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Solve real-world manufacturing challenges using the Fusion 360 Extensions

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Learning Objectives

- Understand how Fusion 360 extensions solved a real world customer problem
- Get greater understanding of industry challenges faced and overcome with Autodesk Fusion 360
- Gain insights about how to leverage the additional performance and capabilities of the extensions

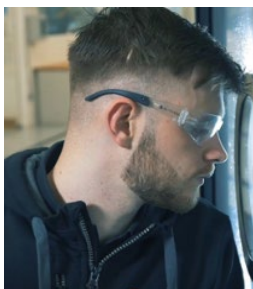
Description

Manufacturers all around the world are trying to increase efficiency by reducing scrap, increasing quality, reducing cycle time and automating traditionally manual processes. The Autodesk Fusion 360 manufacturing extensions address these challenges by eliminating disconnected platforms and costly overheads. These tools are an extension off the core product which encompass specialized technologies and provide flexible consumption of the technology.

Speaker(s)



Kieran graduated from Oxford Brookes University with a Bachelor of Sciences degree in Mechanical Engineering. His career spans the design & manufacturing of precision machined dental implants and prosthetics all the way through to manufacture of components for the mechanical and aerospace industries. He currently works as a Customer Advocacy Manager in the Customer Engagement Organisation helping to drive customer success through adoption, validation and education. My job entails championing the voice of the customer within Autodesk.



Dylan is an experienced machinist who spend 8 years in Autodesk's Birmingham Technology Centre learning the process of machining parts. Dylan spent the first part of his career creating complex part for customers, he's now a Customer Engagement Manager for Manufacturing working with customers to bridge the success gap.

Ganas Manufacturing

Maximizing efficiency for bespoke millwork and custom furniture-making

UTILIZING THE FUSION 360 NESTING & FABRICATION EXTENSION

Image courtesy of GANAS MFG

Summary

Ganas Manufacturing is a small startup based in Detroit that specializes in custom millwork and bespoke furniture for commercial and residential clients. Engineering these projects from the ground up required 3D modeling, but the company needed a solution that wouldn't break the bank. The company found that Autodesk Fusion 360 provided all the capabilities they needed and more, including 2D CAD, 3D modeling, CAM and CNC support, and a nesting & fabrication extension that dramatically reduced the time and effort involved in complex cabinetry projects.



Photo courtesy of GANAS MFG.

Building custom installations from scratch

Ganas Manufacturing is a startup providing full-service architectural millwork and bespoke furniture-making, with a specialty in woodworking and in-house metalworking. Launched in 2015, the Detroit-based shop is 15 people strong, which puts them in a uniquely agile position.

“We can be nimble in the projects we take on and flexible in our capabilities because we’re smaller,” says CEO and founder Richard Ganas. “Our sweet spot is design-driven projects that aren’t a good fit for larger shops. We are craftsmen by trade so we have attention to detail in realizing the vision of the architect or designer. We excel at one-off statement pieces for public and private spaces.”

This kind of bespoke work can be a serious engineering challenge because there are no previous projects or parts libraries to reference. But this is exactly what this team is passionate about.

“We have a lot of things working against us,” Ganas says. “Timelines and budgets are tight. Everything is new and custom. There is an extreme amount of detail. That’s what excites us about working here. Of course, we’re always looking for technology that allows us to do our job better.”

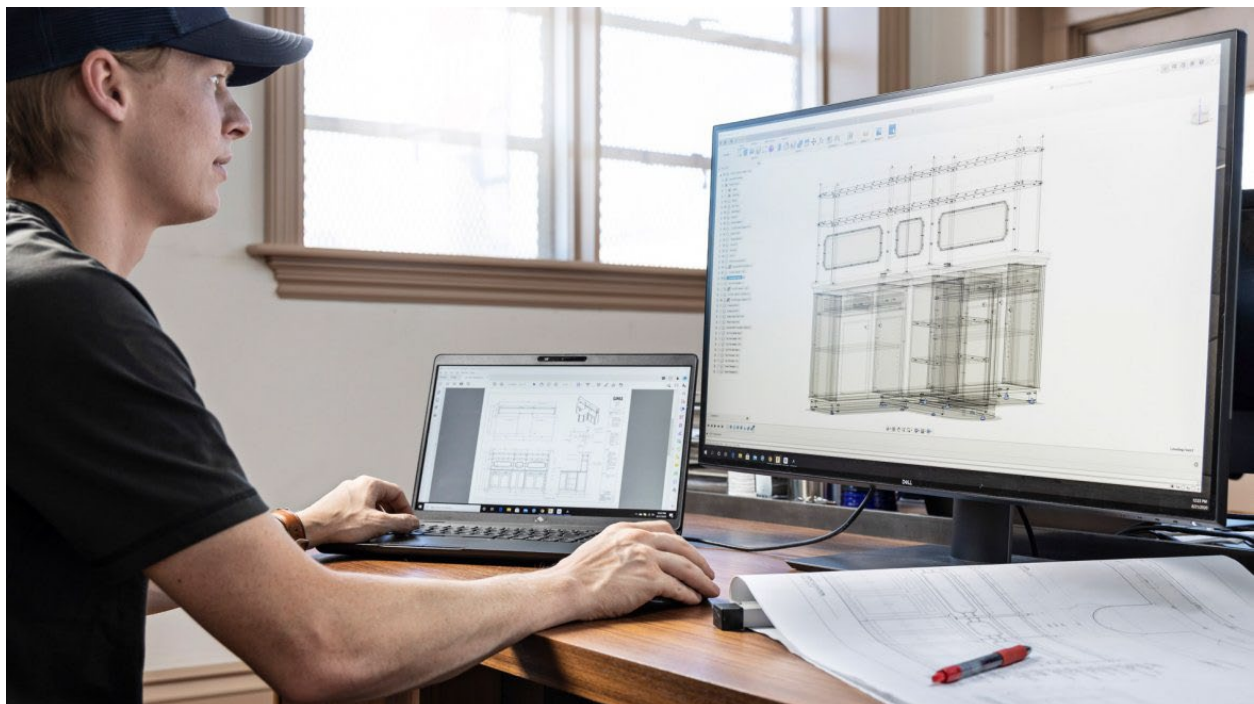


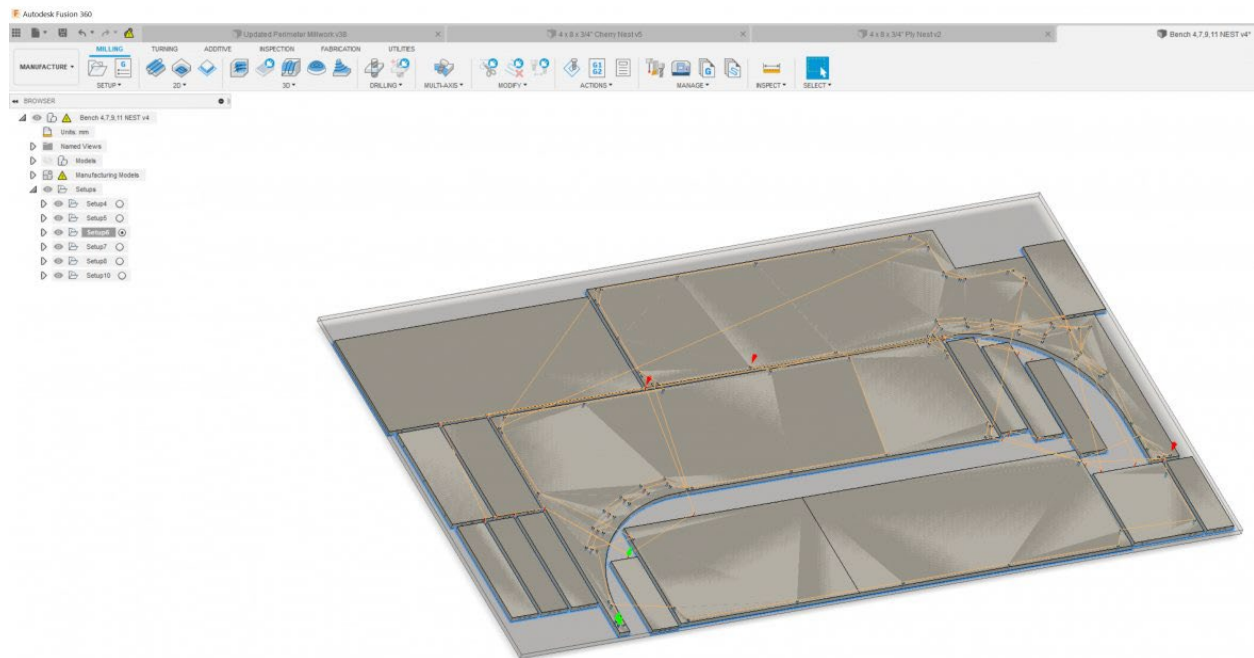
Photo courtesy of GANAS MFG.

Making the move to 3D modeling

To engineer projects from the ground up, the Ganas Manufacturing team uses an in-house CAD team and 3D modeling with Autodesk Fusion 360. The decision to add 3D modeling was an easy one, because the company needed to create 3D models parametrically and use them to engineer joinery and construction jobs.

Choosing Fusion 360 turned out to be an easy decision as well. Ganas's background was in consumer product design, so he was familiar with a variety of 3D modeling tools. But the cost-efficiency of Fusion 360 was an undeniable draw.

“We were a scrappy startup at the time, and the price of Fusion 360 was very obtainable,” he says. “Other platforms required larger initial investments and annual service contracts. Fusion 360 has everything we need, including support for 2D drawings as well as CAM for our CNC machines.”



Fusion 360 Nesting & Fabrication Extension. **Image courtesy of GANAS MFG.**

Saving time with automated nesting

On the CNC side of the shop, Ganas Manufacturing has a 3-axis and a 5-axis router as well as a horizontal drilling and doweling machine. One of the biggest benefits of using Fusion 360 for CNC is the Nesting & Fabrication Extension that automatically determines how to maximize the yield of sheet goods when accommodating a number of smaller pieces.

“There is a big gap in the woodworking and millwork industry when it comes to nesting,” Ganas says. “There are a lot of products for cabinet libraries, but they are not custom. Fusion 360 can do nesting directly from the 3D model and that’s invaluable to us.”

The impact of the Nesting & Fabrication Extension is huge for the shop, **reducing expected scrap from 25% to just 5%** of any given sheet.



Photo courtesy of GANAS MFG.

Automating repetitive tasks

Before the Fusion 360 Nesting & Fabrication Extension, which feeds CNC code directly into the router, Ganas and his team not only had to figure out the nesting but also cut every sheet by hand with a saw. This was very physically demanding, not to mention the fatigue factor of such a monotonous task.

“We always took pride in getting through the cut sheets,” Ganas says. “But how do you want to spend your time? Would you rather cut 50 sheets or assemble them and make them look beautiful with your craftsmanship? The Nesting & Fabrication Extension, together with all of the CAM tools in Fusion 360, lets our team focus on delivering a high-end product with perfect fit and finish.”

“Previously we were using a different program for nesting to make the cut lists, but that’s still susceptible to human error,” Ganas says. “You type one number wrong and

now you have 200 sheets that are 1/16 of an inch off. Fusion 360 has eliminated those kinds of errors. Now we know it's 100% correct, and that's a game-changer.”

—Richard Ganas, CEO, GANAS MFG



Example of custom millwork designed and manufactured by GANAS for a retail concept. [Photo courtesy of GANAS MFG.](#)

Reducing production time on the jobsite

While those improvements are important in the shop, they also make a big impact on actual client jobs. Ganas Manufacturing has created and installed custom millwork for the lobby, exam rooms, and offices of a regional chain of veterinary clinics. It has done identical jobs without Fusion 360 and with Fusion 360 and the difference is big.

“It has lowered our costs and increased our profit margins while cutting our timeline in half,” Ganas says. “What used to take a month we can now do in two weeks. We can order everything pre laid-up, factoring in the lower scrap with nesting. We’re not guessing—we know exactly what we need.”

Growing the business

Ganas plans to grow the business significantly in the next five years and believes he can do much more work while maintaining an agile team by using Fusion 360.

“We’re investing in technology that allows us to do cool projects, that’s what excites us,” Ganas says. “Our team will grow but by using technology like Fusion 360 we can assist our craftspeople even more. If you need it, Fusion 360 already has it. It’s already in there.”

Evolve

UTILIZING THE FUSION 360 GENERATIVE DESIGN EXTENSION

Images courtesy of Evolve

Discovering generative design for CNC milling

Evolve achieves 40% weight reduction on electric hypercar component using generative design and 2.5 axis machining

Evolve specializes in engineering high-quality bespoke systems and products, delivering cutting-edge solutions to motor sport, automotive, aerospace, medical, industrial equipment, and clean technologies industries. The team at Evolve has used Fusion 360 since 2016, but like many companies, they assumed generative design was too complicated, expensive, and best suited for additive manufacturing. Recently the team applied generative design to an electric hypercar component and quickly realized the time and cost-savings to design with artificial intelligence and ease of manufacturing parts on a CNC machine.



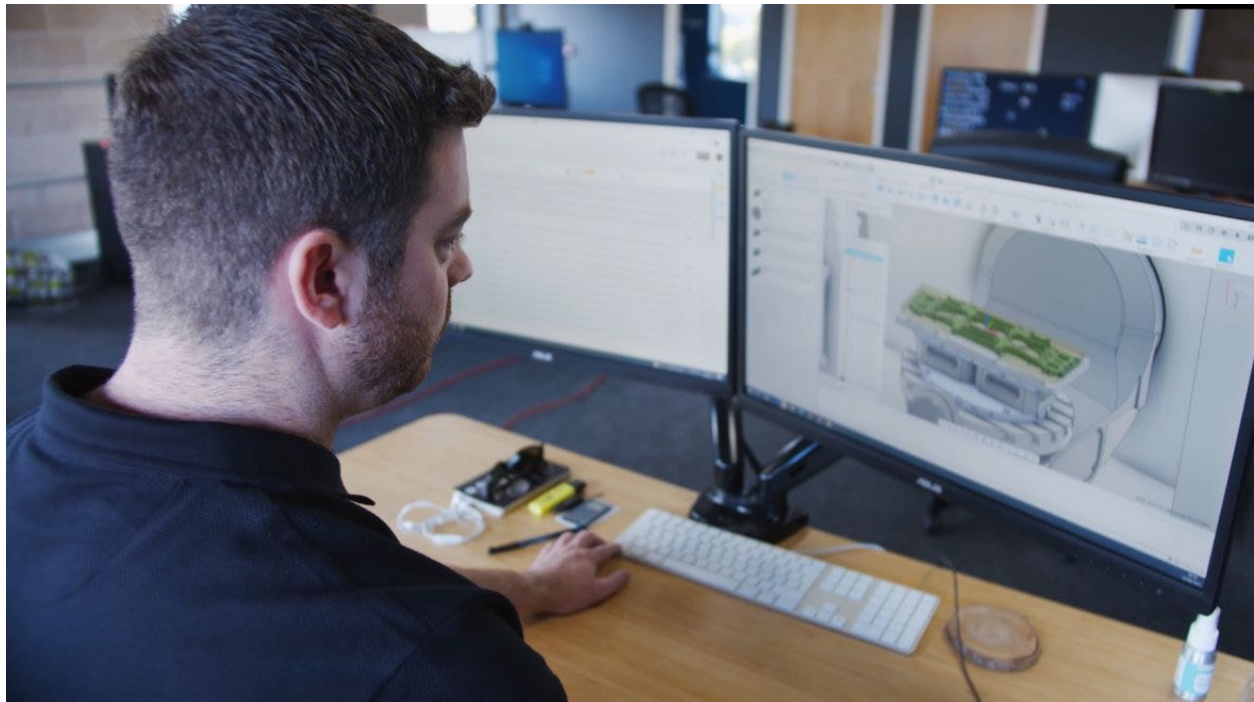
Evolve used generative design to lightweight components for an electric hypercar.
Photo courtesy of Evolve.

Generative design supports traditional fabrication

The team at Evolve prides itself on solving the toughest engineering challenges, so they are constantly exploring new technologies to help them to transform their design approach and add value to their growing design and manufacturing business.

Evolve's first foray with a generative design project for an electric hypercar component quickly dispelled any initial thoughts they had about the AI-driven technology.

"I personally had this preconceived idea that generative design is a complex process, very expensive, and creates organic solutions that are more suited to additive manufacturing than CNC machining," said Matt Hill, founder and CEO, Evolve. "This project focused on machine parts for the production of the vehicle. The challenge was to try and move that mindset to the fact that we could create something that was suited to 2.5 axis milling. It was a pretty obvious choice in hindsight."



AI drives cost-effective manufacturing solution.
Photo courtesy of Evolve.

Explore multiple design solutions driven by AI

With an electric vehicle, weight reduction is even more important to hit performance and range targets. For the component, Evolve also focused the requirements of their generative design in terms of strength, performance, and stiffness. Most critically, it had to be optimized for CNC milling.

With these parameters in Fusion 360, the team could quickly see different options and choose their priorities for the component. They selected their preferred solution from the full set of design options—and what they landed on came as a surprise.

“It created something that was very interesting and aesthetically pleasing that perhaps we wouldn't have created if we'd have done this from a traditional design method,” Hill said. At the same time, Hill could then take the model, modify it, clean some surfaces and edges, and add a human element to it for a finished and polished product ready for manufacturing.

Generative design helps to reduce weight by 40%

In the end, the final electric hypercar component was a staggering 40% lighter than when they started and the project was completed in record time. That's just the beginning as Evolve moves generative design into more projects.

“We're really looking forward to having this as a tool in our toolbox for the future, to make our design process more efficient, and add value to our customers going forward,” Hill said.

Conturo Prototyping

When you think of Pittsburgh, Pennsylvania, you may recall its identity as a blue-collar steel town. But the days of traditional manufacturing are changing faster than you think, especially at Conturo Prototyping.

Founded in 2016 in the Point Breeze neighborhood of Pittsburgh, Conturo Prototyping began as a 1,000-square-foot shop. It has quickly grown to a 17,000-square-foot facility complete with ten multi-axis CNC mills and three CNC lathes, primarily because of its agile manufacturing workflow and world-class engineering customer support.

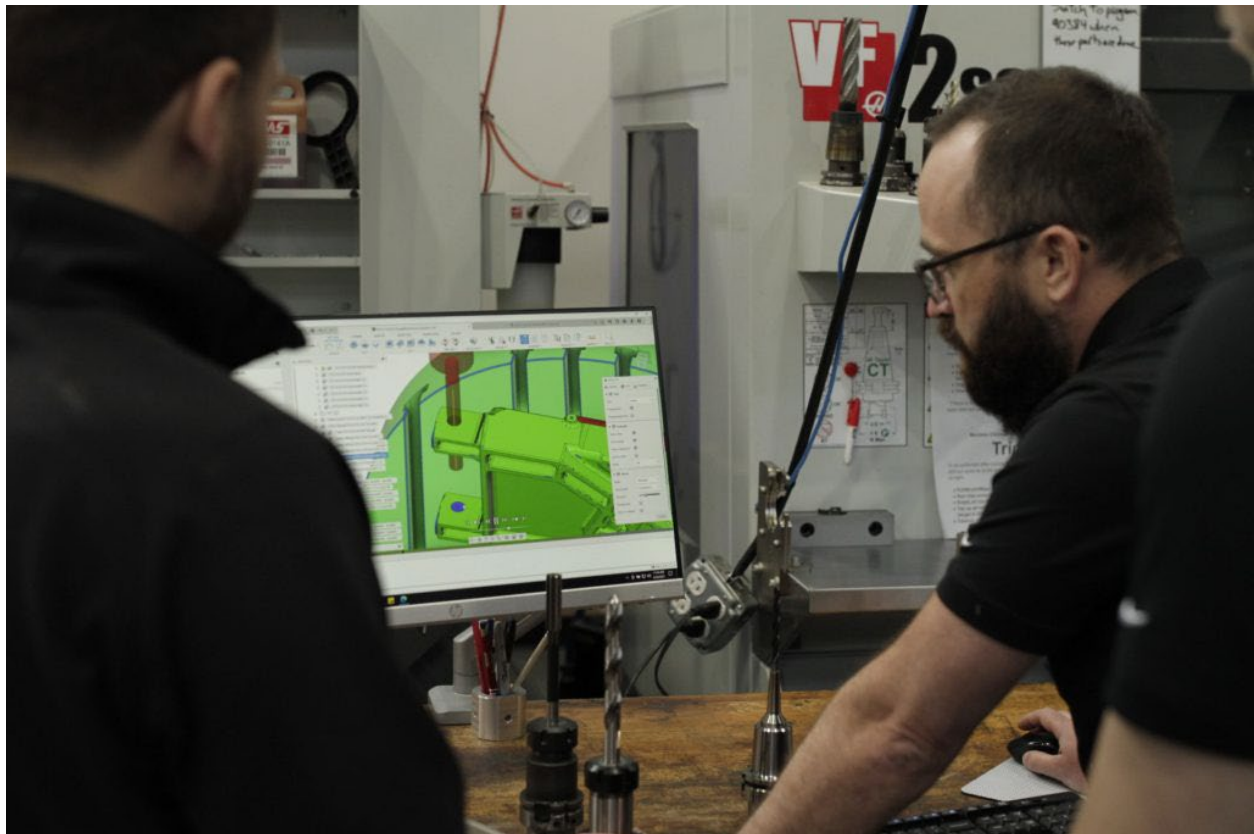
“We work with engineers that have very complex goals and make very advanced mechanical assemblies and components,” says Andy Lawniczak, Chief Operating Officer. “But they’re used to the old-school ways of manufacturing and machining. So, when we get back to them within a day with a design for manufacture analysis, they say, ‘Wow, that was fast!’”



Conturo prototyping specializes in short production runs that support OEMs during product development cycles, allowing them to bring products to market faster. Image courtesy of Conturo Prototyping.

A key element of the shop's success is Autodesk Fusion 360, which allows the teams to simulate and automate many of the initial steps that used to be done manually. And in the digital world, each of these steps can be accomplished much more rapidly.

“As soon as the customer comes to us with a problem, we load it in Fusion 360,” Lawniczak says. “Right away, we can start looking at geometries, measuring different aspects, making slight changes, and putting it in our machines to see how it will fit and how feasible the job is. What’s really important about these advanced tools is we can be so much more agile than we used to be.”

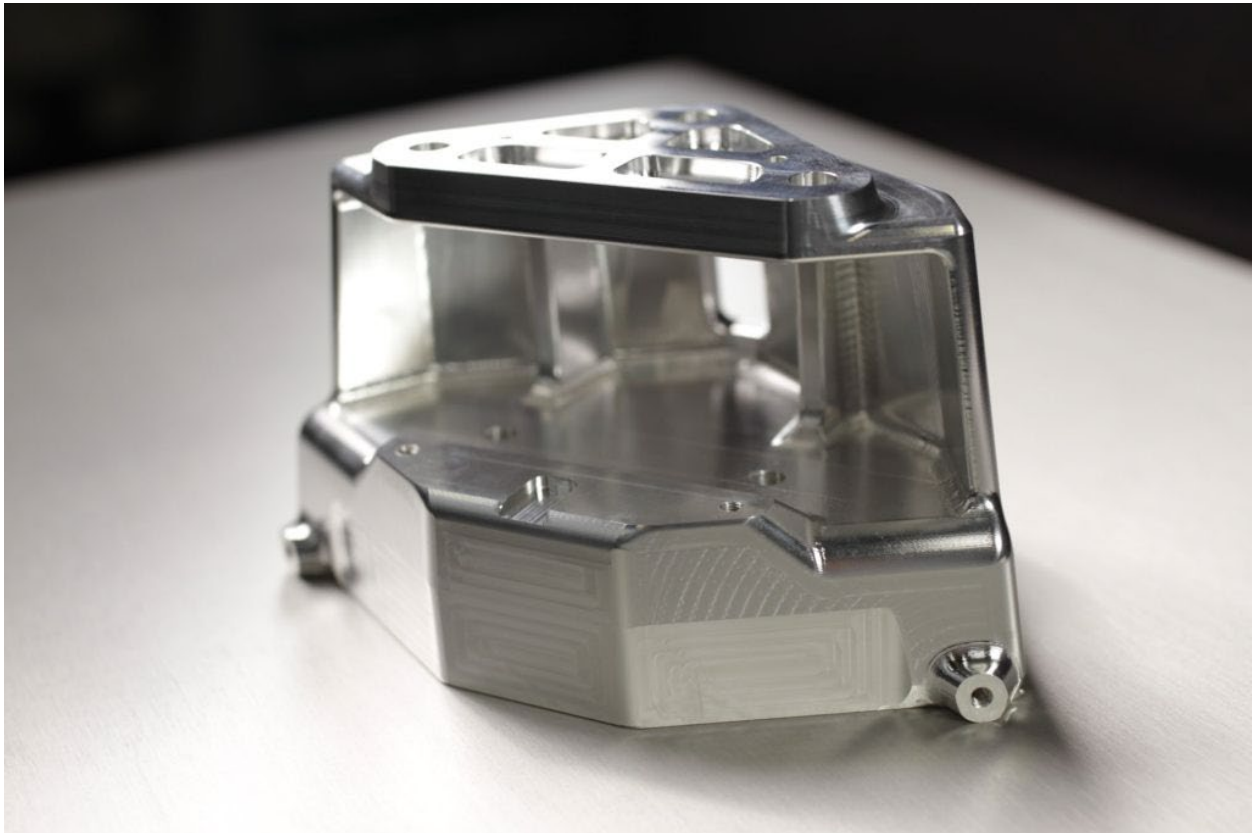


Engineers use Fusion 360 and the Fusion 360 – Machining Extension to operate their 3- and 5-axis CNC machines. Image courtesy of Conturo Prototyping.

A traditional job shop with a few CNC programmers and a large crew of operators might be able to program a handful of parts in a week. Conturo Prototyping, on the other hand, can program that many parts in a single day. From Lawniczak’s perspective, the

versatility of Fusion 360 contributes directly to the shop's ability to solve customer problems more rapidly.

"We had a client on a very short timeline making robots, and they wanted to cast a lot of the parts, but making a casting mold is really expensive and really slow," he says. "They asked us if we could CNC the geometry so they could get to market sooner."



A typical prototype component produced using 5-axis machining. Image courtesy of Conturo Prototyping.

Conturo Prototyping ended up programming the entire part in Fusion 360. The level of complex, intricate geometry meant it would have been almost impossible to produce using 3-axis machining. Instead, the Conturo engineering team decided to purchase the new Fusion 360 Machining Extension, which unlocked 5-axis functionality inside their existing Fusion 360 software, meaning they could quickly produce the NC code they needed to run their 5-axis mills.

"We were able to get the prototype back to our customer in a few weeks as opposed to six months or more from a casting vendor," he says. "This is how we end up solving so many client problems."

The Fusion 360 Machining Extension is a cost option that unlocks a vast array of advanced tools for CNC machining. In addition to 5-axis functions, including automatic collision avoidance, the extension unlocks access to machining strategies like steep and shallow that simplify the machining of complex, feature-rich parts. The extension also includes dedicated toolpaths and workflows that can be used with spindle-mounted probes to measure components throughout the machining process to help speed up set-up and improve overall part quality. The extension is considered as being extremely powerful, according to shop supervisor Patrick Fee.

“The Fusion 360 Machining Extension can do some really advanced stuff on the CNCs,” Fee says. “For example, part alignment typically involves a lot of shimming to make the part really flat. It can take hours, and it’s really stressful. With Fusion 360, the probe does all the work. That’s immensely time-saving and valuable to us.”



Spindle-mounted probes are used to simplify setting up parts, such as castings, prior to CNC machining. Image courtesy of Conturo Prototyping.

Tight schedules and complex parts are just a normal, everyday expectation for shops like Conturo Prototyping. But with help from Fusion 360, the shop can do more work in less time. “We know everyone’s on a tight timeline, so we make sure we’re using the most cutting-edge tools we can, and that’s why we’re using Fusion 360,” Lawniczak says. “it really embodies the whole agile movement in engineering.”

Brown & Holmes

As a precision machining subcontract manufacturer and workholding specialist, Brown & Holmes Ltd supplies high-quality services to blue-chip companies and tier 1 suppliers throughout the UK, Europe, Asia and the US. With decades of experience delivering machine components to the automotive, aerospace, machine tool, construction, power generation and nuclear industries, the company recently invested in Fusion 360 software to reduce spindle idle times, remove production bottlenecks and improve throughput.

Established in 1939, Brown & Holmes has an enviable reputation for quality, which has seen the Staffordshire company add JOSCAR to its ISO:9001, AS:9100D, ISO:14001, ISO: 45001 and OHSAS:18001 certification list. This philosophy for quality that is matched by its commitment to environmental sustainability has seen the company win significant levels of new business.

Brown & Holmes had been using Autodesk design tools such as Inventor since 2013 for the design of components, fixtures and assemblies, but over the last two years, an upturn in orders saw the company upgrade its licenses to include subscriptions to the Autodesk 'Product Design and Manufacturing Collection' (PDMC).

As the name suggests, the PDMC includes a collection of Autodesk products including Inventor and Fusion 360. The increasing demands on the team resulted in Brown & Holmes realising that its existing practices, workflow and CAM system needed a significant overhaul. It is here that Fusion 360 was implemented to help the business grow.

