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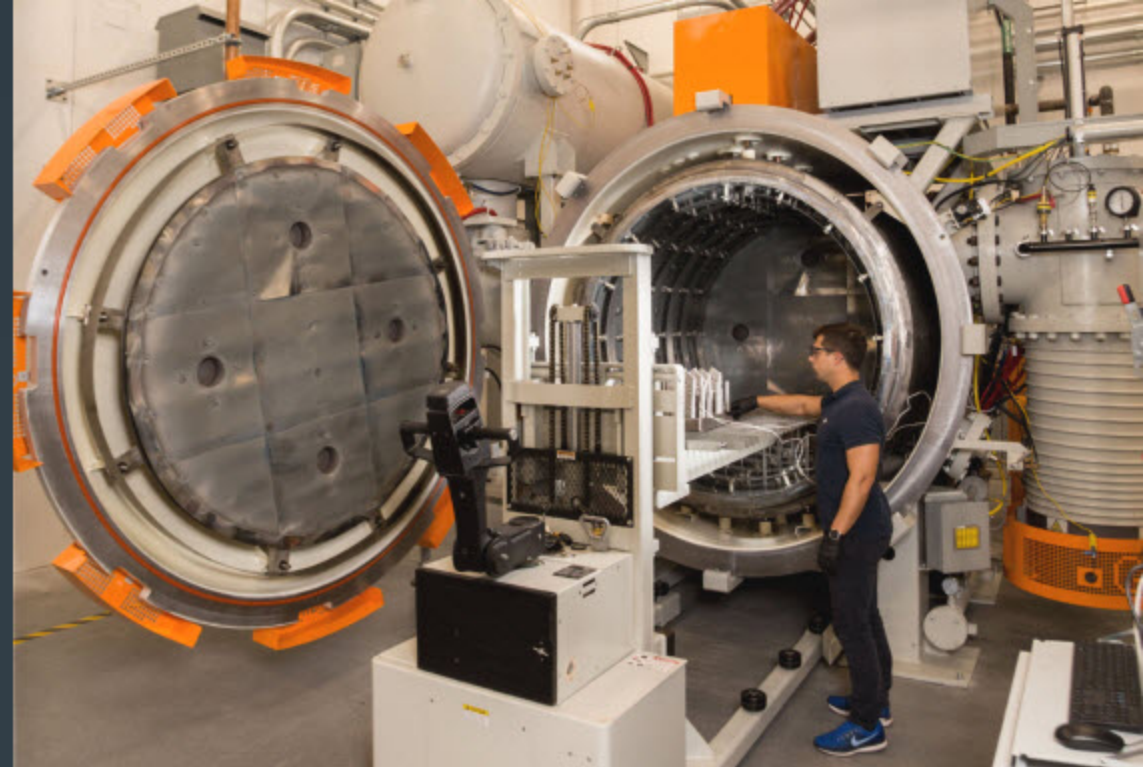
# Sustainability

The vital role of sustainability across additive manufacturing

## Case Study

# Is additive the answer to a more sustainable aviation industry?

Sintavia believes AM will play a key role in increasing the efficiency of commercial aircraft



Sintavia, an AM company serving the aerospace and defense markets, has placed an emphasis on the sustainable benefits of AM design.<sup>10</sup>

As an additive manufacturing company serving the aerospace and defense markets specifically, Sintavia is strategically positioned to help optimize aircraft components to improve efficiency and, consequently, sustainability. The company's founder and CEO, Brian Neff, has leveraged his expertise in the industry to try and make a positive difference using additive manufacturing.

The environmental impact of the commercial aviation industry is well known: every flight taken relies on energy-intensive aircraft that burn fossil fuels, contributing significantly to the world's emissions. Recognizing this problem, people around the world have become acutely aware of their personal carbon footprints and many have tried to

minimize their air travel. In 2018, the term "flight shame" was coined in Sweden to put a name to the environmental phenomenon.

Sintavia says that the moment it heard of the no-fly movement, it knew it needed to react along with the commercial aviation industry to make flying more sustainable. Additive manufacturing, in its capacity to produce complex, optimized geometries, offers a potential solution. To demonstrate the potential of improving aircraft fuel-efficiency using additive manufacturing, Sintavia set out to redesign a small bracket used in the Boeing 767. In the aircraft, 12 brackets are located at the back of each of the 767's two engines. The brackets are unassuming parts and haven't been updated or years,



Sintavia believes AM is a cleaner process compared to more traditional production techniques and can help produce more efficient parts.<sup>12</sup>



which made them the ideal candidate for Sintavia's experiment. With a scan of the original bracket, the Sintavia team ran the design through a sophisticated optimization software, resulting in a generatively designed component with the same mechanical properties as the original part but a significant material (and weight) reduction. In testing the 3D printed component, the part was not only 20% lighter than the original, it was also about 50% more durable.

The weight reduction of the small part (about 30 g) might not seem like much, but it makes a difference in terms of fuel consumption. According to Brian Neff (citing a consulting firm affiliated with Airbus), every 1 kg of weight saved from a fleet of 600 aircraft can reduce fuel consumption by 24,000 gallons

a year, which can reduce carbon dioxide emissions by 250 tonnes. Based on this, the optimized 3D printed bracket could save 720 gallons of fuel a year per fleet.

The experiment showcases how AM has the potential to transform the aviation sector, making it more efficient and reducing its footprint. Today, as the commercial aviation industry faces a unique challenge, AM's potential could be even more vital, enabling the sector to overcome supply chain challenges and, at the same time, become more environmentally focused. The fact that planes are flying less now due to the COVID-19 pandemic and various travel restrictions has undeniably put a strain on the aviation industry, but it can also present the opportune time to strive for innovation and

implement new technologies and parts, so that when the aviation sector does recover, it is all the better for it.

The company says: "Sintavia is optimistic about the speed at which these new additively manufactured parts will be integrated into commercial aerospace. The industry is accelerating and while there isn't a defined timeline, Sintavia feels well positioned as a company to play a major role in the adoption of AM technology. We believe that the traditional aerospace supply chain disruption caused by COVID-19 will in the medium and longer term present a real opportunity for AM to develop an alternative—and greener—supply chain."

Brian Neff also believes that if AM is fully exploited by the aviation industry, there is the potential to completely redesign aircraft systems, including engines, to become more sustainable. He even suggests the possibility of hybrid aircraft engines that use jet fuel to take off, and then electric energy to cruise and descend.

Brian Neff discussed this experimental case study in a TEDx Talk in December 2019.

#### Sintavia's eco mission

In addition to Sintavia's goal to help the aviation industry move towards more sustainable design and operation, the company also strives for sustainability internally.

"Demonstrating the commitment to sustainability is most definitely an area that customers look for when they audit

us," the company tells us. "And when we're working with other companies and business partners, we too are looking for the same. We are also always looking for ways to improve the AM process. Right now, we're in the process of becoming ISO 14001 certified and we have identified more than one area that can be improved. Sintavia has also developed proprietary powder reuse and handling parameters for the primary alloys in which we print—nickel, titanium and aluminum—which allows for maximum utilization of any remaining powder after a print job."

The company is also part of the Green Business Bureau and is the founder of the Additive Manufacturer Green Trade Association (AMGTA). ♦

The redesigned bracket saw a weight reduction of 20% compared to the original part, which could result in significant fuel savings.<sup>13</sup>

