. Having the ability to produce complex geometries allows for functional improvements. Traditionally separate parts can be merged with internal channels and other features that reduce weight and optimize performance. Further, part consolidation reduces assembly time while also simplifying supply chain efforts by reducing the number of SKUs that must be sourced, stocked, and managed.

In this case, a component consisting of five distinct parts, joined by six bolts was reconfigured into a singular structure, saving significant assembly time, in addition to reducing the need for multiple suppliers and costly inventories.

Lighter weight

"Through our design team's efforts and by leveraging MJF's unique capabilities, the final design iteration resulted in a noteworthy reduction in part weight," says Dr. Kılıçaslan.

HP Multi Jet Fusion 3D Printing technology offers a significant advantage when lightweighting parts. It enables the use of intricate lattice structures and thin walls within a printed part, which can dramatically reduce the weight of a part while maintaining its structural integrity.

With the transition from metal to polymer, Norm Additive was able to decrease the weight of the component from 2.5 kilograms down to .5 kilogram. Lowering the weight helped lower cost, improve performance and reduce supply chain costs.

Faster production

"Parts for the old assemblies required a three week lead time," says Dr. Kılıçaslan. "The overarching objective of this project was to streamline logistics by ensuring the receipt of parts within a one-week timeframe. Notably, within our additive manufacturing framework, the expeditious delivery of the part to the customer was accomplished within a mere two days of order placement."

Unlike traditional manufacturing processes, which can take weeks, with 3D printed, parts can be manufactured and shipped within days. HP Multi Jet Fusion technology amplifies the advantage with faster printing speed, less post processing, and more efficient utilization of its build area.

Less expensive

"Our refinements yielded a considerable reduction in the customer's inventory holding costs, effectively dropping them to zero," says Dr. Kılıçaslan. "Remarkably, despite all of our comprehensive enhancements, the cost of the part remained consistently unchanged."

In higher volume scenarios, it can be difficult for additive manufacturing to compete with injection molding and other traditional technologies, but for shorter runs, it can be less expensive, especially when parts are produced just-in-time or on demand.

HP's nylon-based 3D printing materials are generally less expensive than resins or metal powders, and when combined with HP MJF's material efficiency, further increase cost effectiveness

More customizable

"MJF has garnered renown for its exceptional speed and precision," says Dr. Kılıçaslan. "But having the ability to concurrently fabricate diverse geometries within a singular build unit, all devoid of the need for supplemental supports, renders HP's MJF technology distinctly advantageous."

With HP's MJF 3D Printing solution, multiple different parts can be produced in the same job, without significantly affecting cost. When combined with HP's digital workflow, this greatly reduces the cost of complexity, facilitating customization. This flexibility empowers businesses to produce customized parts in low volumes, cater to niche markets, and even personalize products for individual customers – all without the limitations of traditional manufacturing.

The bottom line

"The favorable reception of our products by customers is attributed to the commendable attributes of surface quality, durability, and sealing properties inherent in the manufactured parts," says Dr. Kılıçaslan. "It is a testament to the high-performance characteristics of HP's technology."

With HP Multi Jet Fusion technology and HP's advanced 3D printing materials, Norm Additive validated that it could produce production parts "on demand," reducing the need for large inventories and streamlining supply chain management. Using DfAM principles, the "Sensor Holder" was enhanced for better performance and lighter weight, resulting in a part that would have been impossible to produce any other way.

"We are encouraged with our early successes," says Dr. Kılıçaslan. "Over time, I anticipate that we will continue our collaboration with HP and expand our production capabilities by incorporating higher-capacity metal and polymer additive manufacturing solutions, allowing for the production of larger and higher-volume parts."

Discover more about Norm Additive by visiting https://normadditive.com/en/

To learn more about HP Multi Jet Fusion 3D printing technology and how it is helping companies develop high performance, lightweight production parts, please visit us at:
https://www.hp.com/us-en/printers/3d-printers/products/multi-jet-technology.html

4AA8-4051ENW, May 2024