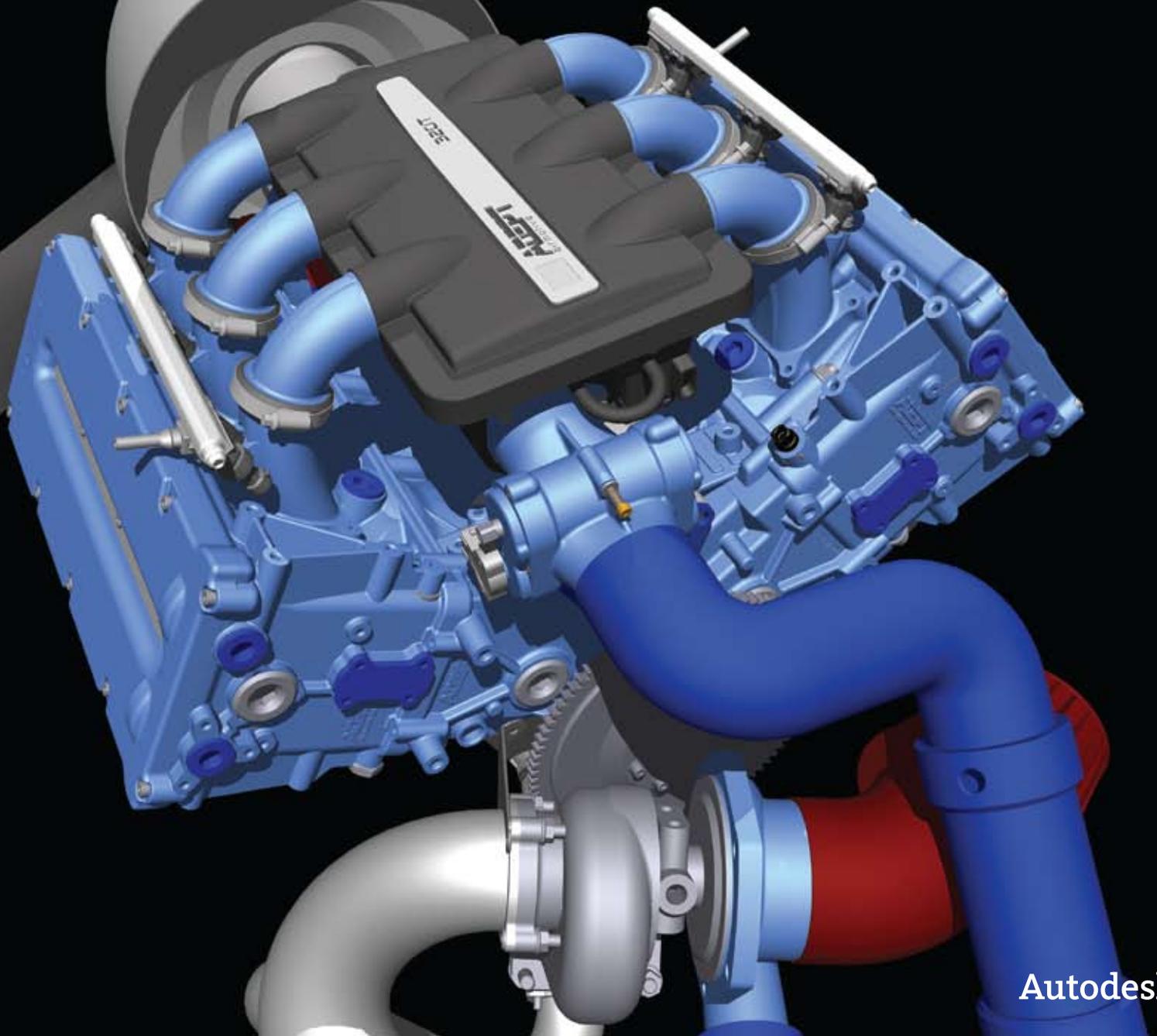


Autodesk®  
for the Transportation Industry

Experience It Before It's Real



Autodesk®

# Get Your Products Moving Easier and Faster

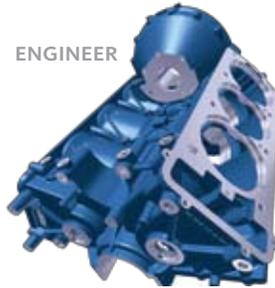
## Improve collaboration and productivity with the Autodesk solution for Digital Prototyping.

### Industry Challenges

Transportation manufacturers operate in a complex and demanding environment and face unprecedented challenges today. They are facing increasing global competition for new project opportunities at the same time that customer requirements are becoming more complex and demanding.

Successful manufacturers must effectively collaborate with both local and global product development teams and supply chain partners in order to develop and deliver more complex products in less time. At the same time, the need to incorporate visually appealing and innovative designs is essential for market success, while managing costs closely is critical to the bottom line. The challenges do not end with product development - the ability to introduce products into flexible manufacturing facilities can make or break the success of a project.

ENGINEER



DESIGN



MANUFACTURE



VISUALIZE



### Strategies for Success

Succeeding in this market requires an intense focus on eliminating inefficiencies throughout the development process from initial concept development and bid proposal through to project delivery and aftersales support. Development teams need the ability to explore a design early in the design process and to communicate that design with stakeholders and customers. The ability to design, visualize, and simulate a product from the earliest concept phase is a prerequisite to avoiding design errors that may not appear until the physical prototyping stage. Just as important is the ability for multiple disciplines to communicate and collaborate throughout the development process, without recreating data to meet customer needs.

### The Autodesk Solution for Digital Prototyping

The Autodesk solution for Digital Prototyping enables workgroups to create a single digital model that can be used in every stage of production, bridging the gaps that usually exist between conceptual design, engineering, and manufacturing teams. This single digital model enables the simulation of the complete product and gives designers and engineers the ability to better design, visualize, and simulate their designs before producing a physical prototype, in turn helping projects get to market faster with greater product innovation.

The Autodesk approach to Digital Prototyping is unique in that it is attainable, scalable, and cost effective, allowing transportation manufacturers to realize benefits with minimal disruption to existing workflows. Digital Prototyping provides a straightforward path to creating and maintaining a single digital model in a multidisciplinary engineering environment.



Images courtesy of Adept Airmotive, AnsaldoBreda, Wild West Motor Company, Viking Yachts

### Common challenges faced by transportation manufacturers:

- Adapting product appearance and function to meet specific customer needs
- Integration of mechanical and electrical design data
- Data from customers and suppliers exists in various CAD formats
- Late design changes increase development and manufacturing costs
- Product performance issues are not identified until physical prototyping
- Communication across development teams is inefficient
- Disconnected processes for conceptual design, engineering, and manufacturing



### Conceptual Design

Autodesk tools help to maintain a single digital model from early sketches through design modeling, visualization and decision-making, and final technical surfacing. These tools enable designers to work closely with engineers on a single digital model to balance aesthetic and functional requirements while accelerating development.

With market-leading industrial design tools from Autodesk you can:

- Work digitally from project start
- Incorporate industrial design data into the digital prototype (share design data with engineering using a common file format)
- Create highly realistic representations of your product to support customer reviews and bid proposals

Autodesk offers a comprehensive set of industrial design products which cover all aspects of the conceptual design, Class A surfacing, visualization, and collaboration process.

- Autodesk® Sketchbook® Pro provides best-in-class digital sketching capabilities for up front design using a digitized pen tablet and tablet PC.
- Autodesk® Surface software (previously known as Autodesk® AliasStudio®) is the industry standard for aesthetic interior and exterior conceptual design in 2D and 3D from ideation sketching through concept modeling, Class A technical surfacing and design communication.

Autodesk industrial design products provide a wide range of data exchange and engineering collaboration workflows with product development tools, including Autodesk® Inventor® and many other 3D CAD tools.

- Autodesk® Showcase® provides a solution for design visualization and communication by accelerating decision making about your transportation designs. It lets your designers visualize, present, and select design options digitally by delivering accurate, realistic imagery created from 3D design data.

By providing a means to communicate conceptual designs across multiple sites with photorealistic quality, Showcase helps teams make informed decisions faster and provides an efficient way to share stunning visuals with customers.



Images courtesy of Akar Yards and Wild West Motor Company



## Engineering

With Autodesk software, you can design, visualize, and simulate designs early in the design process and collaborate with customers and stakeholders to reduce errors, optimize designs, and minimize physical prototyping.

With Autodesk® Inventor®, the foundation of the Autodesk solution for Digital Prototyping, you can easily and quickly validate the form, fit, and function of a design under real-world conditions before it is built.

- Design and validate the digital prototype with easy-to-use and tightly integrated simulation capabilities.
- Use automated design and simulation capabilities to quickly develop plastic parts and the injection molds used to manufacture these parts.
- Incorporate multi-CAD 3D product design data to improve productivity and reduce errors in the design of tooling and equipment.
- Simulate and visualize the motion of equipment and tooling to optimize manufacturing processes, before you commit to a manufacturing concept.

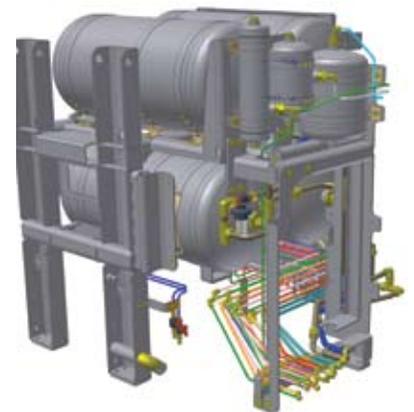
The smooth, bidirectional interoperability between Autodesk Inventor and AutoCAD® Electrical allows you to easily incorporate your electrical controls designs into 2D or 3D mechanical designs, so electrical and mechanical teams can work collaboratively. Autodesk Inventor provides capabilities ranging from complete parametric 3D modeling to dynamic simulation and powerful analysis tools. Modeling capabilities extend to multi-disciplinary needs such as 3D routing of cable harnesses, hoses, pipes, and tubes. Dynamic simulation capabilities represent the entire model and are tightly coupled to analysis tools to provide a powerful desktop solution.

Autodesk Inventor software includes a wide range of native translators to incorporate and share data in a variety of CAD formats, which is essential for a manufacturer dealing with multi-CAD data from suppliers and customers. Inventor software also shares data, including geometry and materials, with Alias Surface and Showcase software to provide an effective way to leverage the single digital model from conceptual design through engineering.



The Autodesk® Moldflow® family of products provides the designer with simulation tools to predict the manufacturability of injection molded components during the design process, before the design is frozen and tools are fabricated. Autodesk Inventor provides the only associative sharing of data with AutoCAD® and AutoCAD® Mechanical, and includes the ability to generate DWF™ data from the original model, improving the ability to collaborate with internal teams and external partners that use AutoCAD.

Autodesk enhances internal and external collaboration by better sharing and managing design data with products like Autodesk® Vault (formerly known as Autodesk® Productstream®) and Autodesk® Design Review. Autodesk Design Review software is the most widely used design review and markup software in the world with over 20 million downloads to date. Autodesk Vault enables the effective reuse of product design data and the ability to leverage prior design analyses, freeing design teams to focus on true product innovation.



Images courtesy of Wipaire Inc., Vossloh Locomotives, THT

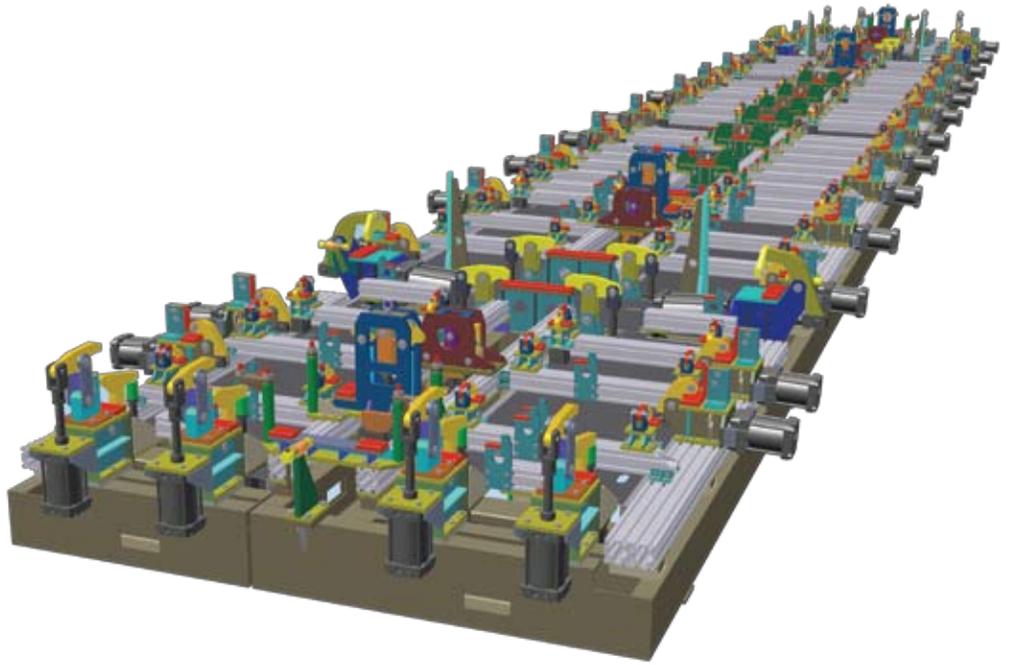
## Manufacturing

Autodesk tools facilitate the integration of product design with tooling, equipment, and manufacturing plant layout capabilities. Digital Prototyping in the manufacturing workflow enables:

- Early, digital communication with manufacturing teams, so manufacturing input is received up-front, which results in better product quality.
- Simulation and visualization of manufacturing processes to develop an early understanding of manufacturing implementation issues resulting from product design decisions.

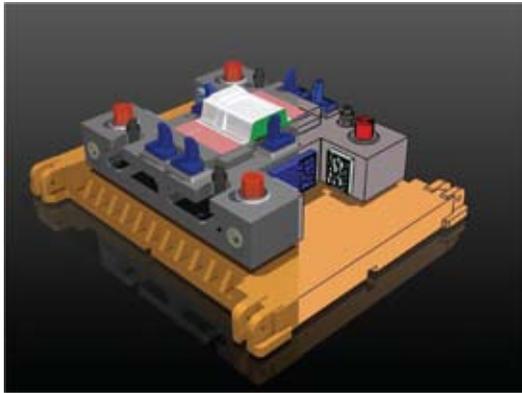
Resulting in:

- Reduced reliance on costly physical prototypes
- Improved design for assembly and smoother production implementation using 3D data rather than ambiguous paper drawings.



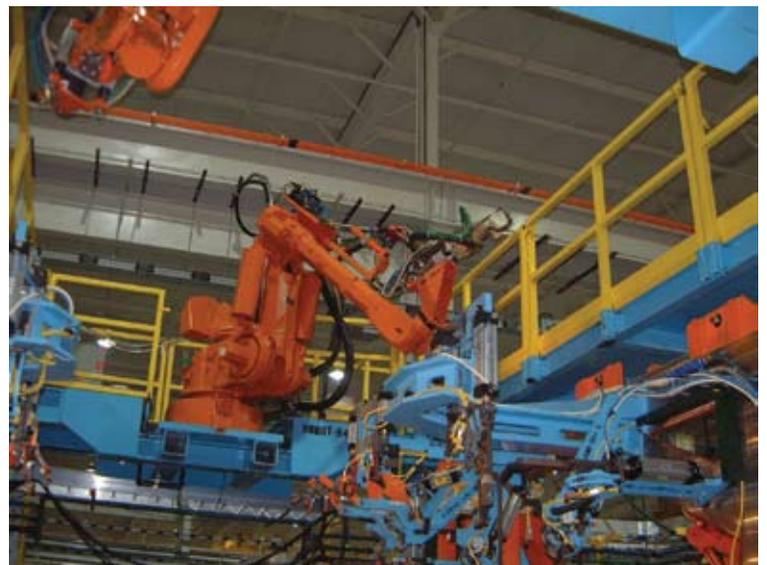
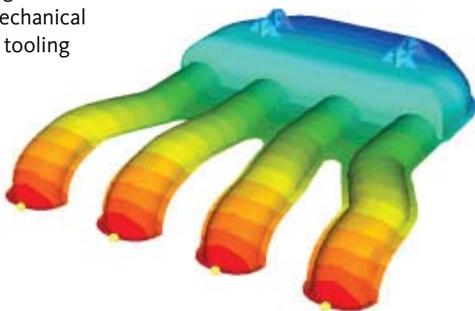
The Moldflow family of products provides powerful simulation capabilities to simulate the complete process for injection molded components, enabling the optimization of tooling designs and manufacturing processes before the first part is ever molded.

Autodesk® Navisworks® enables the integration of building, product, equipment, and other data to create a comprehensive digital model of the factory. Navisworks provides facility and manufacturing engineers a whole project view to help improve design decision-making, construction implementation, and performance prediction and planning, straight through to management and operation of the facility. Autodesk® Vault supports workgroup productivity by enabling multiple workgroups to manage documents, changes, and release of information.

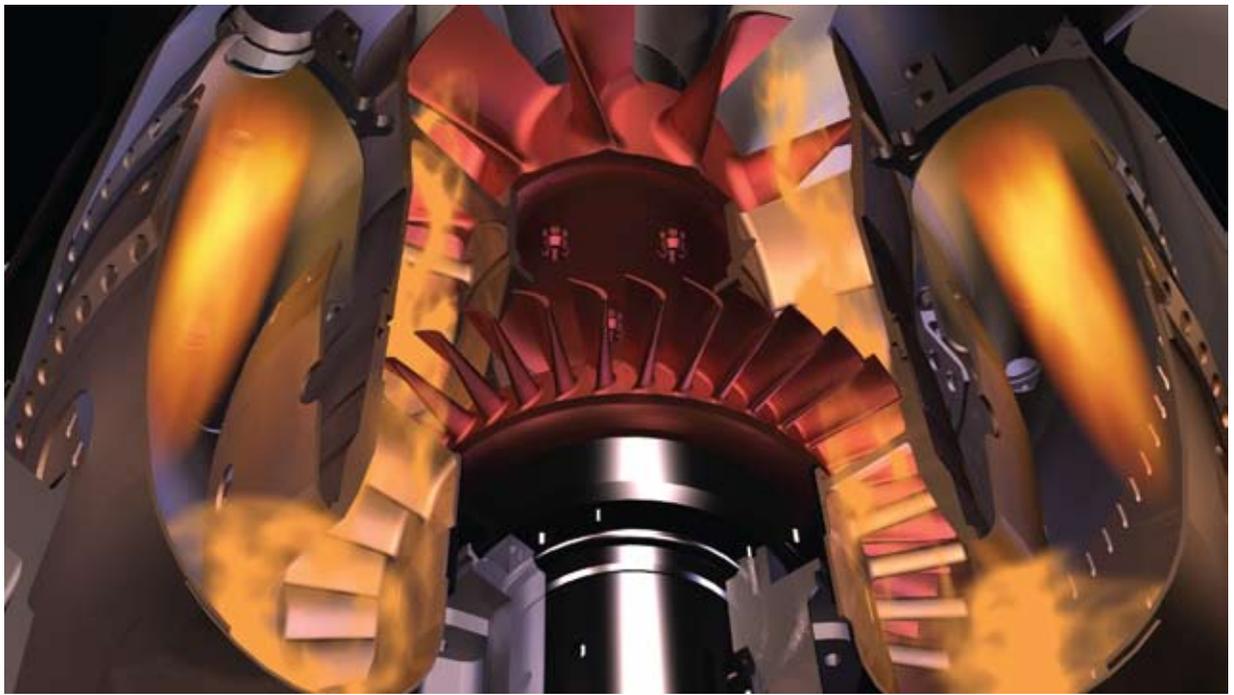


Autodesk® Inventor® and AutoCAD® Mechanical provide the ability to associatively work with 3D tool, jig, and fixture designs and 2D equipment layouts while incorporating 3D product design data from Inventor or other CAD solutions.

Autodesk Inventor provides the ability to simulate and visualize the motion of equipment and tooling to more effectively develop and optimize manufacturing processes before committing to a manufacturing concept. AutoCAD® Electrical provides a complete set of tools for controls design, and works in concert with Autodesk Inventor to integrate electrical controls into mechanical equipment and tooling designs. In addition, the cable harness routing capability of Inventor automates the process of integrating electrical controls.



Images courtesy of J.S. McNamara, Tekhvagonmash



Images courtesy of AnsaldoBreda, Aeronautical Research and Test Institute, Viking Yachts

### Visualization

Autodesk provides solutions for virtual photography and cinematography that enable marketing teams and creative agencies to market products without the need for costly physical prototypes and photography shoots. These tools effectively repurpose the digital prototype and allow the development of marketing materials in parallel with product development.

Autodesk® Showcase® provides advanced visualization of the digital prototype combined with ease of use. Finished products can be visualized in a custom environment or incorporated into a larger vehicle model to communicate design intent to the customer with photorealistic quality.

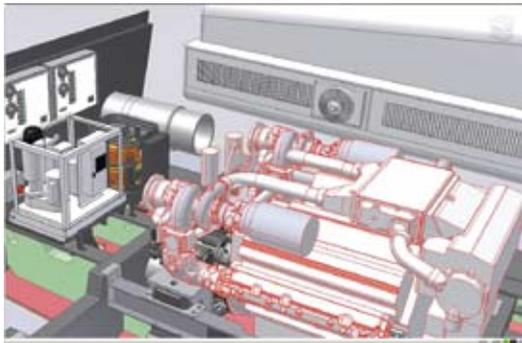
For additional visualization, Autodesk® 3ds Max® Design software leverages Autodesk Inventor® engineering data to create advanced visualizations of digital prototypes which can incorporate additional modeling, effects, and animations.



### Customer References

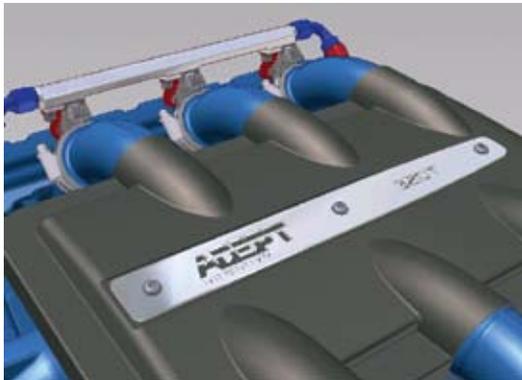
“Now that we’re using Inventor to simulate real world conditions, we don’t need full-scale physical prototypes. It’s saving us substantial time and money on each boat design.”

—Kurt Bender  
CAD Manager  
Design and Engineering  
Viking Yacht Company



“Digital Prototyping helps us make engineering changes, see the impacts visually, adjust them aesthetically, and then develop the tooling. It’s an amazingly efficient process.”

—Richard Schulz  
Managing Director  
ADEPT Airmotive



“Autodesk technologies for digital prototyping have enabled us to save time, reduce errors, and correctly manage a large number of design resources”

— Stefano Fanucci  
Project Manager  
V50 High Speed Train Platform  
AnsaldoBreda/a Finmeccanica Company



“During exterior design and concept design, our materials must be flexible so we can change things very quickly. With Alias, we can design a number of alternatives in several days and the realistic renderings and animations require no extra work.”

— Janne Andersson  
Architecture Design  
Aker Yards



### Autodesk® Alias Surface

Autodesk® Alias Surface (previously known as Autodesk AliasStudio®) modeling software provides all the tools you need to create Class A quality surface models – faster.



### Autodesk SketchBook Pro

Autodesk® SketchBook® Pro is designed specifically for use with digitized pen tablets and tablet PCs. Industrial designers can capture ideas without switching from pen to keyboard and back again.



### Autodesk Showcase

Autodesk® Showcase® software enables transportation designers to transform 3D CAD data into visually realistic images for interactive to support design and customer reviews.



### Autodesk Design Review

Accelerate automotive reviews with Autodesk® Design Review software, the all-digital way to view, mark up, and track changes to 2D and 3D CAD designs without the original creation software.



### Autodesk Vault

Autodesk® Vault, previously known as Autodesk® Productstream®, securely stores and manages engineering information, design data and documents.



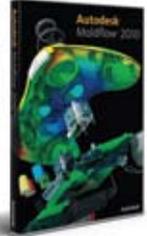
### Autodesk Navisworks

Autodesk® Navisworks® manufacturing software offers a comprehensive set of 3D digital mockup tools for large-scale assembly visualization and analysis, multi-CAD data aggregation, and collaboration.



### Autodesk Moldflow

Autodesk® Moldflow® is a comprehensive suite of injection molding simulation tools used to analyze and optimize the creation of molder parts and their associated molds.



### AutoCAD

AutoCAD helps transportation equipment manufacturers speed documentation and share ideas seamlessly with its powerful, flexible features for both 2D and 3D development.



### AutoCAD Electrical

AutoCAD® Electrical is AutoCAD® software for controls designers, purpose-built to create and modify electrical control systems.



### AutoCAD Mechanical

AutoCAD® Mechanical is AutoCAD for manufacturing, purpose-built to accelerate the mechanical design process while preserving the AutoCAD user experience.



### Autodesk Inventor

The foundation for Digital Prototyping, Autodesk® Inventor® software provides a flexible set of software for 3D mechanical design, simulation, tooling creation and design communication for transportation equipment manufacturers



# Digital Prototyping for the Manufacturing Market

Autodesk is a world-leading supplier of engineering software, providing companies with tools to experience their ideas before they are real. By putting powerful Digital Prototyping technology within the reach of mainstream manufacturers, Autodesk is changing the way manufacturers think about their design processes and is helping them create more productive workflows. The Autodesk approach to Digital Prototyping is unique in that it is scalable, attainable, and cost-effective, which allows a broader group of manufacturers to realize the benefits with minimal disruption to existing workflows, and provides the most straightforward path to creating and maintaining a single digital model in a multidisciplinary engineering environment.

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