AUTODESK UNIVERSITY

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Solving Your Manufacturing Business Challenges with Autodesk Fusion 360

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Learning Objectives

- Describe how using automation can reduce programming times to start machining sooner.
- Simplify the programming of expensive 5-axis CNC machines.
- Identify where in-cycle inspection can improve part setup and avoid the need for costly re-work.
- Improve your use of data to help design and manufacturing teams to collaborate more effectively.

Description

Whilst manufacturing departments come in all shapes and sizes, business owners and production managers will all face similar challenges, such as keeping up with design changes, the need to automate CNC machine usage, and improve part quality, all whilst addressing potential skills gaps in their workforce.

This class will look at these challenges in detail, and then using an example manufacturing department, will illustrate how they can be addressed, with a series of scenarios where Autodesk Fusion 360 can be used to provide possible solutions to the outlined challenges.

Speaker

Rob is the Manager of the Manufacturing Technical Marketing team at Autodesk, whose role is to help customers understand how they can achieve their manufacturing goals, using the advanced manufacturing solutions that Autodesk offers.

Rob graduated from the University of Liverpool with a Bachelor's degree in Aerospace Engineering and a Masters in Product Design and Management, before embarking on a career with Delcam as an Applications Engineer. Initially starting in the UK department, he trained and supported UK customers, before moving into an international role, where he assisted the global network of subsidiaries and resellers in both pre- and post-sales activities. Following the acquisition of Delcam by Autodesk in 2014, he moved to Technical Marketing, and is now in his 18th year of service.

Introduction

As a business owners you probably have a vision for the outcomes you are looking to achieve, but there are many challenges that can hinder this progress.

When it comes to manufacturing, many businesses will share similar goals, where they are constantly looking for ways to make better use of the hardware in their manufacturing departments, by providing their CAM programmers, manufacturing engineers, and CNC machine operators with the tools they need to produce better parts and do it faster.

In this class, we will look at some likely outcomes, the challenges that need to be overcome to achieve them, and relating these to the use of manufacturing software to face these challenges within your manufacturing department.

Manufacturing Department Scenario

Before digging into it, we need to start with a definition. So, what do we mean when we say "Manufacturing Department", in the context of this class?

Well, *Figure 1* shows an example facility. This particular organization has grown to the point at which there are defined departments within the facility.

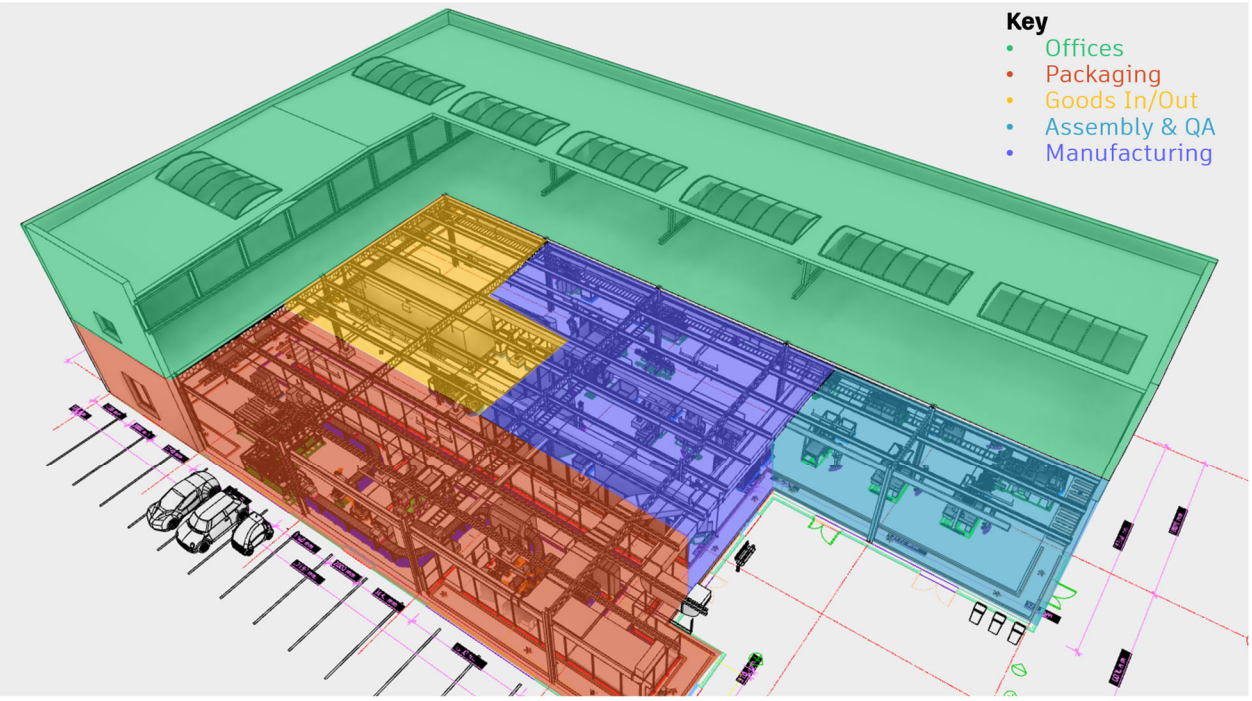

Figure 1 - An Example Manufacturing Department

On the upper floor we have some office space, where we'll probably find the design offices, part programming, sales, finance, meeting rooms and so on. On the lower floor we have areas such

as packaging, goods in and out, assembly and quality assurance, and the area we are interested in, the Manufacturing Department.

Now your business may already at this stage, or it might be on the way there, but one thing that's for sure is that as a manufacturing organization grows in size and capability, it will naturally establish separate departments.

And since each of these departments has its own focus, such as those in our example, like design, production, quality control, finance, and so on, then it becomes clear that choosing the right manufacturing software can empower you to unlock the full potential of your manufacturing department.

Business Outcomes and Challenges

But before we dig into it further, we need to consider some business outcomes you are probably looking for, and the typical challenges facing manufacturing departments that limit the opportunity to achieve those outcomes.

Now there are a lot of major trends impacting the world of manufacturing, which bring about both challenges, and represent opportunities for manufacturers.

An Increasing world population represents an opportunity to make better use of process automation to meet growing demands for products and services. The skills shortage represents an opportunity to use Machine learning and automation to shorten learning curves to help workers onboard and become productive sooner. Climate change, represents an opportunity to embrace new manufacturing technologies and emerging materials to become more sustainable. And, difficulties with the supply chain represent an opportunity to embrace cloud-based tools to improve collaboration between producer, supplier, and consumer.

To move with these trends, it is only natural that your business will have key values drivers, such as the need to create better products, or to win more business. Or perhaps to improve operational efficiency, or maybe enable increased innovation across the organization. And so it is likely that you will have a range of outcomes you are looking to measure, which in turn provide value to your business.

For example, you might be looking to improve collaboration across your organization. Or you might perhaps be looking to improve your time to market and improve your manufacturing throughput, by finding ways to produce more output in a given timescale. And this is all whilst also trying to reducing the number of defects and non-conformities in the parts that you make, and reduce the non-value added tasks in your processes.

Basically, it all boils down to you wanting to make more parts, make better parts, and spend less time and money making them. Simple right?

Challenges

But in order to achieve these outcomes, it is likely that there are challenges (see *Figure 2*) which are you probably facing that might be limiting your success?

Figure 2 - Challenges Facing Manufacturing Departments

There is the constant challenge to keep up with design changes, a need to automate to reduce delivery times, and a need to maximise cnc machine usage. There is also a need to improve the quality of manufactured parts, all whilst addressing the skills gap.

Design Changes

Looking at these challenges in a little more detail, first, we have the need to cope with design changes.

Now, design changes can be costly, as they can delay production. But how are these changes communicated? What happens if a design change is not communicated before production begins, and what are the costs of this?

The right software can help, by simplifying the design revision process, with seamless associativity between CAD and CAM, so that the manufacturing team are always up to date with the latest designs. And this can be reinforced, through effective communication methods, which informs stakeholders of design updates.

By overcoming this challenge, you can improve collaboration across your organization.

Need to Automate

Next, there is the need to automate to speed up manufacturing processes and reduce delivery times. But in the context of this presentation, what do we mean by “automated”?

Automation within the manufacturing industry comes in many forms, from assembly lines, to industrial robots, to the automated guided vehicles (or AGV’s) that transfer sub assemblies and components around the manufacturing floor.

In this case thogh, we are focussing primarily on software solutions to help automate the processes for design and manufacturing. By utilizing automation, manufacturers can deliver repeatable and consistent processes, which improve quality, reduce human error and will ultimately result in more reliable products.

By overcoming this challenge and embracing automation, you can improve your time to market.

Maximizing CNC Usage

The next challenge comes from the CNC machine usage in our manufacturing department. Whether we have existing machines, or are purchasing new ones, it is important that we maximize their usage in order to maximize the return on the investment in them.

This can come in many forms, from the automation of the setup process which minimizes machine idle time, to utilizing multi-axis capabilities to reduce the number of setups required, minimize tool lengths and avoid collisions, to in-cycle probing to verify parts are accurate during production to keep machines productive and reduce wasted machining time on bad parts.

Again the key is software that can unlock the potential of a manufacturing department to produce safe, predictable NC code for CNC machines, which in turn can help increase your manufacturing throughput.

Improve Quality

This next challenge is inherently linked with the previous ones, where the need to improve part quality goes hand-in-hand with machine utilization, and can be aided by automation.

Quality issues can have an adverse effect on profitability. This can be through the need to perform costly rework or manual processes such as polishing. Or if not rectified, can affect the reputation of a business, which in-turn affects repeat custom.

To improve part quality and consistency, again we look to software, providing toolpath strategies which improve surface finish, machine parts with fewer setups and shorter more rigid tools through multi-axis machining, and improving setup accuracy with in-process checking.

By improving quality you can reduce defects and non-conformities.

Fill Skills Gap

The fifth and final challenge I wanted to talk about, comes from the need to fill the skills gap. The skills gap is something that has been widely spoken about, but fundamentally comes down to the gap between the number of skilled jobs available and an apparent lack of skilled people to fill those roles.

Part of this problem is down to an aging workforce which, once retired, takes a lot of craft, skills and knowledge with them. This is difficult to pass on in a traditional sense, so capturing this knowledge is vital to maintaining skill levels within an organization.

Therefore, we might look to software that can help capture this knowledge and store it, for use by others within the organization, allowing best practices to be shared and collaboratively refined later, which brings us back full circle, to improving collaboration again.

Why Fusion 360?

Having defined what we mean by a manufacturing department, the business outcomes they are looking for and the challenges they face, we now need to talk about Fusion 360.

So why Fusion 360?

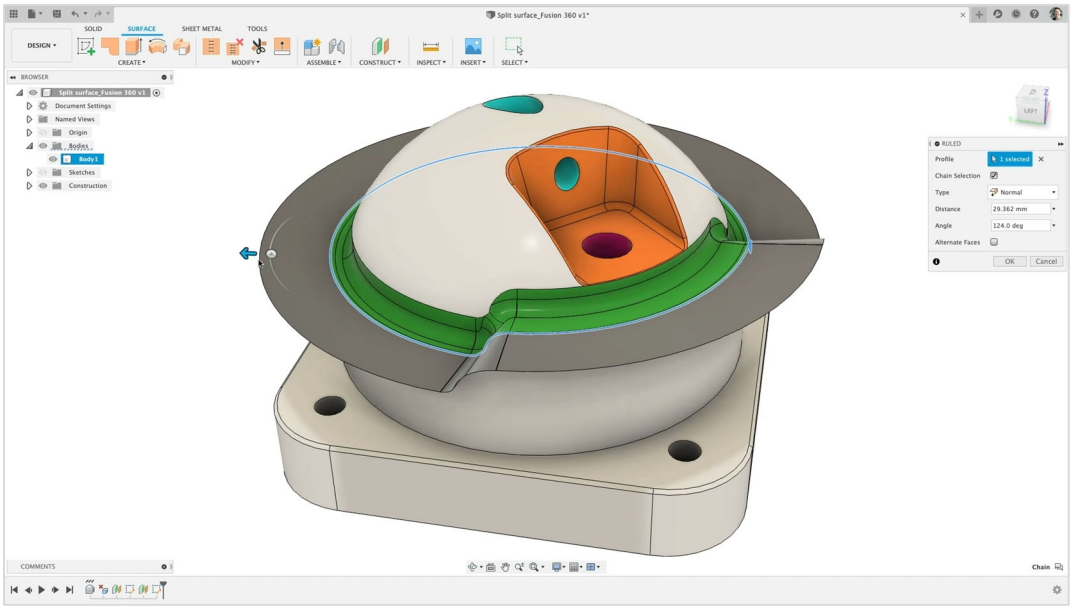

Figure 3 - Surface Extension in Fusion 360

Well, in its simplest definition, Fusion 360 (see *Figure 3*), is a cloud-based design, engineering, electronics and manufacturing platform, which combines industrial design, mechanical and electrical engineering, and machine tool programming into one software solution.

Fusion 360 brings together technologies that had previously been separate. By building Fusion 360 in this way, we're able to differentiate in the market in three main ways.

1. With an Integrated platform that makes it easy to connect all phases of a product development process.
2. Data can be viewed from a single source and easily collaborated on with both internal and external stakeholders.
3. And the data and technology can be accessed across devices from a single, affordable offering.

Fusion 360 has a core of functionality, where you can perform CAD functions such as 2D drawing or 3D & assembly modelling, or mechanical and thermal simulations. It also gives you access to 2D, 3D and multi-axis positional CAM, and work coordinate system probing, and has additive tools for plastic additive fused filament fabrication (or FFF), and fabrication tools.

Layered on top of that, are the extensions, which extend the core capabilities of Fusion 360 by adding in enterprise-grade, features and services. Access is flexible, meaning you can access what you need when you need it, and thus only paying for what you use at any one time. In this class, the extension we are most interested in, is the Machining Extension (see *Figure 4*).

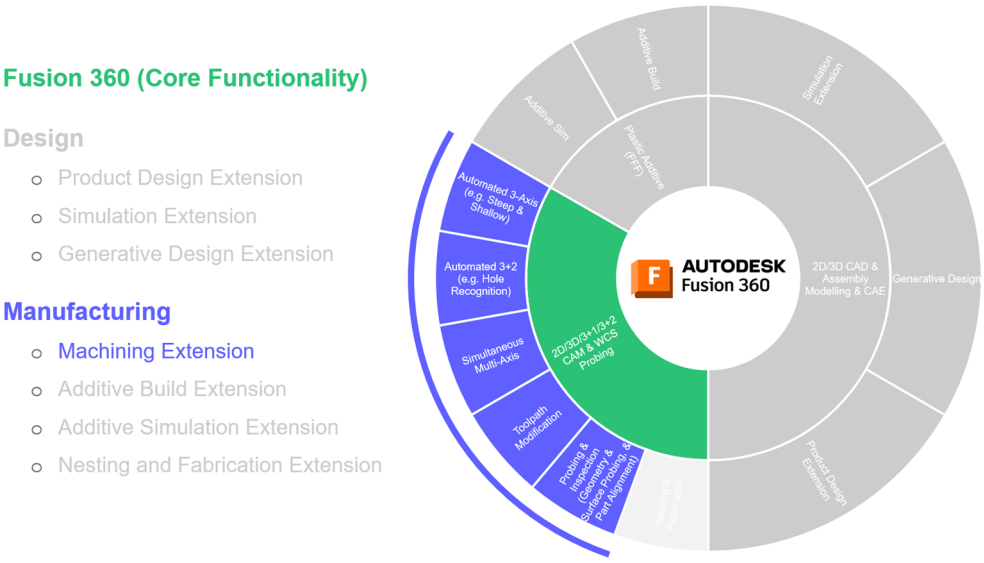

Figure 4 -Fusion 360 Extensions Layered on Top of Core Functionality

How Might it Work in a Manufacturing Department?

Adding some detail to our manufacturing department, we have 4 programmer/operators. These are Jan, Sanjay, Lauren and Patrick (see *Figure 5*).

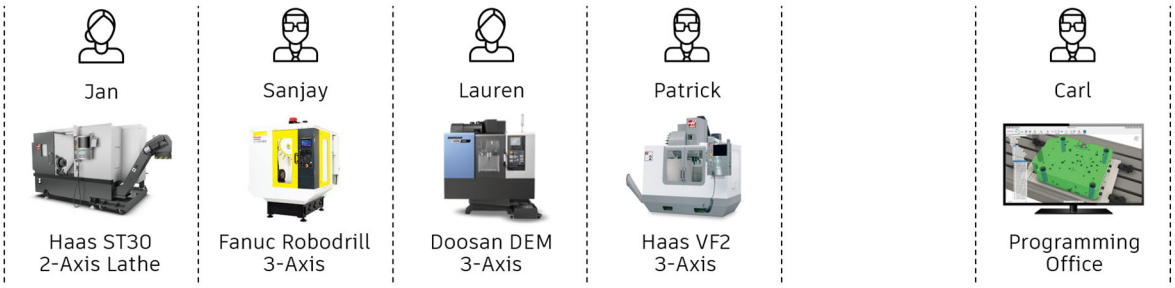

Figure 5 - Our Example Manufacturing Department

Each of them program and operate their own machines, those being a single 2-axis lathe and 3, 3-axis milling machines. We also have Carl. He is in the programming office, upstairs, and needs to be able to program all of the machines.

We shall refer to this example throughout.

With that understood let's look at some scenarios that our manufacturing department could face, and identify how Fusion 360 can help.

Associative CAD/CAM

As discussed earlier, Fusion 360 is integrated, meaning design and manufacturing tools are integrated into the same environment. This means you are able to go from design, to machining faster. Additionally, when design changes are made, toolpaths associatively made from Fusion 360, or other CAD tools using AnyCAD, can automatically update.

Additional elements such as workholding, fixtures (see *Figure 6*), hole caps and extension surfaces, can all be added to aid the manufacturing processes, because Autodesk Fusion 360 integrates powerful and easy to use modelling, alongside its intuitive manufacturing tools.

For workholding, models can be created from your own designs, or brought in from a range of samples, and quickly included and positioned within your Fusion 360 file. For fixture elements, such as soft jaws, powerful modelling tools can be used, to quickly establish the models needed, which are inherently linked to the original design, to hold your parts accurately and safely.

If the original design changes, the associativity of Fusion 360, means workholding, fixtures, setups and toolpaths will all update seamlessly, reducing the risks associated with change orders, letting a manufacturing department be more productive.

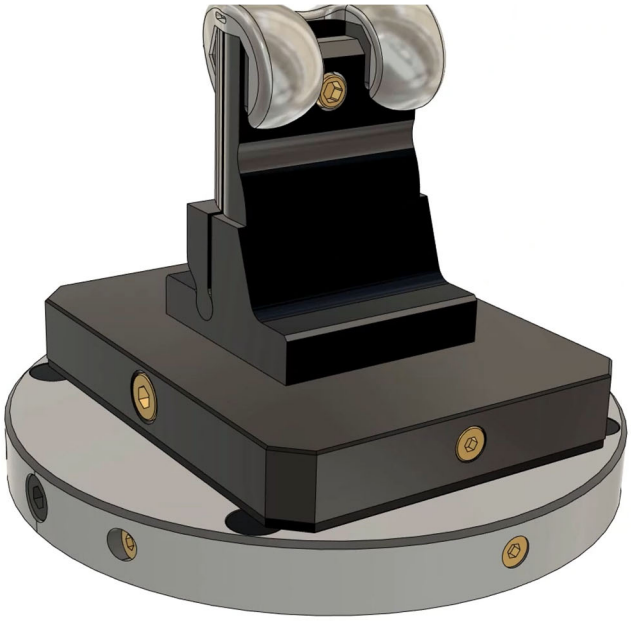

Figure 6 – Machining Fixture Design in Fusion 360

And the associativity even extends to third-party data, because Fusion 360 has AnyCAD. AnyCAD lets you collaborate and manage CAD data with anyone, regardless of the CAD software they use, removing the need to translate their data, whilst still maintaining a link to the original CAD file. The result is that, any updates to the original third-party file, will also be reflected in Fusion 360. So, whether you are modelling from scratch, or working with imported data, Fusion 360 connects design and manufacturing departments, for better, faster, seamless, workflows.

How Might it Work in a Manufacturing Department?

For our manufacturing department then, every member of the team can be given access to Fusion 360 (see *Figure 7).*

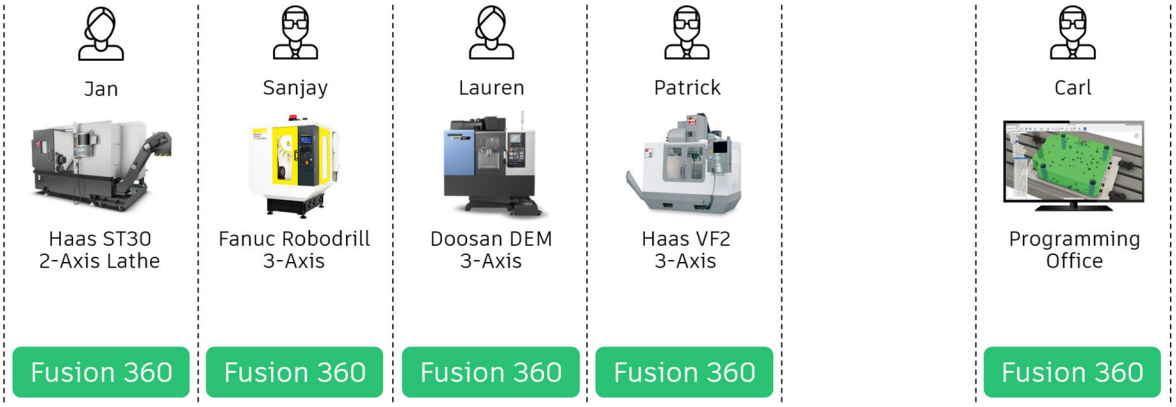

Figure 7 - Every Team Member Gets Access to Fusion 360

The low cost of entry, and core functionality of Fusion 360, means that it is more than capable of meeting the needs of our manufacturing department at this stage. Each user also gains the benefit of the associated CAM updates, should their CAD models change.

Improved Accuracy and Part Quality

We have covered the benefits of the CAM in our manufacturing department being associatively linked to the CAD. But what if we want to machine parts with growing complexity, with the same or even increased demands for accuracy and quality?

To maintain profitability, customers rely on their manufacturing department to produce accurate, high-quality parts, in as short a time as possible. Manual rework, poor quality results, and missed delivery dates can have an adverse effect on the reputation of their business. Which is why Autodesk Fusion 360 has a range of advanced toolpath strategies to speed up part programming and improve the final output of their CNC machines.

For finish machining, the programming of feature rich, freeform parts, can be a time-consuming activity, experimenting with different toolpaths to get the right result. To help with this, Fusion 360 has steep and shallow machining (see *Figure 8*), a single toolpath strategy, combining the strengths of traditional 3D finishing toolpaths, by automatically detecting surface slopes and applying the appropriate strategy for each region.

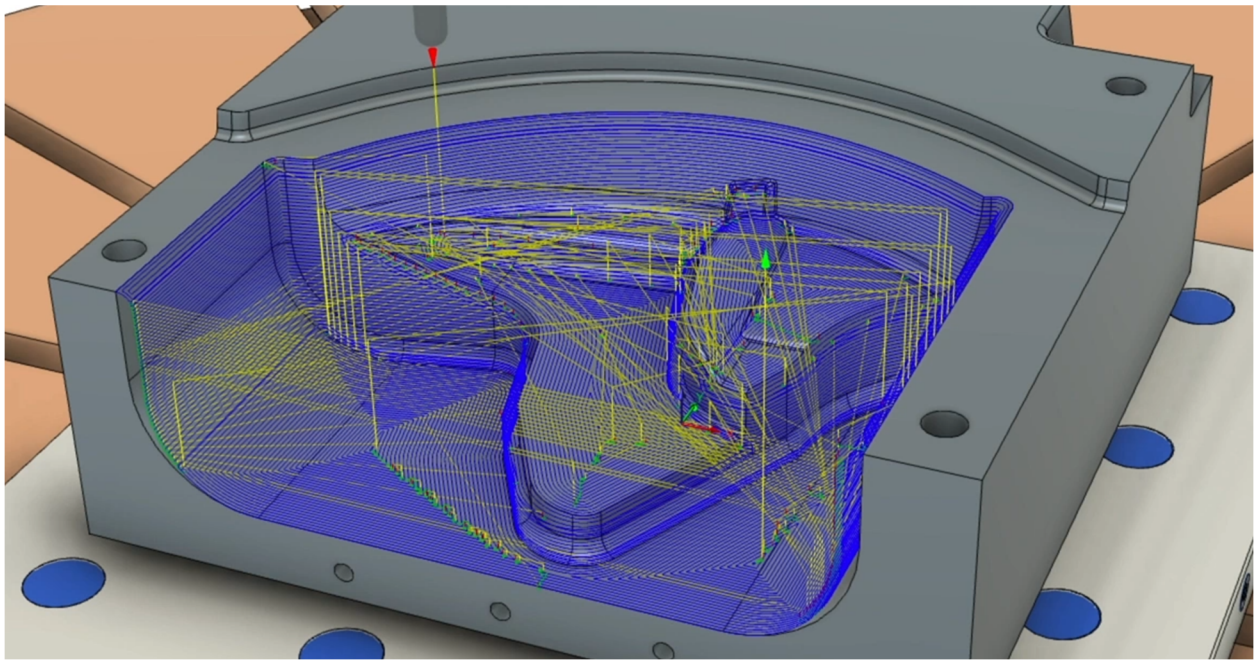

Figure 8 - Steep and Shallow Machining on a Mold Cavity

What's more, there are a wealth of options to control the output, such as the overlap distance to smooth out transitions between regions, the ability to choose the finishing strategy for shallow regions, as well as enabling continuous passes, and setting stepover and cut direction, in a single location.

Shallow regions have additional options to improve surface finish, and increase tool life. The direction of Parallel passes are automatically determined for each region, to minimize transitional moves, whilst the wall clearance option prevents tool marks being left on adjacent steep walls. For scallop passes, the smooth offsets option rounds-off sharp corners, improving machine motion, and reducing dwell marks on the finished part, with any corner cusps remaining being automatically detected and removed, further refining the final surface, and minimizing the need for manual polishing.

And with the ability to edit toolpaths without the need for full recalculation, Fusion 360 has the tools needed to produce accurate, high-quality parts, to maximize a manufacturing department's throughput.

How Might it Work in a Manufacturing Department?

Back in our manufacturing department then, we want Patrick to be responsible for machining our feature-rich designs. These designs only require a 3-axis machine, but in order for Patrick to machine these parts, he will need to utilize strategies such as steep and shallow, and have the ability to perform toolpath modification. Therefore he will need access to the Machining Extension.

It would also make sense for Carl to have access to the extension too, so that he is able to program the parts for Patrick's machine (see *Figure 9*).

Figure 9 - Machining Extension Added to Support Machining of New Designs

But there is no need for Patrick and Carl to install additional software. Once purchased, the machining extension is simply made available from within the Fusion 360 interface.

Multi-Axis CNC Machining

We have addressed complex feature-rich 3-axis parts, but what about multi-axis machining? As part complexity increases further, manufacturing departments are under constant pressure to deliver safe and reliable CNC machining programs.

Complex, high value parts often contain features and details which cannot be produced using 3-Axis machining alone. Which is why Autodesk Fusion 360 can create multi-axis operations, to fully utilize the capabilities of multi-axis machine tools.

The process begins by checking the part. Accessibility analysis shading (*Figure 10*) creates a quick, visual reference, indicating whether or not a part can be fully machined from a single direction. This speeds up the decision process, on how to orient and fixture parts, ready for machining.

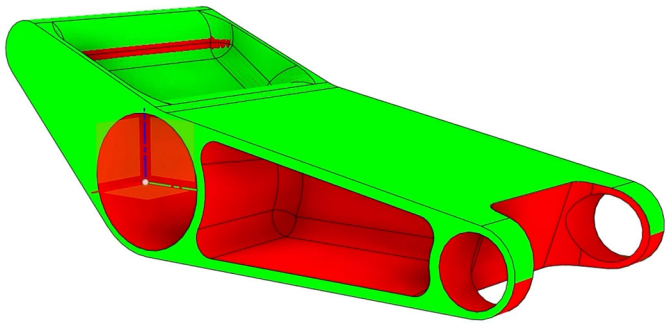

Figure 10 - Accessibilty Shading Indicating if a Part Can Be Machined from a Specific Direction

To reduce the cost of fixturing, and produce parts in fewer setups, multi-axis positional, such as 3+1 or 3+2 machining can be used. Toolpath directions can be rapidly selected and calculated, with efficient patterns and ordering options, for multi-part machining on tombstones.

To address 4-axis machining, such as a bolt-on 4th axis, or turn-mill machine, there is 4-axis rotary capability. This allows full 4-axis simultaneous machining of freeform shapes, with multiple pass options to best suit the geometry, and the ability to set angular limits and offset the tool, to improve cutting conditions.

For the most complex parts there is full simultaneous 5-axis programming, to allow the use of shorter, more rigid tools which reduce vibration and improve the surface quality of finishing operations.

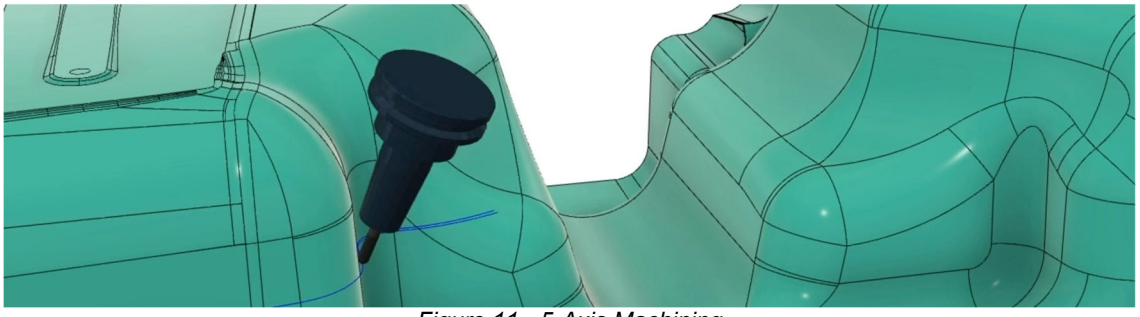

Figure 11 - 5-Axis Machining

A selection of toolpath options are available, with a range of tilting methods, such as lead, lag and sideways lean, to improve surface finish, as well the ability to cut with the side of the tool to take advantage of its full flute length.

Extending this further, Fusion 360 has automatic collision avoidance. Parts can be programmed using a primary tool direction, either vertical, or from and to a point or curve. In the event of a collision being detected, between the part and the tool or holder, the tool is automatically tilted away from the part removing the collision. This is enhanced with intelligent smoothing, to help avoid sudden and erratic machine motion, and tool axis limits to control how far the tool tilts.

And with the ability to simulate the toolpath to provide confidence in part programming, and access to a vast library of free, customizable postprocessors, Fusion 360 provides the tools manufacturing departments need, to deliver multi-axis parts.

How Might it Work in a Manufacturing Department?

Going back to our manufacturing department again, our latest design, is even more complex, and will require multi-axis machining.

Let's say we decide to sell Patrick's old Haas VF2 and upgrade his machine to a Haas UMC 5-Axis machine? Again it's simple, he continues to use Fusion 360 with the Machining Extension, but this time utilizing advanced multi-axis options such as automatic tool tilting, in combination with the steep and shallow toolpath he's already been using, to get the best out of his new machine.

And as our business grows, and we purchase new machines, and recruit new programmer/operators, we can add more licences of Fusion 360 and the Machining Extension, to cope with demand, utilizing the vast library of free postprocessors to address each new machine (see *Figure 12)*.

Figure 12 - Machining Extension Users for Multi-Axis Machining

Advanced CAM Automation

So how can we improve our processes further? One way is to use automation.

The responsibility of a manufacturing department to produce reliable parts, whilst minimizing time to market, is critical to the success of a business. Which is why Autodesk Fusion 360 offers a range of automated programming tools to enhance manufacturing processes, minimize waste and improve consistency.

Manufacturing productivity can be increased through the use of automated programming tools such as hole recognition (see *Figure 13)*.

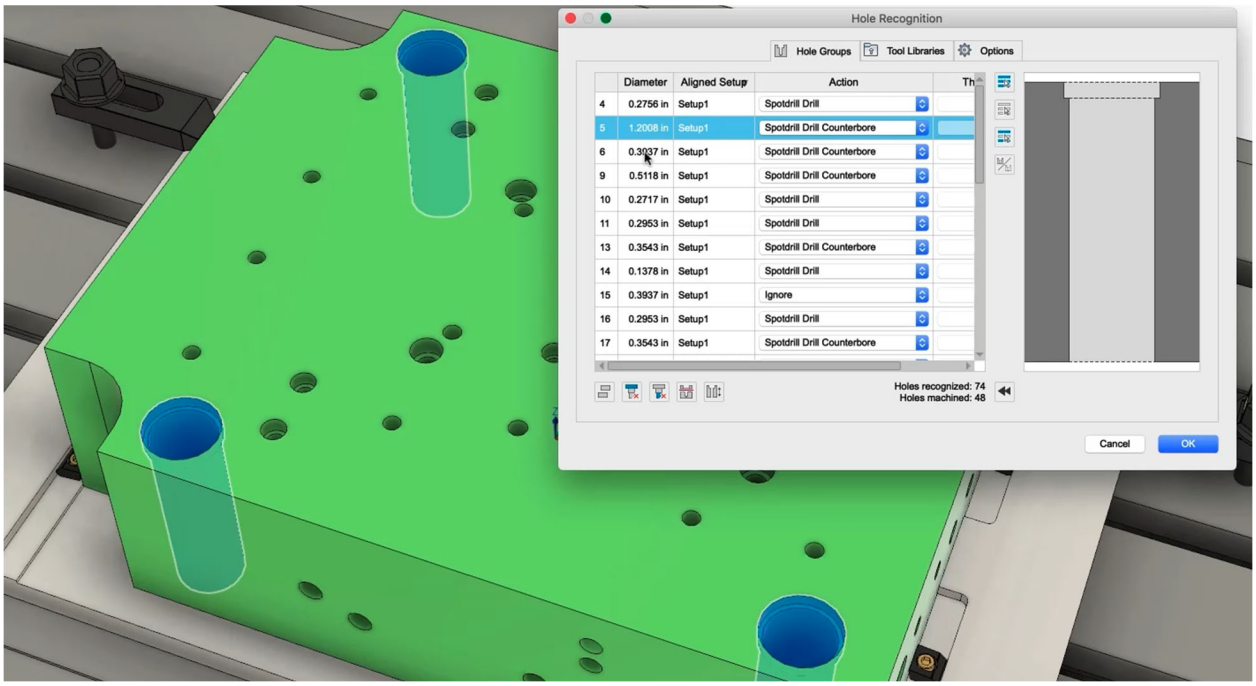

Figure 13 - Hole Recognition Can Speed Up Part Programming

Hole profiles can be detected and programmed automatically, automating decisions that would previously have been made manually. What's more, by automating, no matter who is programming, the resulting output can be the same, allowing flexible changeovers, improving result consistency and ultimately component reliability.

Toolpath operations such as Steep and Shallow, automate the finishing of freeform surfaces, automatically detecting the surface slope and applying the optimal strategy. And even when the part complexity increases, automatic collision avoidance can provide the control needed to machine parts utilizing the full 5-axis capability of CNC machines for better access, and using more rigid, shorter, tools for improved surface finish.

Manufacturing knowledge and best-practices can be stored as templates (see *Figure 14)*, and shared with an entire manufacturing department, helping less experienced members of the team to become more productive sooner, and improving programming consistency.

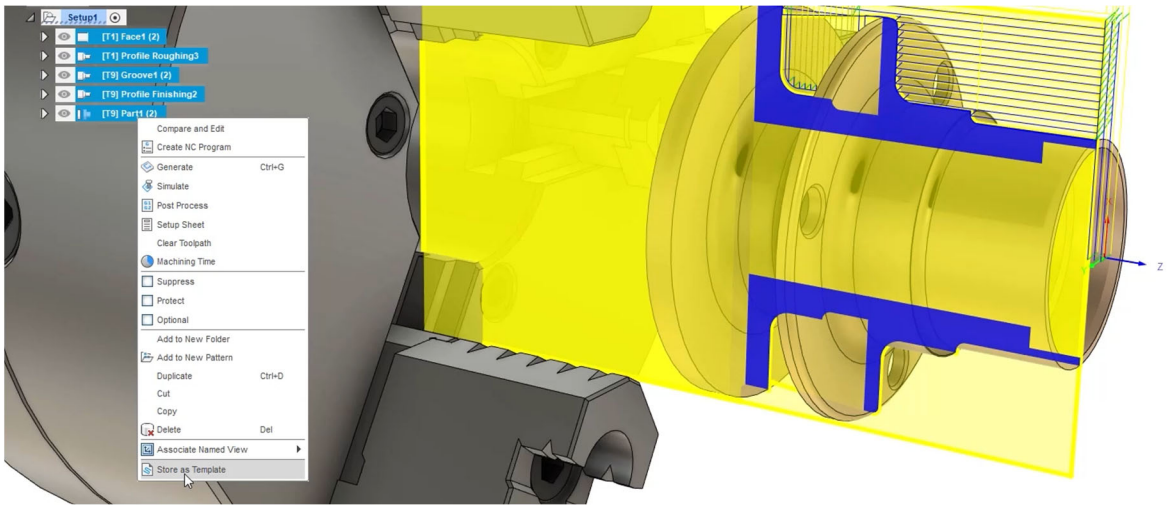

Figure 14 - Storing Toolpaths as Templates to be Used Later

And if a design department is also using Fusion 360, the integrated design and manufacturing environment means that programmers are automatically notified of new versions, allowing toolpaths to be quickly regenerated on the new design, lowering the costs associated with a design change, because the latest version of the design is always used.

By embracing automation in a manufacturing department, Fusion 360 can help customers achieve their production goals.

How Might it Work in a Manufacturing Department?

In our manufacturing department example, Sanjay has some machining projects that could be automated. Carl has programmed these sorts of parts before, so he is able to share his best practice with Sanjay, by providing him with pre-set templates to make programming these parts easier.

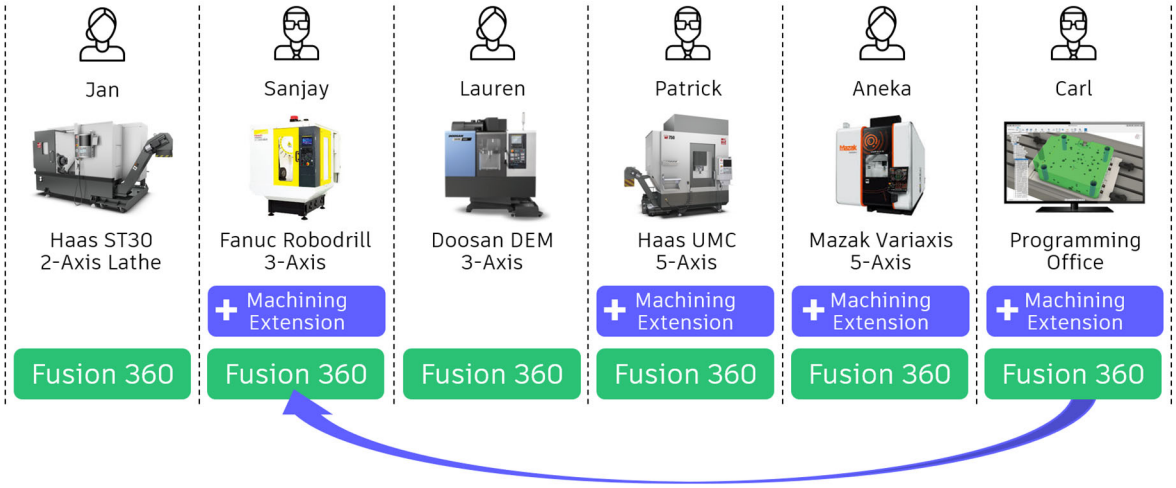

Figure 15 - Data Sharing and Additional Machining Extensions for Automation

In addition to this, Sanjay could also have the Machining Extension, to access the automatic hole recognition, to speed up the programming of his parts even further, and with flexible access, once the project is over, the Sanjay's extension can be switched off meaning our manufacturing department only pays for access to the technology it needs, at any given time.

Automated Setup and In-Cycle Process Control

So how can we take the principles of automation, and the need to fully utilize machine tools, to improve processes further?

Any area where a manual process is used, is an opportunity for the introduction of automation. The manual setup of a part is one such example, so one idea is to automate the part setup and add on-machine verification.

When we place our stock material, or our part processed component on the machine, we will obviously need to tell the machine where the work coordinate zero position is located, relative to what we want to machine.

This process is difficult to do manually, carefully jogging the machine, clocking the location in order to position as accurately as possible.

And because it is difficult, it is time consuming. The knock-on effect is that the machine is under-utilized, sat idle, and not cutting parts, which eats into profit margins.

And what if the part is taken off the machine, for example for in-process inspection, and further work, or rework is required? Then the part must be repositioned again, adding more time to the manufacturing process, with the issues of setting up manually being compounded further by the difficulty to repeat the previous setup process exactly. The result is that part accuracy suffers.

To combat this, spindle-mounted probes, can be utilized in Fusion 360, to perform automated setup and part verification processes. Fusion 360 provides in-cycle inspection capabilities (see *Figure* 16) using spindle mounted probes, to monitor and control the quality of CNC machining processes.

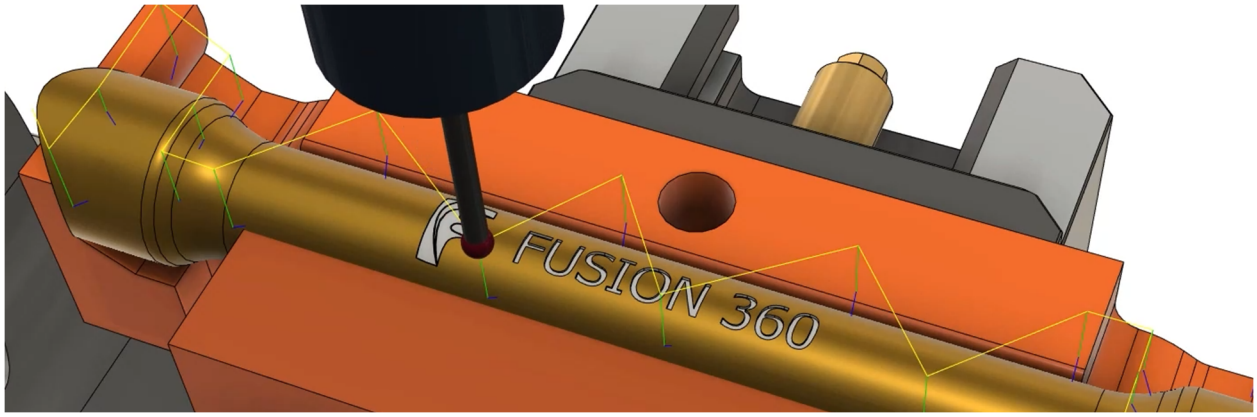

Figure 16 - Probing Simulation In Fusion 360

The integrated environment of Fusion 360 means that part setup, programming, and verification on the machine, are unified into a single user experience, letting you quickly and accurately setup and check, stock material, part-processed components and finished parts on the machine, and create the required toolpaths, without leaving the Fusion 360 environment.

Measurement and alignment sequences are created offline, with the ability to inspect freeform surfaces, and probe geometry such as bores and faces, to verify the accuracy, dimensions and positions of critical features and surfaces.

For part setup, the measurement sequence is postprocessed as NC code, and then run on the machine (see *Figure 17*), the results from which are read back into Fusion 360 to automatically generate a part alignment, which is then used for all following operations. This is especially useful for irregular, non-prismatic parts, like castings or 3D printed parts, which are difficult to locate manually, and larger, heavier parts, which are difficult to maneuver.

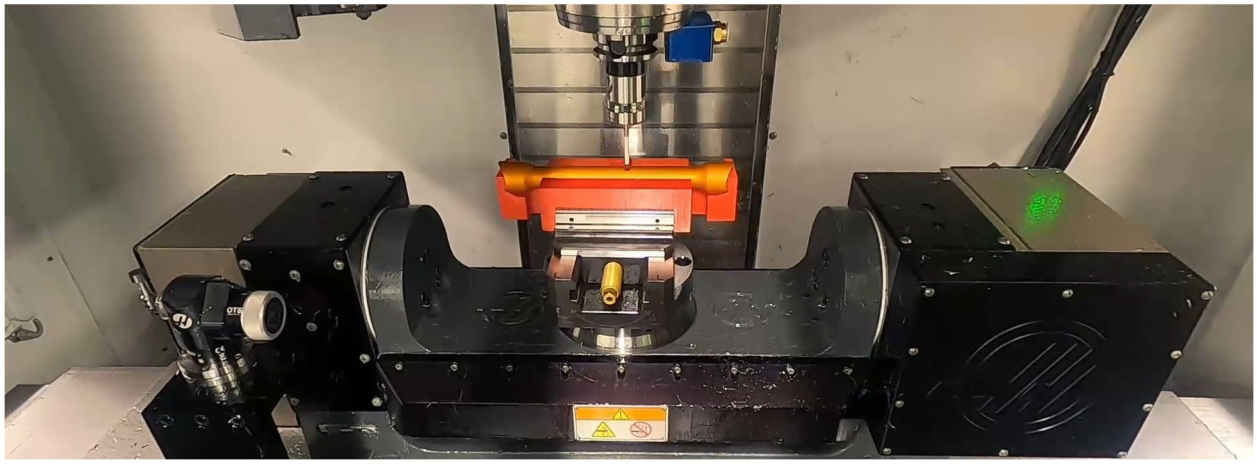

Figure 17 - Part Setup Probing on a CNC Machine Tool

The same technology is also used for part verification, without taking the part off the machine. This allows part accuracy to be checked before moving to subsequent processes or final inspection. Unexpected variation can be detected and remedied immediately, minimizing costs and improving efficiency.

By using Fusion 360 as an integrated solution for design, manufacturing, and part setup and verification, non-productive operations can be removed, to start machining quicker, and realize the full potential of a manufacturing department.

How Might it Work in a Manufacturing Department?

In our manufacturing department example, Lauren has a short term project to machine some castings. The nature of these parts means they are not easy to locate on the machine manually.

She has been using a spindle mounted probe, for locating her work coordinate system on prismatic parts with the core functionality in Fusion 360, and now needs more advanced probing capabilities to position the castings on the machine.

Again she can utilize the Machining Extension, to access the surface probing function, to allow her to perform part alignments (*Figure 18*).

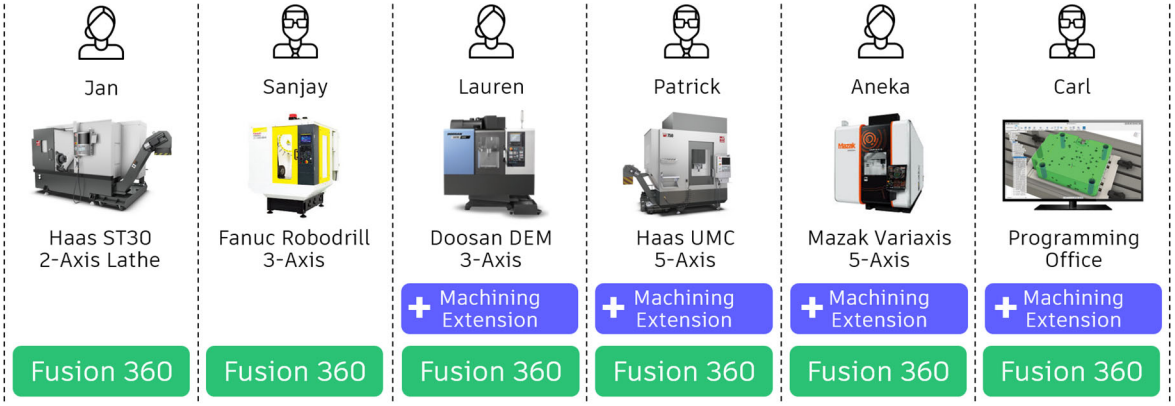

Figure 18 - Machining Extension Added to Setup Castings Using Probing

And because of the flexible access, just as with the previous example, once the short term project is over, the extension can be switched off, again meaning our manufacturing department only pays for access to the technology it needs at that time.

Cloud-Based Collaboration

The final area for discussion is cloud-based collaboration. A collaborative environment makes it easier to communicate faster, speeding up the communication between designers, engineers and machine operators.

This is the glue that holds everything together, from sharing data and best practices, to communicating design revisions to the manufacturing team.

A manufacturing department is just one part of a larger business, so it is important that this team can collaborate both easily within itself, as well as the wider organization. Fortunately, Autodesk Fusion 360 was built to support flexible and dynamic collaboration workflows, through the utilization of a cloud infrastructure.

When a design department releases the latest design, the manufacturing department can get to work, quickly accessing model data from the cloud to prepare and program for manufacture. Programmed toolpaths and fixtures are stored on the cloud too, along with tools, postprocessors, setup sheets and even NC code, allowing easy access to the data a team needs to work effectively and efficiently.

Data can be accessed from anywhere, from PC, Mac or mobile, and shared through team access (see *Figure 19*), or through simple links, with download and password options, allowing full control of data access.

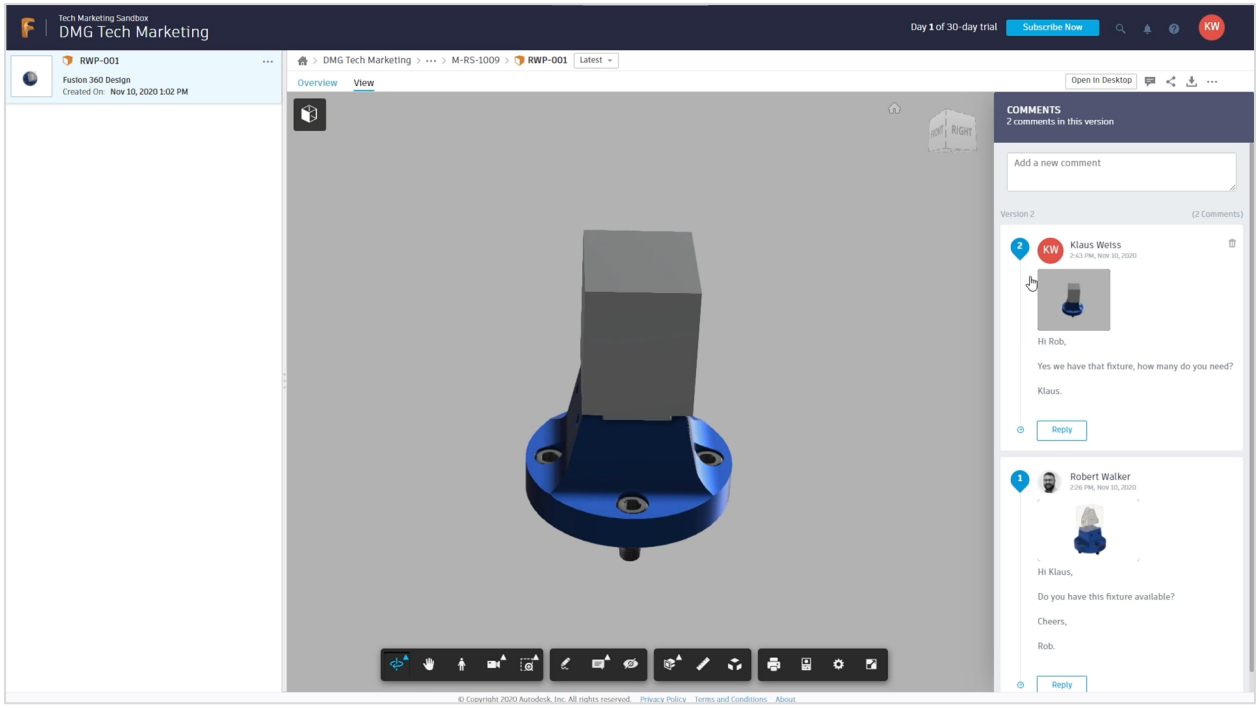

Figure 19 - Data Access and Collaboration Through Fusion Team

And since the data is hosted in the cloud, external collaborators, can be given secure access too, using Fusion 360 Team Participant to upload, download, view, markup and collaborate on projects. This seamless collaboration streamlines project management, allowing issues to be quickly addressed, improving communication and helping to avoid costly delays. This ultimately improves the level of service users can provide to their customers, increasing the likelihood of repeat business.

And because everything is hosted on the cloud, everyone is working the latest data. Programmers can share setup sheets with operators, operators can update cloud tool libraries for programmers. Designers can communicate design changes to programmers, and assembly teams can receive instructions on fixture assembly, all quickly and easily.

By using Fusion 360, and Fusion 360 Team Participant, seamless collaboration workflows can be unlocked, to keep teams connected, whether they're across the hall, or across the world.

How Might it Work in a Manufacturing Department?

Linking everything together then, is the data at the centre, where everyone is connected through Fusion Team (see *Figure 20*).

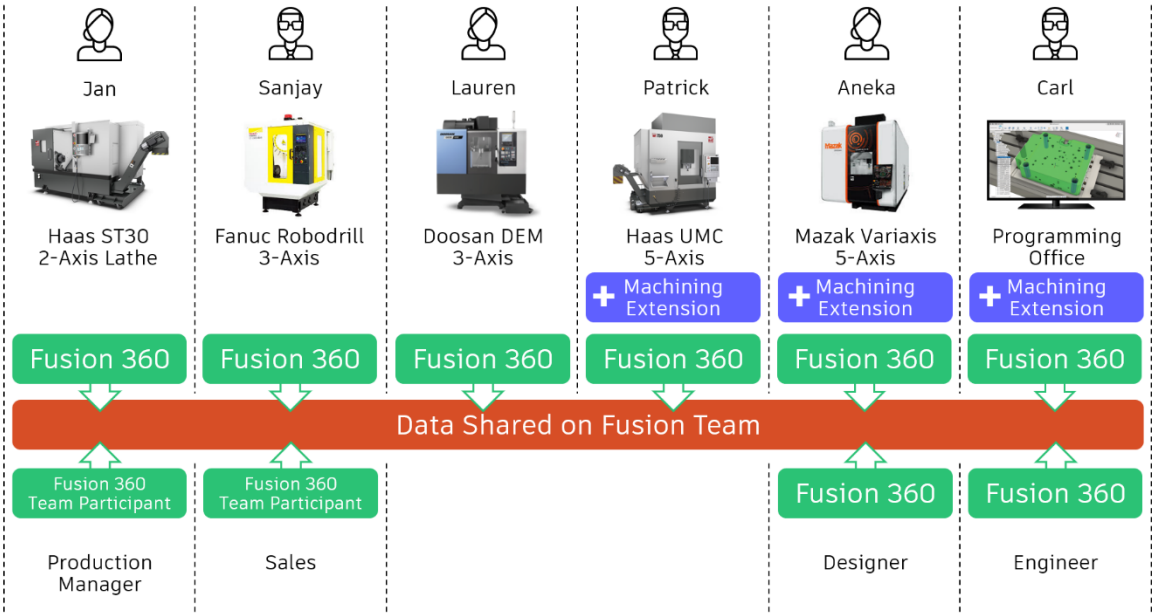

Figure 20 - Everyone Connected Through Fusion Team

This means that regardless of whether our Manufacturing Department team members use the Machining Extension or not, they can all access the same data on the cloud letting them collaborate and share things such as tool libraries, fixture assemblies, setup sheets and more. And it is this mechanism that is used, for example by Carl, when he shares projects, and programming templates with the other programmer/operators.

Summary

Summarizing then, we have seen how there are 5 key challenges that can be solved with the application of the right software in a manufacturing department, to achieve your business outcomes.

And of course, there is more to this story than just manufacturing. Fusion 360 re-imagines the product development process and provides people with access to their data in a connected, flexible, and seamless way. We're bringing together technology that's previously been delivered separately. We're investing rapidly in intelligent means of automation, and we've architected the software for collaboration as a natural part of design and manufacturing.

This let's you work in new ways with the next generation workflows available in Fusion 360.

Want to Know More?

If you want to learn more about Fusion 360 for manufacturing department, then visit our dedicated Manufacturing Departments page (*Figure 21*), and see how Fusion 360 can help your manufacturing teams be more productive today, and how Fusion 360 can support your business as it innovates and grows in future.

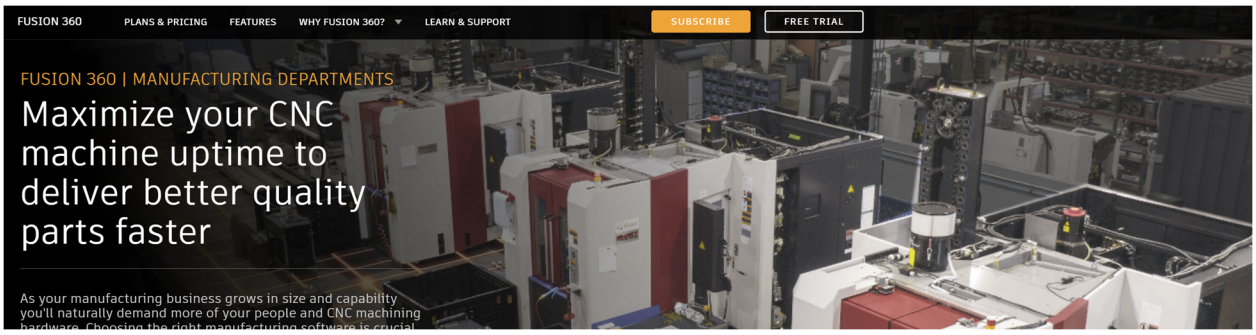

Figure 21 - The Manufacturing Departments Page