SYMETRI
ADDNODE GROUP

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Manufacturing

WHITE PAPER

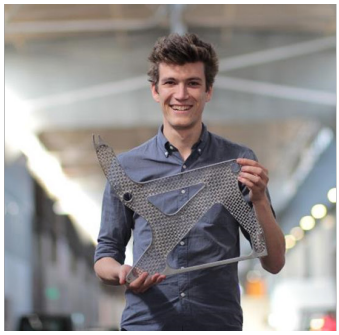
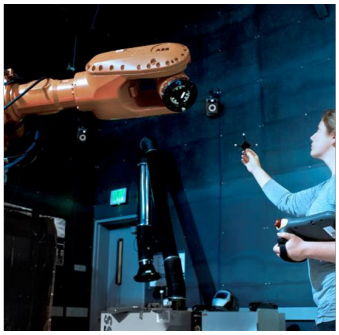
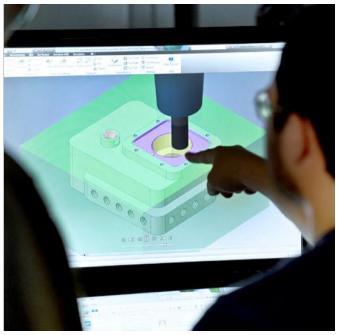
Product Design and Manufacturing Collection

Benefits of moving from individual products to a collection

Product Design and Manufacturing Collection

Introduction

This topic is more than just a buying decision of one product vs. many. Therefore, the best place to start is to consider how we have reached this point. For several years now Autodesk have communicated a message, “The Future of Making.” But what does this mean to you and what makes it so important? Well, many of the products coming to market today are forcing us all to change the way we conceive them, engineer them, and manufacture them. Although “Future” is stated, this is already happening, so it is just as much about now as it is about the “Future.”

As always, there are industry trends that are having an impact on each businesses concept and design approach, along with the increasing amount of data we all create and consume in tackling these changes. All these things combined have a large influence on the way we get from an initial product idea to getting it in to the hands of consumers.

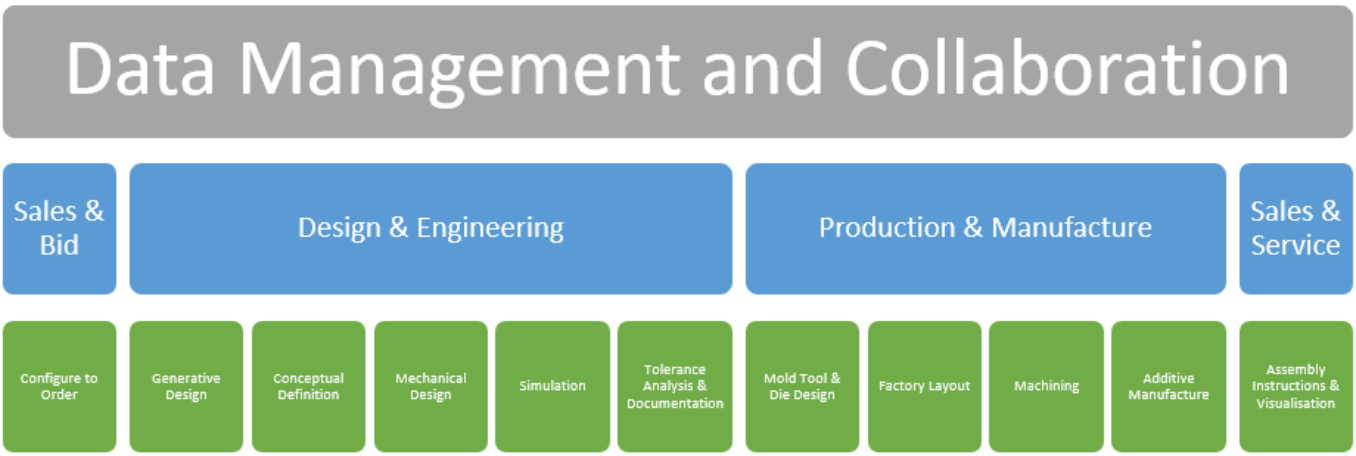
Current industry trends we consider to be important include:

- Connected Data and Cloud Collaboration - Now, more than ever, product development relies on keeping teams and data connected across all departments and locations. Helping to manage processes, projects, and people to drive efficient operations across your supply chain.
- Advanced Manufacturing - The use of innovative technologies and methodologies for improved competitiveness in the manufacturing sectors. Advanced manufacturing involves versatile production methods that fully utilise capital plant and are more efficient, effective, and responsive.
- Generative Design - Designers or engineers input design goals into the generative design software, along with parameters such as performance or spatial requirements, materials, manufacturing methods, and cost constraints. The software explores all the possible permutations of a solution, quickly generating design alternatives. It tests and learns from each iteration of what works and what doesn’t.

These trends and influences bring with them different challenges for each business; such as those looking for ways to innovate, but struggle to find the time. Businesses looking for improved product performance which can only be found from a fuller understanding of designs in advance of production and in the hands of consumers. Those trying to make the most of production capacity and alleviating potential process bottlenecks, all whilst looking to maximise ways to win new business, along with increased recurring business.

If we review all the potential divisions a manufacturing company might contain and operate, you start to understand that this is more than just a single task to create a Mechanical Design or 2D drawing or simulation.

Product Design and Manufacturing Collection



Each of these different business functions will have different requirements/outcomes, along with different personas operating with them. This in turn will generate different application requirements for any supporting software deployed into the business. One constant pivotable factor for most businesses, will be a centralised data management and collaboration solution, connecting all departments. Providing everyone with a single source of truth and the right information, at the right time.

If we review how Autodesk's technology (from the Product Design and Manufacturing Collection) is spread throughout these divisions, you start to quickly see that an individual product (for example AutoCAD) only lets you capitalise within a very limited area of the overall business. This leads to a disconnected product workflow and inherently reduced productivity.

Autodesk created the Industry Collections, combining various connected technologies which allow deeper and wider impact on a business within a chosen industry marketplace. Whilst providing a simpler procurement process and taking the guess work out of deciding which application to use for which division/task.

What can an Industry Collection offer?

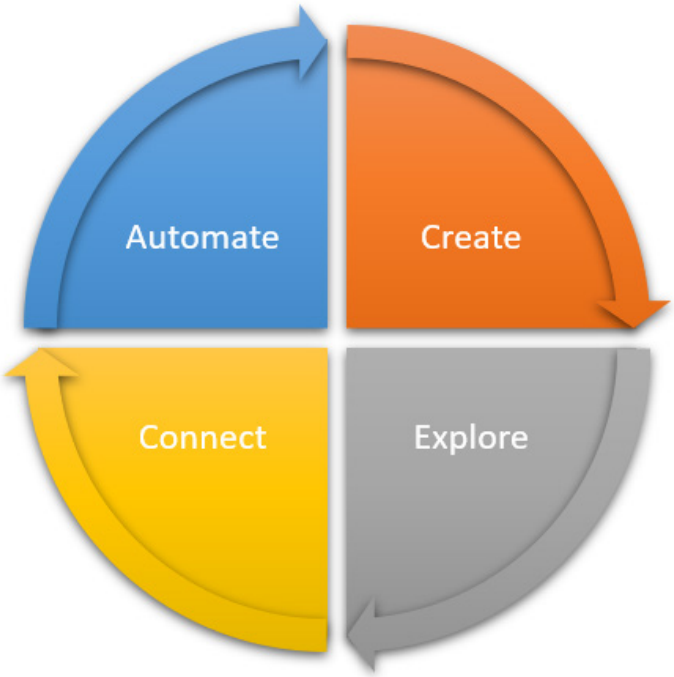
Autodesk currently offers three industry Collections, each with a focus on different market sectors:

- Product Design and Manufacturing Collection
- Architecture, Engineering and Construction Collection
- Media and Entertainment Collection

In this paper, we are focusing on the Manufacturing industry sector and therefore the Product Design and Manufacturing Collection.

Product Design and Manufacturing Collection

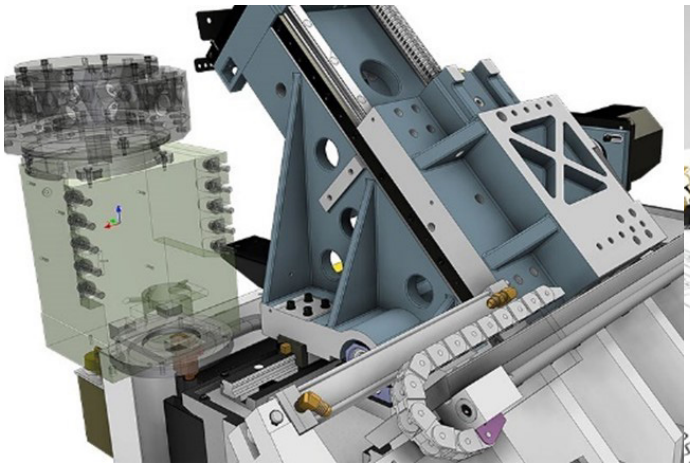
This Collection presents a solution, which spans across a design and manufacturing business. Including tools to help you design, simulate, assess tolerances, nesting, CAM and factory layout. Whilst all data produced can be stored centrally and managed within in a secure project. It is this compilation of technologies, which can enable your business to connect on a single design platform, automate processes and accelerate production. The Product Design and Manufacturing Collection gives you the power to:

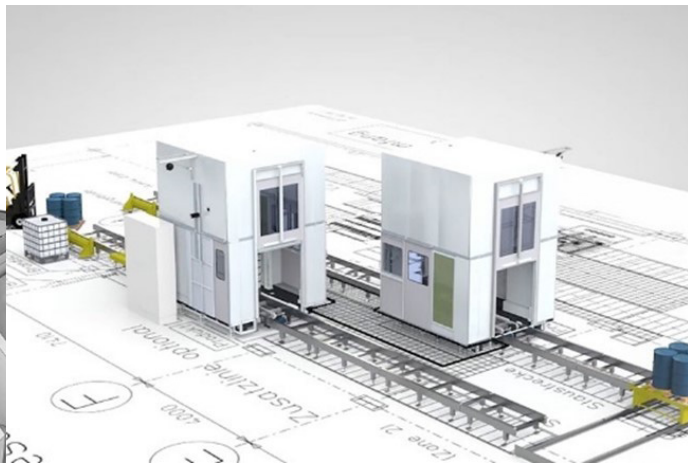


At this point, it would be worth us diving into each of these four areas to demonstrate the value each can bring to the overall connected solution a collection is looking to provide.

Create

Perhaps a more obvious topic and one that each individual application can provide on its own. However, the Product Design and Manufacturing Collection is designed to provide creation across several business departments. Within Design and Engineering, there is the ability to create anything from a single component to large/complex assemblies. Intuitively model and document your products with professional grade 3D parametric design capabilities alongside 2D drafting toolsets. Regarding production line layout, the Product Design and Manufacturing Collection provides the ability to conceptualise production line layouts using familiar 2D workflows that can be automatically converted into detailed 3D models, helping to inform critical design decisions.



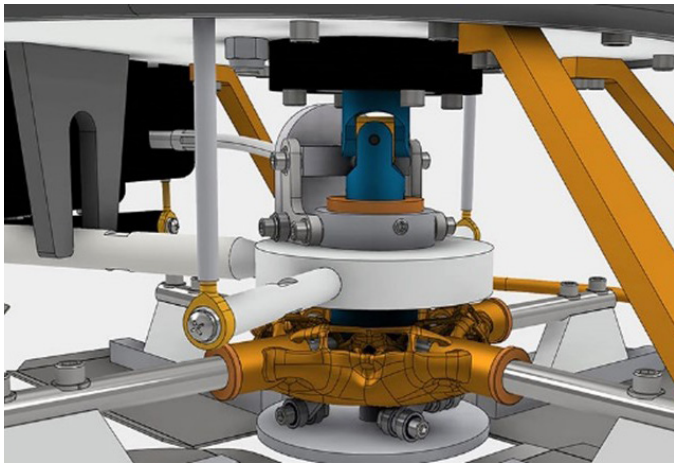


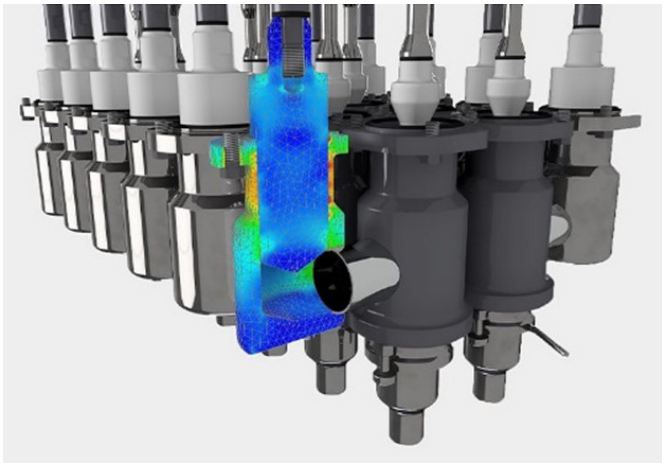
Product Design and Manufacturing Collection

Communicate your ideas with stunning visualisations and clear communication of designs generated directly from your 3D data for use in design reviews, documentation, and marketing collateral. Streamline your move to manufacturing by creating efficient processes that help you seamlessly transition from design to manufacturing with integrated tools for generating multi-axis toolpaths and sheet metal nests.

Explore

Consider all design alternatives with Generative Design capabilities. Giving you the ability to create multiple, production-ready design options and review trade-offs in materials, performance, cost, and manufacturing processes. Push the boundaries for better products, extending product capabilities, improved efficiency and failure prevention with advanced performance simulation built around an industry recognised solver in Nastran.

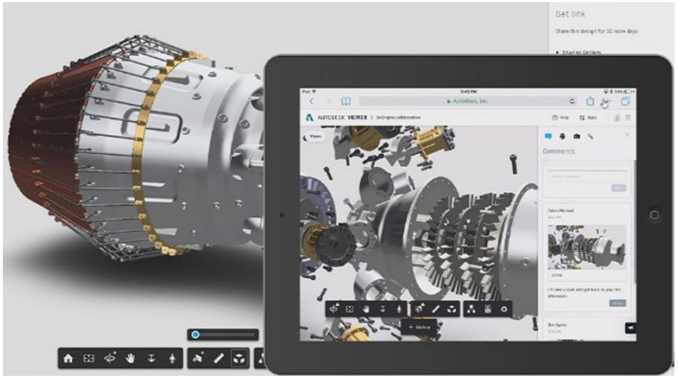




Evaluate factory projects before you build, helping to remove bottlenecks in the process with discrete-event simulation capabilities and in the installation using clash detection between the as-is state and proposed production line designs. Evaluate the cost of dimensional variation, by balancing mechanical fit and performance with the cost of tighter tolerances based on an analysis of the cumulative dimensional variation between mating geometry.

Connect

Connect your 2D and 3D design tasks by combining the capabilities of industry leading 2D and 3D CAD. Allowing the integration of electromechanical models, conceptualise designs and speed up the creation of drawings and documentation. Manage all that data in less time, with control of your intellectual property in a single location, making it easy to collaborate with your colleagues. Securely share data externally to simplify and speed up review cycles.

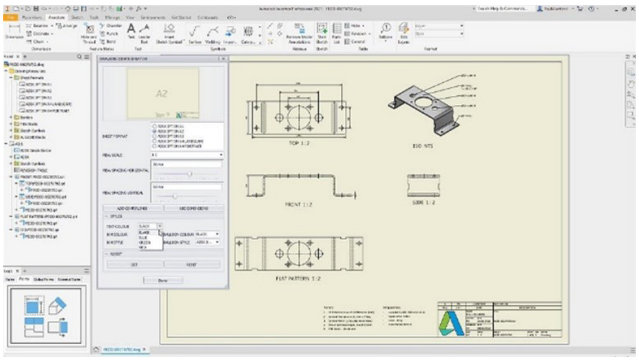


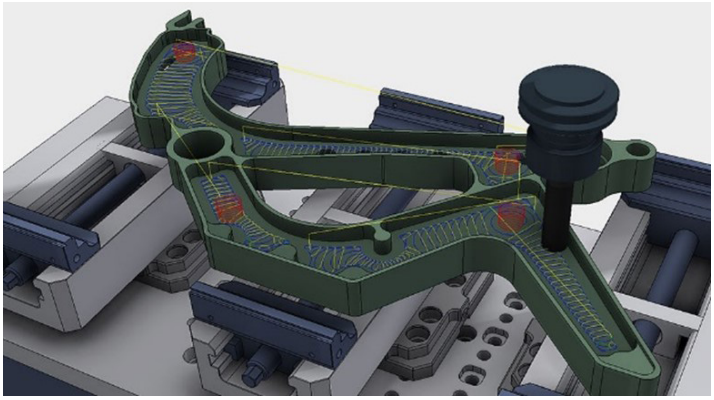
Product Design and Manufacturing Collection

Speak the many dialects of CAD and BIM with reference models created in other CAD or BIM applications that update any time the original files are changed. Prepare BIM objects of your product models for delivery to your clients. Aggregate design data from multiple sources to collaborate and review effectively on large-scale design projects. Check for clashes, simulate installation and centralise communication between stakeholders.

Automate

Create a customised product configurator using a powerful, simple-to-use automation engine that captures engineering knowledge, preserving your time for value-added projects. Make compliance automatic for the team using automatic templates for parts, assemblies, and drawings to reduce errors, save time and make it easy to follow company standards.

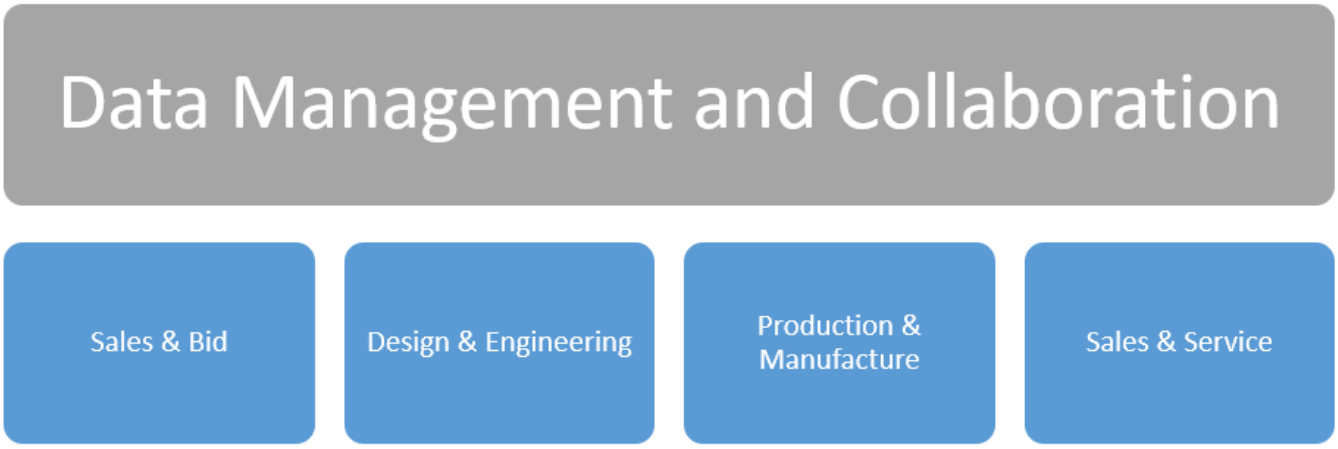




Accelerate design validation and manufacturing by automating routine tasks involved in simulation setup in Inventor Nastran and toolpath strategies in Inventor CAM. Generate multiple sheet nests to reduce raw material waste and produce comparison reports to review overall efficiency, total cost, and machining time.

What technologies are included?

If we return to our initial example of a manufacturing company and the breakdown of key operational areas, it will look like the below image. We not only want to provide digital toolsets and improvements across these different functions, but also connect the data and users throughout the whole process. Leading to the creation and exploration of better products for both the business and the end consumer.

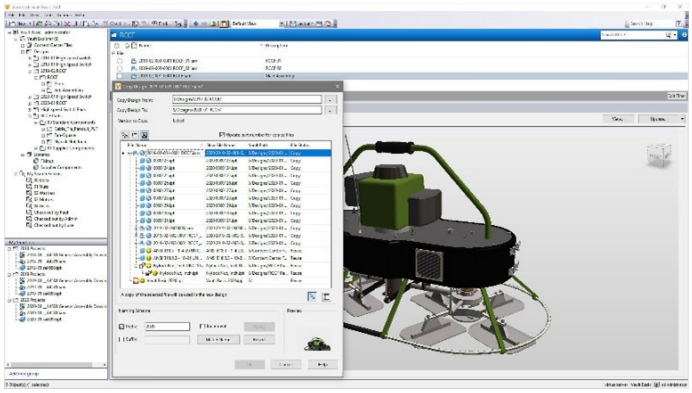


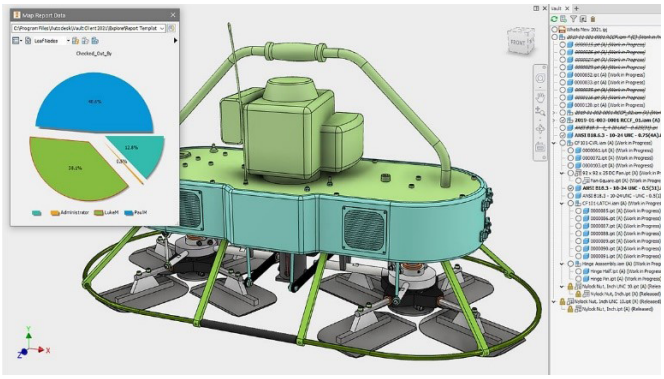
Let us look at each of these operational areas and drill into the particulars of each to evaluate the technologies and benefits the Product Design and Manufacturing Collection can bring.

Product Design and Manufacturing Collection

Data Management and Collaboration

Vault is a product data management (PDM) software that improves productivity, management, and collaboration throughout a business. Allowing everyone to work from a central source of organised data, leading to better collaboration, reduced errors and time saving. Installation is vastly simplified, when compared with alternative solutions and easy to administer. Directly integrating into the Autodesk design tools, such as Inventor and AutoCAD. Offering a saleable solution, with the ability to connect both internal and external teams.



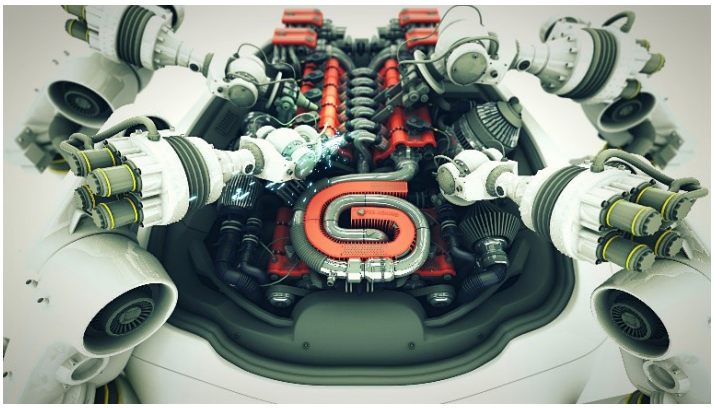


Included within the Product Design and Manufacturing Collection is Vault Basic. Although this is the entry level version from Autodesk, it still presents a massive up lift from typical storage of data within a Windows environment (for example saving data to a Network Shared folder). Speed up your product development through intelligent search tools, quickly finding and reusing data when you need it, reducing the need to start from scratch. Track changes and design history automatically as you work. Be secure in the knowledge that only one user can work on one file at any one time. All of this with the added benefit that you have full control of what data people can access and edit based on their roles and projects.

Should you require further control and greater flexibility of your data throughout the business, then Autodesk offer two additional levels of Vault; Workgroup and Professional. Both extend the toolset to cover various other areas businesses need help with, from document revision to Bill of Material (BOM) and Parts list management.

Sales & Bid

Screen captures of models are helpful to understand what the product looks like. Everyone knows it is better than a 2D drawing. But what if you need an image that is going to show off your product to your customers. Simply displaying textures, lighting and shadows are not going to be enough to remain competitive. You need a software application that is 100% purpose built for compiling visual effects, whether it is a rendered image or cinematic quality video.

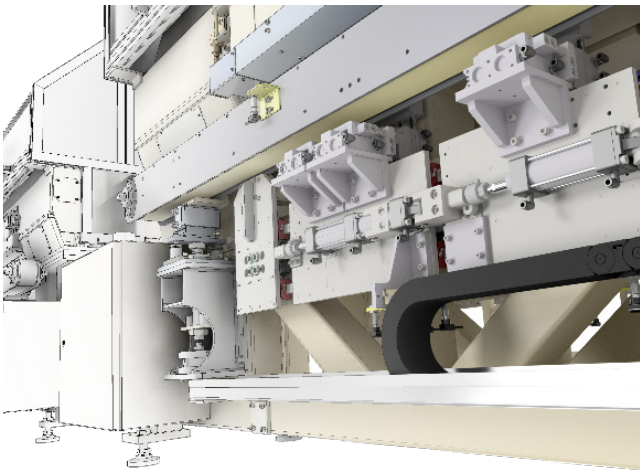


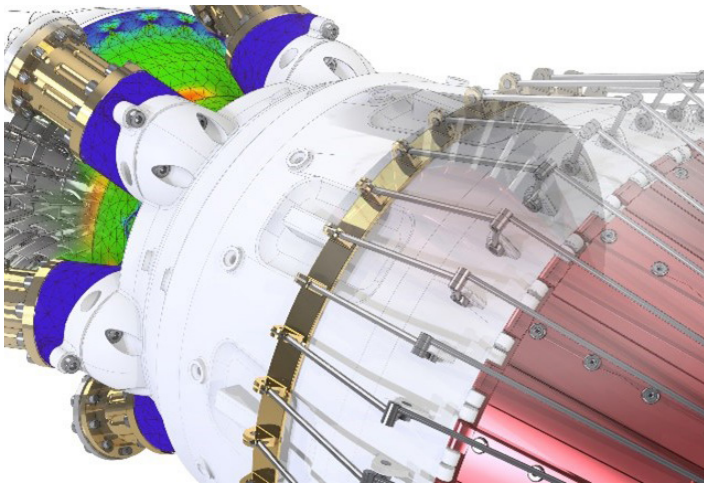
Product Design and Manufacturing Collection

So, that is why we have Autodesk 3ds Max as part of the Product Design and Manufacturing Collection. This industry leading application offers a rich and flexible toolset to create premium designs with full artistic control. Giving your sales and marketing teams access to high-quality rendering, finely detailed interiors/objects, along with the ability to bring characters and features to life with animation and VFX. With Autodesk's Arnold renderer built in, you are provided with a fully interactive experience, which can handle your most complex characters and scenes. Save time with an artist-friendly UI, intuitive controls and render previews while you work and iterate quickly. Produce high-quality renders, faster.

Design and Engineering

The concept and design of your products begins with professional grade 2D and 3D CAD. Providing flexible modelling tools for both parametric and freeform design changes. Automated tools for specialised model types such as sheet metal, structural frames, and mould creation. Whilst helping to reduce repetitive tasks and quickly reconfigure parts and assemblies through design automation. Maintain an associative link to files from other CAD systems as you work using AnyCAD technology. If your market sector requires it, gain access to tools for the creation and authoring of BIM objects and custom architectural fabrication.



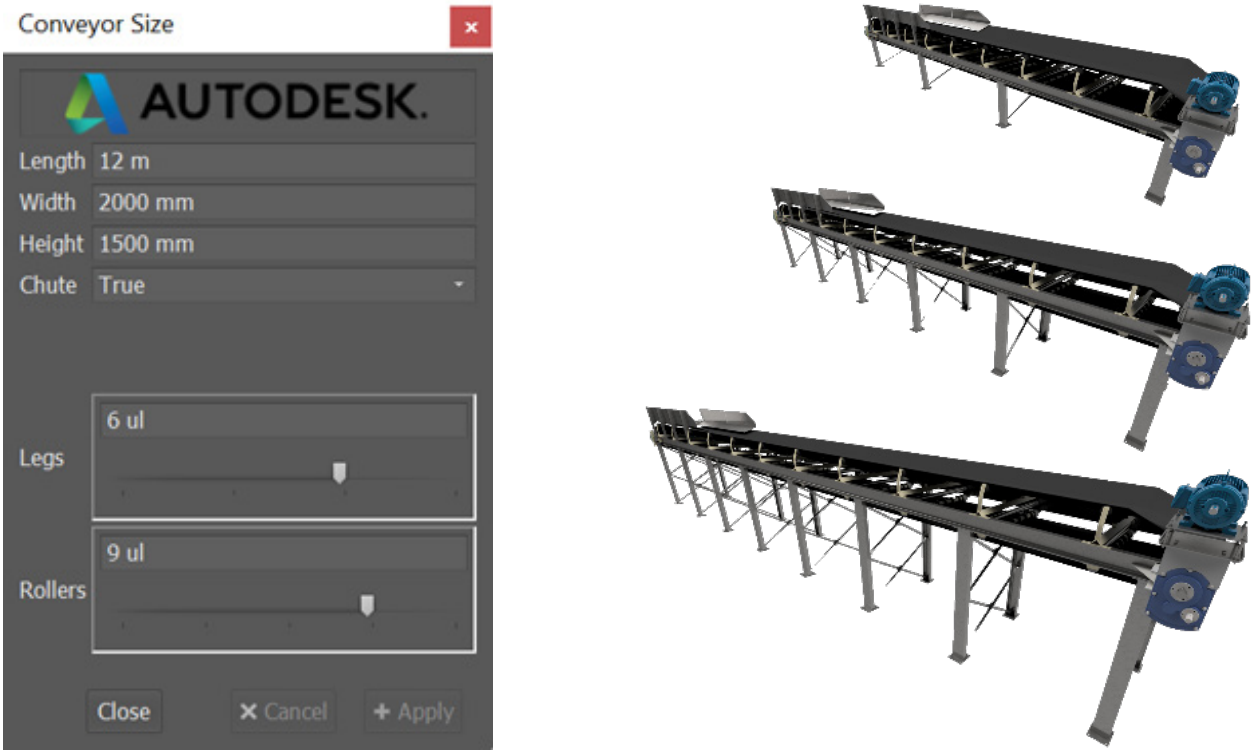


With the Product Design and Manufacturing Collection you will have access to both Autodesk Inventor and Autodesk AutoCAD (with specialised toolsets). While most 3D CAD software providers encourage companies to "make the move" from 2D to 3D, in many instances the best solution is a combination of both. 3D parametric CAD is proven to improve overall engineering productivity. Continuing to use 2D draughting for specific use cases with an associative connection between modeling paradigms means you can use whatever tool is best suited for the job at hand. While still benefiting from downstream use cases of 3D models like digital simulation, visualisation, and preparation for manufacturing.

The professional grade parametric and freeform modeling tools in Autodesk Inventor will help you to design anything. More than that, it contains a large library of standard components (currently 1.2 million) and component generators, so you do not have to take the time to create every part for your assemblies. Also, using the handbooks and calculators inside Inventor, lessens the need to leave the application to gather the engineering data you are searching for.

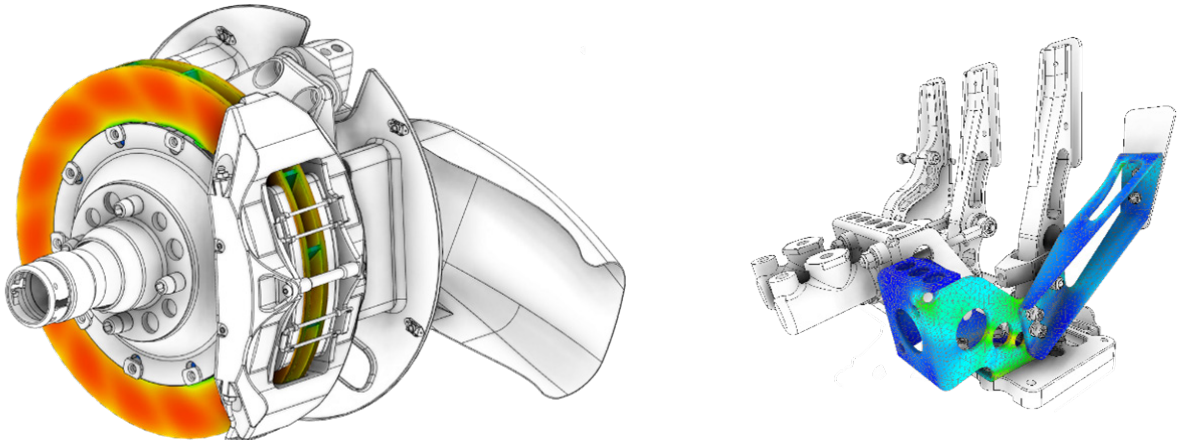
Rules-based design with Autodesk Inventor iLogic presents a powerful and effective way to save on time. Define the rules to quickly reconfigure your designs to meet the demands from your customers for the customisation of your products. Reduce time-consuming repetitive tasks and reuse existing components for future projects. Produce accurate quotes that are driven by the rules you have established in iLogic. Win more business from your customers as you get the design to manufacturing and out the door faster.

Product Design and Manufacturing Collection



How are you communicating with your design teams internally or with your customers? Autodesk Shared Views enables you to easily collect work-in-progress feedback from anyone, anywhere, on any device. Use the view orientation tools to review the design, explode assemblies, measure, section and redline. This functionality is directly accessed within your CAD application, meaning a simple and streamlined process is in place to collaborate quickly with others.

Most 3D CAD software today includes some entry level stress analysis (or FEA) studies that you can use to solve for stress and deflection. But are you getting all the information you need for your design? Are those results telling the entire story? Autodesk Inventor Nastran offers advanced simulation studies that are set up, solved, and observed all without leaving the familiarity of the Autodesk Inventor interface. Nonlinear, thermal, fatigue, vibration and dynamic studies offer a complete understanding of your product performance with accurate results. The technology is powered by the widely accepted industry standard Autodesk Nastran solver.



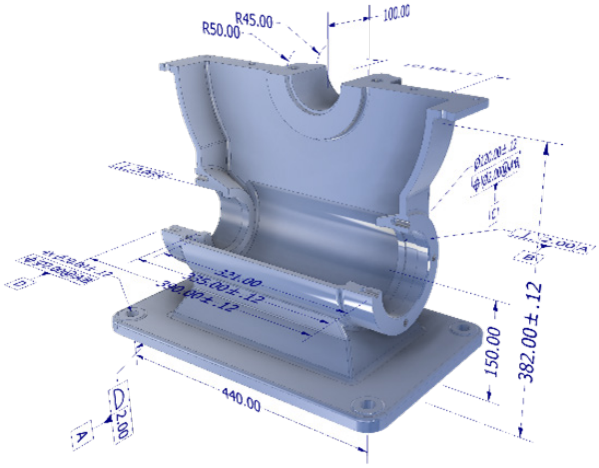
Effective collaboration between mechanical and electrical engineering teams can be challenging. But what if electrical and mechanical designs could talk to each other? What if they were synced with each other? What kind of an impact would that have on your current engineering workflow? That is electromechanical design between Autodesk Inventor and Autodesk AutoCAD Electrical. Share up-to-date information between your electrical schematics and your Autodesk Inventor 3D models.

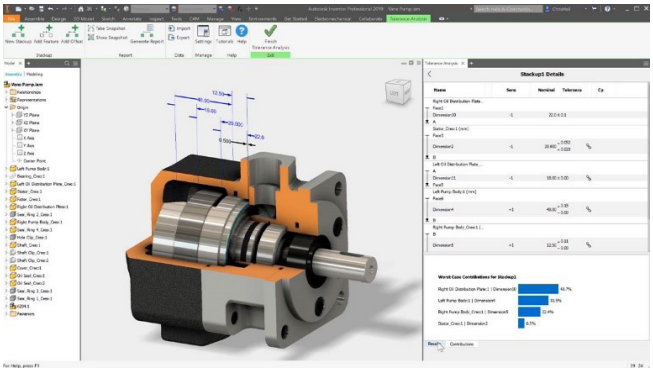
Product Design and Manufacturing Collection

Production & Manufacture

The Product Design and Manufacturing Collection provides a full set of documentation tools to get accurate information to the shop floor, whether it is in the form of a 2D drawing or 3D model. There is a growing demand for engineering organisations to get design data to manufacturing more efficiently. Autodesk Inventor provides model-based definition for including all the necessary fabrication instructions directly within the 3D model. This helps reduce the need for a traditional 2D drawing used by CNC programmers for tolerances and surface finish on the design.

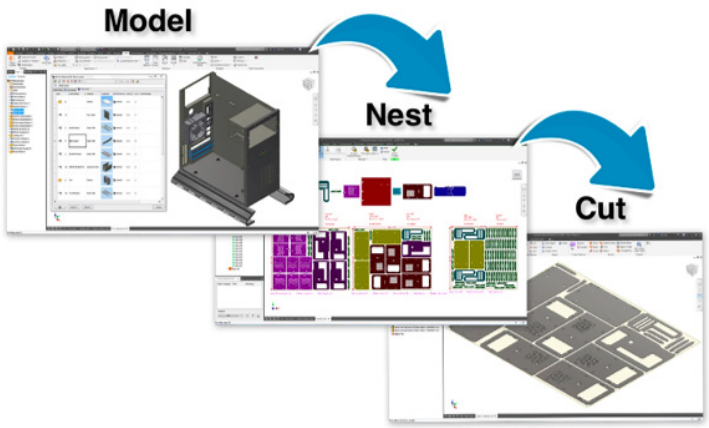
There is a sense of accomplishment when your assemblies fit perfectly, but at what cost? Manufacturing tolerances have a significant impact on cost and quality. Are you spending too much time and money on an unnecessary high-quality finish? Or is the tolerance stack-up preventing your assemblies from fitting together? Autodesk Inventor, Tolerance Analysis is designed to help Inventor users make informed decisions while specifying manufacturing tolerances. The toolset is directly embedded within Autodesk Inventor, providing 1D tolerance analysis that helps understand the impact of mechanical fit and performance based on cumulative dimensional variation.





An important toolset for Production and Manufacturing is Autodesk Inventor CAM, which provides a seamless workflow from design to manufacturing. Fully integrated into Autodesk Inventor enables users to turn their ideas into machined parts using a single, familiar interface. Current functionality allows for 2.5 to 5 axis machining, as well as lathe and mill-turn applications. Advanced toolpaths like Adaptive Clearing enable shorter mill times while simultaneously extending tool life.

Alongside the CAM tools, there is also access to Autodesk Inventor Nesting, designed to help optimise yield from raw material. Autodesk Inventor Nesting works directly inside Inventor, so nesting studies can be created and then updated to reflect any changes to the design. Easily compare nesting studies to optimise efficiency and reduce costs and then use Autodesk Inventor CAM for cutting path generation.

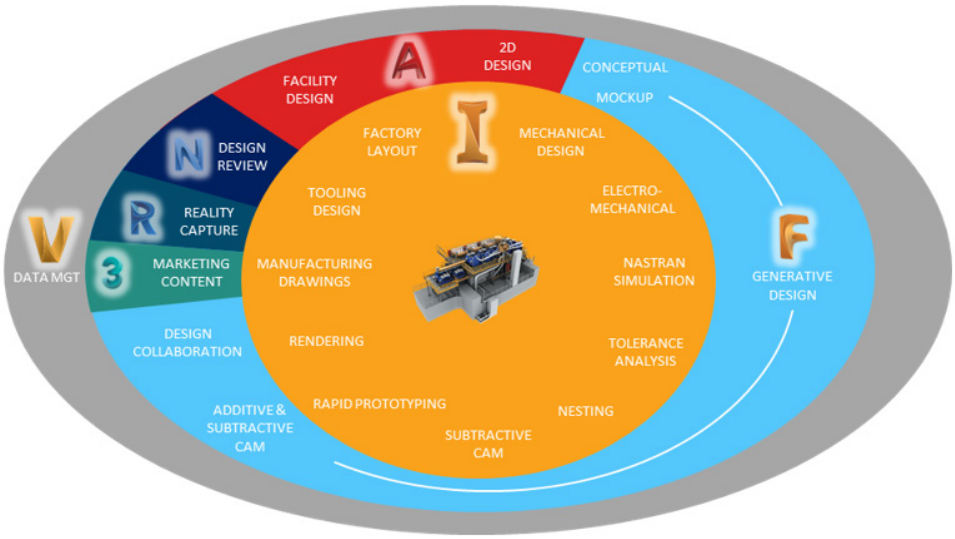


Product Design and Manufacturing Collection

Coming up with a great product design is just the beginning. Now it is time to make it in the most efficient way possible. Improve design efficiency during processes, production, and site planning, to identify opportunities of getting your product out the door as fast and affordably as possible.

Conclusion

In the entire product development lifecycle, there are a lot of moving parts from the beginning stages of coming up with a concept, all the way to the final product rolling out the door. Along the way, there are multiple tools that each member of your team needs to get their job done. The Autodesk Product Design and Manufacturing Collection ensures that many of your processes can be done concurrently and work from the same 2D and 3D model.



In other words, if there is a change to the 3D model, the simulation can be run again by pressing a button, the CAM cutting paths will update, and the manufacturing drawings reflect the change, just to name a few. All whilst your data is stored and accessed from a secure data management solution.

All of this combines to deliver a solution with the following benefits:

- Innovate – Clear time for more innovation and take advantage of the tools that are purpose built to have a positive impact on the way you design and make products
- Connect – Have your entire product development process on a single platform, powered by professional-grade 3D solid modelling, simulation, documentation, and multi-axis CAM tools.
- Automate - Leverage data, AI and cloud technology to reduce iterations, optimise tolerances, solve complex engineering problems and quickly create production-ready designs.
- Produce - Enable smart manufacturing using familiar CAD interfaces to automatically update design changes downstream and simplify machining workflows, reducing production times and waste.

To discuss your needs and evaluate how the Product Design and Manufacturing Collection could benefit you and your business, please get in touch with us today by emailing info@symetri.co.uk.

Together we can help you digitise and streamline your product development lifecycle with greater visibility and collaboration throughout the process.