

# **COSINE ADDITIVE, INC.**

## ACCELERATING NEXT-GENERATION 3D PRINTER DEVELOPMENT WITH SOLIDWORKS



Cosine Additive leveraged SOLIDWORKS design tools to accelerate development of the Agile Manufacturing 1 (AM1), the first large-format 3D printer designed for fabricating highly functional components in a large build envelope. AM1 extends the usefulness of 3D printing technology beyond rapid prototyping, and into actual manufacturing of sizable parts like kayaks and aircraft wings.

### **Challenge:**

Streamline and accelerate the development of next-generation 3D printing technology that utilizes common materials and overcomes the limitations of proprietary systems.

### **Solution:**

Implement SOLIDWORKS Standard design software.

### **Benefits:**

- Shortened modeling time by factor of three
- Cut subassembly design time by 50 percent
- Designed and fabricated sheet metal parts in three days
- Developed functional prototype within six months

Jason Miller (CEO) and Andrew McCalip (CTO) cofounded Cosine Additive, Inc. to design a printer that could be economically competitive with traditional manufacturing methods. To meet this objective, the pair assembled a team to develop a large-format 3D printer that is not dependent on proprietary materials, but can utilize a range of polymers and polymer/carbon fiber blends, extending the usefulness of 3D printing technology beyond rapid prototyping into actual component manufacturing. Cosine Additive's open materials, open software, modular-platform approach drastically decreases the financial barrier to industrial, large-format, additive manufacturing.

An accelerated R&D effort produced the Agile Manufacturing 1 (AM1), which was introduced at the Society of Manufacturing Engineers (SME) RAPID 2015 Conference in Long Beach, California. The first large-format 3D printer of its kind, it is designed for fabricating highly functional components in a large build envelope, with prints ranging from kayaks to aircraft wings. The AM1's ability to produce quality prints in a cost-effective and time-efficient manner makes it the perfect tool for manufacturers to create jigs, fixtures, and other manufacturing implements.

When Chief Technology Officer McCalip, who built a CNC machine in his parents' garage when he was 14, cofounded Cosine Additive in 2013, he immediately knew that the industry-disrupting start-up would need an efficient, cost-effective 3D development platform to help the team streamline and accelerate R&D, design, and manufacturing.

"I've used several different 3D design applications, but my first experience with CAD was when I learned how to use SOLIDWORKS® design software when I was 13," McCalip explains. "Since then, I've always preferred SOLIDWORKS because it's the most modern package and supports an intuitive, common sense approach to design. For Cosine Additive, choosing a CAD system was really about the speed of the platform and how well it integrates with manufacturing processes. I can design something in SOLIDWORKS three times faster than in a package like NX™, so it was truly an easy choice to make."

## **ELIMINATING REDUNDANT STEPS SPEEDS DEVELOPMENT**

With SOLIDWORKS as its standard design platform, Cosine Additive quickly ramped up its product development effort, producing a fully functional, working prototype of the AM1 within just six months, and then delivering four additional revised models over the ensuing 13 months, before shipping its product model in late 2015. McCalip partly attributes the rapid pace of the company's development effort to the ability to work more efficiently because of SOLIDWORKS software.

"Everything happens faster with SOLIDWORKS because there's not a lot of redundant effort, and the software provides the flexibility for automating repetitive or routine tasks," McCalip stresses. "For example, using smart fasteners and mating capabilities in SOLIDWORKS 2016 software, we're able to automate the propagation of 2,000 bolts and washers, comprising 20 different types. The time savings from just that effort are significant, shaving 50 percent off the expected time to complete this particular subassembly.

"Because we can write Visual Basic® macros to automate other tasks in SOLIDWORKS—such as applying part numbers and configuration names, or generating drawing exports and bills of materials—we've been able to accelerate development of a complex mechanism, comprising a 2,800-component assembly with 410 unique parts," McCalip adds.



**"SOLIDWORKS provides the best integration of manufacturing and CAD because it eliminates the impediments to getting things done—like the need to always output drawings—which allows us to get parts produced and in the door more quickly. With SOLIDWORKS, I can design a sheet metal part and have the fabricated part delivered to my office in just three days. That's the kind of agility that's critical to a lean start-up company like ours."**

— Andrew McCalip, Chief Technology Officer (CTO)

## BEST INTEGRATION OF MANUFACTURING AND CAD

SOLIDWORKS software has also enabled Cosine Additive to boost the efficiency of its manufacturing processes, prompting the 3D printer manufacturer to seek out fabrication and production partners who can work directly with SOLIDWORKS design data. "Whether we need to bend sheet-metal or mill parts, we seek out vendors who use SOLIDWORKS," McCalip notes.

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## BENEFITS OF A STABLE, COMPATIBLE SOLUTION

In addition to helping facilitate design and manufacturing at Cosine Additive, SOLIDWORKS software provides a stable, widely compatible design environment, which is why the company keeps its software license current by investing in annual maintenance subscriptions. "We're running some fairly exotic hardware, which makes software stability extremely important," McCalip explains.

"The new releases and SOLIDWORKS service packs that we receive not only improve the stability of our design environment and keep us productive, they also keep us compatible with our partners," McCalip says. "We find that we always get our money's worth from SOLIDWORKS."

**Focus on Cosine Additive, Inc.**  
VAR: MLC CAD Systems, Houston, TX, USA

**Headquarters: 1319 Colorado Unit C**  
Houston, TX 77007  
USA  
Phone: +1 832 519 8441

**For more information**  
[www.cosineadditive.com](http://www.cosineadditive.com)



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