

EBOOK

Increase Productivity and Drive Innovation in the Transportation Industry with Additive Manufacturing

Contents

- 03 Achieve Both Innovation & Productivity with AM
- 05 Advancements Accelerating Innovation & Productivity
- 06 Notable Advances In 3D Systems' AM Software & Printer Technology
- 08 Enabling Transformative Applications Through Materials Science
- 09 Solutions for Transportation Challenges
- 10 Surface Experience
- 11 Lean Manufacturing
- 12 Robust Components
- 13 Advancing the Science
- 14 Application Innovation Group & Customer Innovation Centers

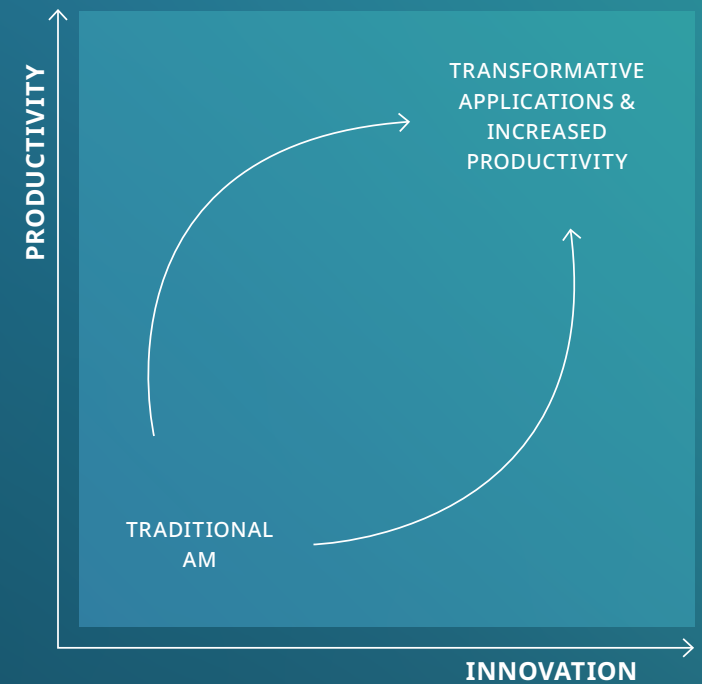
Achieve Both Innovation & Productivity with Additive Manufacturing

Additive manufacturing (AM) and its applications can propel innovation while also helping manufacturers in the transportation industry keep up with the current pace of the industry.

Automotive, bus, truck and train manufacturers rely on constant innovations to advance their industry. This requires the development of transformative applications capable of incorporating the latest engineering and design approaches in order to optimize performance and gain a competitive advantage. But meeting customer demand and maintaining their ROI also requires manufacturers to increase productivity levels. Innovation without productivity is unrealistic for most manufacturers, while productivity without innovation can lead to low margins and economic pressures to evolve.

By incorporating additive manufacturing technology into their product development and production strategies, manufacturers can combine high-value transformative applications with high levels of productivity, giving them the ability to produce innovative parts and products while maintaining higher margins.

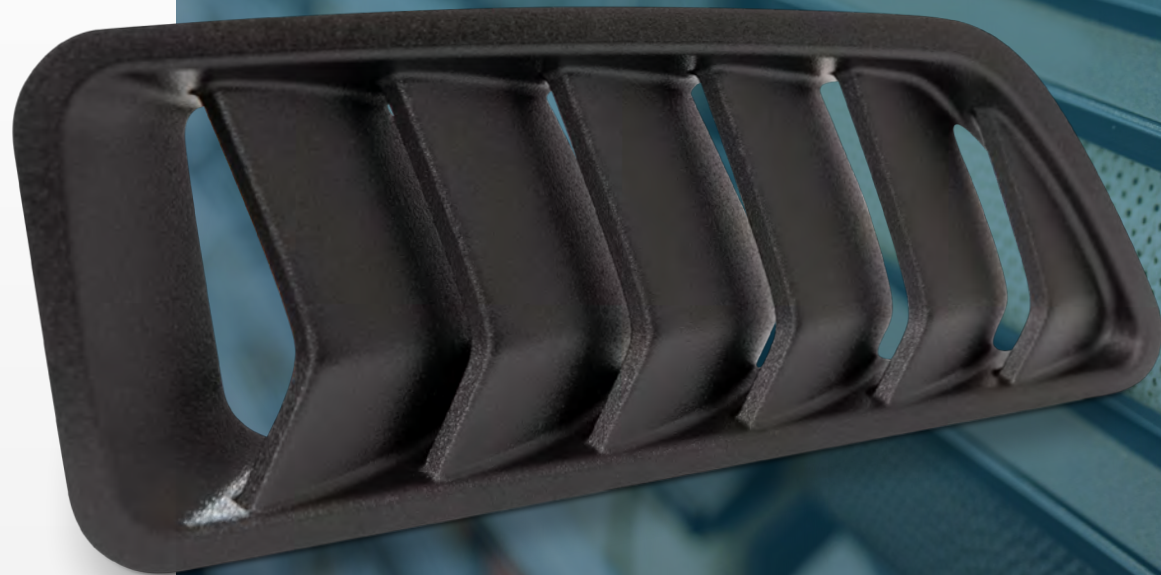
This ebook explains how AM, often also referred to as 3D printing, can help place manufacturers and suppliers in the transportation industry at the intersection of innovation and productivity. We will look at how recent advancements in 3D Systems' AM technology and equipment have made this possible, as well as how specific solutions are helping manufacturers monetize AM and meet their most pressing transportation challenges.



Increased Productivity Doesn't Always Mean Mass Production

What does it mean to increase productivity in today's transportation industry? Creating the next generation of experiences will require manufacturers to build vehicles with more personalized connections to consumers and professional customers. This may include customized interiors and exteriors or other specialized components.

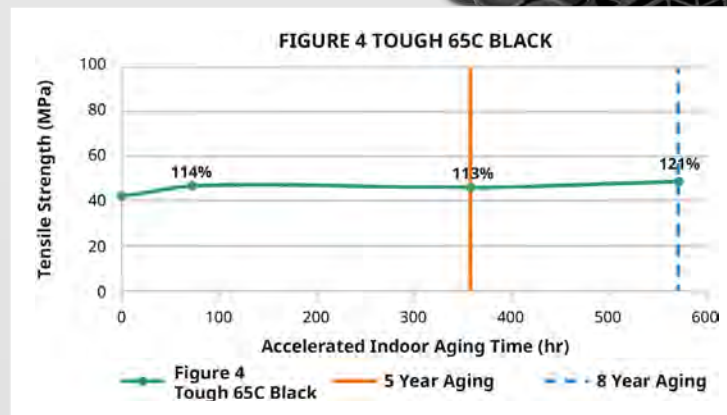
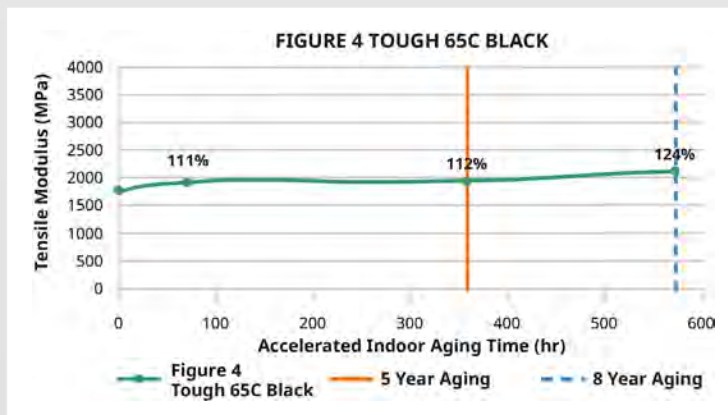
While doing this with traditional methods can be prohibitively expensive, additive technology gives manufacturers the ability to economically increase production of tailored products — and gain a competitive advantage.



Advancements Accelerating Innovation & Productivity

Successfully implementing advanced applications while realizing productivity gains in AM depends on a close interplay between printer hardware, software, and materials. Recent advancements in 3D Systems' additive technology have made it possible to meet the most urgent challenges in today's transportation industry through a combination of innovative solutions and manufacturing productivity.

For new production-ready materials 3D Systems provides a broad scope of test data, including accelerated aging tests. These data give customers from the transportation segment a sound basis for choosing the right material for their advanced applications.



Notable Advances In 3D Systems' AM Software & Printer Technology

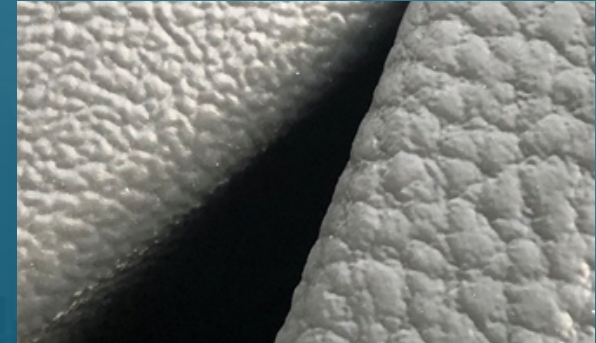
High-Density Part Stacking

Achieve efficient batch production with productivity increases of as much as 40% for plastic AM applications using this advanced 3D Sprint® software feature and Figure 4 printers.



Efficient Surfacing and Texturing

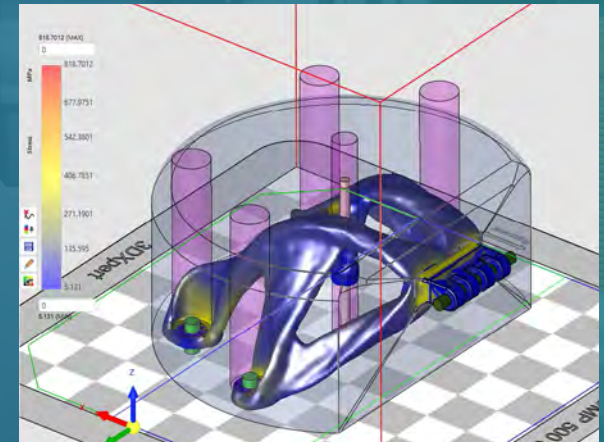
Deliver the ideal customer experience by quickly applying textures to complex surfaces with Geomagic® Freeform® software. Manufacturers can then directly produce these unique parts using Figure 4 or stereolithography (SLA) technology.



Notable Advances In 3D Systems' AM Software & Printer Technology

Simulation-Based Optimization and Automation

Reduce set-up time while improving product yield, throughput, and component performance by using Additive Works simulation-based optimization software. Engineers can quickly determine optimum print set up, such as part orientation, then directly adapt this for effective thermal management and distortion compensation.



High-Quality, Repeatable Metal 3D Printing

The unique architecture of direct metal printers such as the DMP Flex 350, Factory 350, and Factory 500 series makes it possible to produce accurate, high-quality, and highly repeatable parts even for complex lattices or when processing challenging metal alloys. Other benefits include low argon consumption and high oxygen purity (below 25 ppm) for exceptionally dense parts with excellent mechanical properties, as well as a low total cost of operation.



Enabling Transformative Applications Through Materials Science

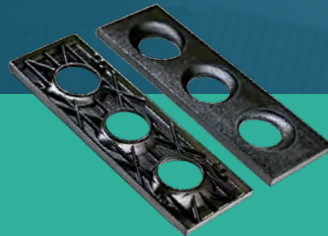
Standards-based materials innovations will continue to drive end-use adoption of additive manufacturing in transportation.

Transportation manufacturing applications require materials that are designed and tested to standards in order to meet a variety of needs, such as temperature resistance, chemical exposure, and long-term environmental stability. Thorough process engineering, parameter development, and material testing, coupled with application expertise, advances the development of additive materials capable of meeting the quality and production requirements of the transportation industry.



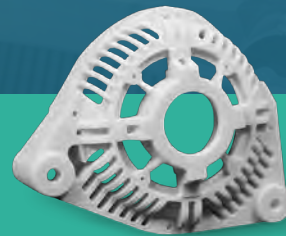
Figure 4[®] High Temp 150C FR Black

UL94 V0 rated flame-retardant black plastic with >150°C HDT for stable, long-term use parts such as brackets, covers, and retention components.



Tough FR V0 Black

Production-grade long-term stable stereolithography resin that passes UL94 V0 test standards and is uniquely tough for a flame-retardant material.



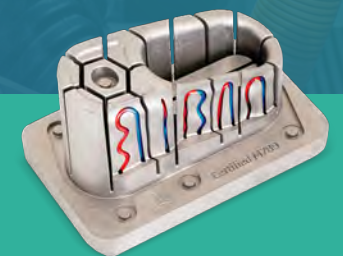
DuraForm[®] HST

Fiber-reinforced plastic with excellent stiffness, high strength-to-weight ratio, and high thermal resistance. Perfect for housings and enclosures under the hood, jigs, and fixtures.



DuraForm[®] PP White

Durable polypropylene (PP) material with excellent fluid and chemical resistance; easily weldable for assembling large parts.



Certified M789 (A)

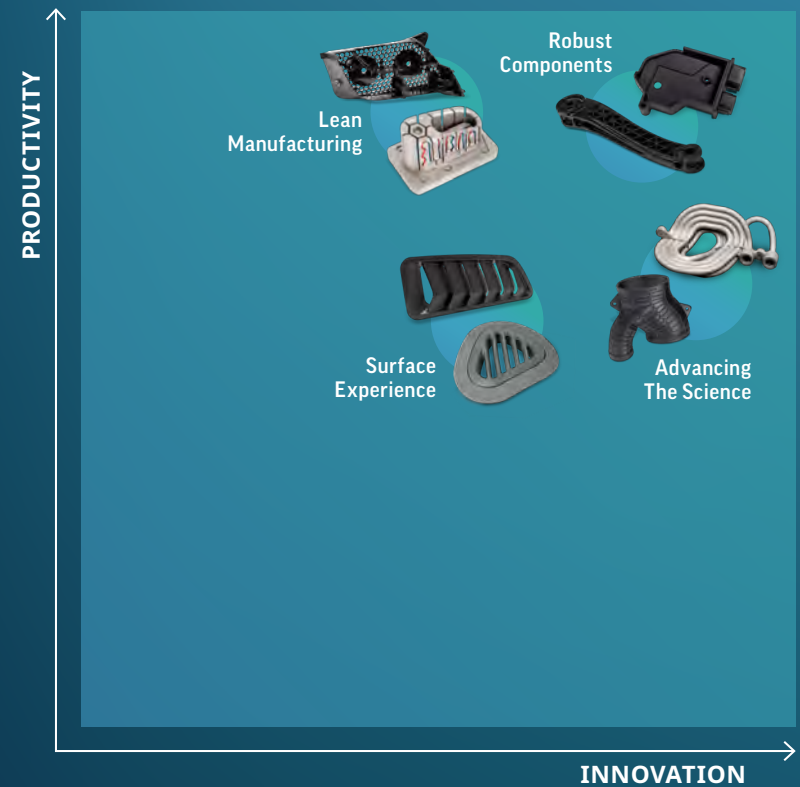
Cobalt-free steel for producing mold inserts with conformal cooling channels, tools, and components with high hardness and excellent corrosion resistance.

Solutions for Transportation Challenges

Pairing advancements in additive technology and materials with transportation expertise to address key industry challenges.

The rapid evolution of the transportation industry requires innovative new solutions that can be brought to market fast. Manufacturers must be able to design, test, iterate, and produce parts and components that optimize performance and create the unique experiences customers demand, while applying higher productivity solutions that leverage lean manufacturing. Achieving this requires solutions capable of advancing both productivity and innovation.

Today's transportation companies can leverage additive manufacturing to address key challenges like surface experience, lean manufacturing, robust components, and newly engineered systems. Each of these challenges requires advancements in both productivity and innovation that are delivered by advancements in additive technology and transportation applications.



Surface Experience

Rapidly produce Class A surfaces that deliver custom automotive experiences for specific users or groups.

Our AM solutions for body interiors and exteriors give you more control over both performance and visual experience while simplifying and tailoring production. Advancing productivity does not have to mean raising production levels to the hundreds of thousands. It can also refer to the efficient production of component sets tailored toward the needs of individual users or groups.



Body Interior and Trim

With our comprehensive portfolio of AM technologies and materials, you can quickly design, test, and iterate custom, high-end experiences. Get precise control over every sensory factor while reducing overall components in order to optimize manufacturing.

Body Exterior and Panel

Our AM solutions allow you to build parts in hours so you can quickly iterate, optimize, and produce your designs. High-performance materials, from rigid plastics to composites, as well as a range of different surface types, makes it possible to further maximize style and performance without affecting productivity.

Lean Manufacturing

Raise productivity and shorten lead time by increasing flexibility and configurability of existing production processes.

Creating tools and components with traditional manufacturing methods that meet innovation requirements often comes at the costs of either quality or productivity. Whether producing complex metal components or custom manufacturing aids, our additive solutions can reduce lead times and increase flexibility without sacrificing quality.



Metal Durable Tooling

Significantly improve quality and efficiency of durable tools. Leverage a comprehensive set of AM solutions to incorporate innovations like complex die inserts and high-productivity conformal cooling.

Manufacturing Aid

Meet the increasing complexity needs of today's manufacturing aids while controlling productivity and cost. Our AM technology lets you efficiently tailor jigs, grippers, and other components and rapidly iterate their designs, while our advanced materials help you maintain quality over the long-term.

Robust Components

Apply additive manufacturing in challenging, package-constrained environments.

Many transportation components have to perform within challenging environmental conditions. This can include constrained packaging or prolonged exposure to heat or chemicals. Improve performance by leveraging design freedom that enables greater functional density, utilizing advanced materials that perform over time, capitalizing on more productive AM platforms.



Underhood and Powertrain

Rapidly design components that maximize both functional and environmental performance. With our comprehensive AM solutions, you can consolidate functionality into constrained spaces, while our advanced materials let you optimize performance and reduce part counts for more efficient manufacturing.

Body Interior and Trim

Use AM to decouple design and production. With our advanced AM technology, you can build parts that improve the feel, appearance, ergonomics, and function of transportation interiors while also introducing efficient assembly solutions, such as integrated latching and fastening mechanisms.

Advancing the Science

Unlock design freedom in order to rapidly iterate, optimize, and produce new and innovative components.

Advances in transportation architectures and systems are introducing new engineering challenges, requiring the development of newly engineered systems. 3D Systems' additive manufacturing solutions enable true digital twins in iteration and validation, and unconstrained engineering for optimal performance leveraging advanced materials.



Air and Fluid Handling

Get complete freedom to design high-quality parts with complex geometries that optimize air and fluid dynamics while also accounting for significant packaging constraints. Further improve system quality, efficiency, and durability by using AM to simplify and consolidate parts.

Energy and Fluid Management

Meet the needs of new propulsions and drivetrain systems with the design freedom of our metal additive solutions. For instance, engineers can use computational fluid dynamics simulation to discover new design innovations, then utilize our range of metal alloy solutions to deliver components with confidence.

We're Here to Help

Whether you're just starting out or need ongoing support, we are available at every stage to apply our professional expertise toward your unique goals.

Application Innovation Group

Committed to accelerating the development of advanced applications, this dedicated team of engineers, technicians, and designers will help you solve your most difficult design and production challenges, whether that means identifying skill gaps, improving part performance, or scaling your manufacturing flow.

[Learn more](#)

Customer Innovation Centers

3D Systems offers global facilities to provide comprehensive access to our full line of 3D printing solutions. These facilities offer the capability to deliver proof of concepts, develop your applications and run small size production to prove out our solutions.



Start Accelerating Your AM Journey

Additive manufacturing can give transportation manufacturers the capabilities they need to improve performance, productivity, and reliability.

Learn how we can help.

[Talk to an Expert](#)