3D SYSTEMS

WHITE PAPER

From Fragile to Agile:
Reshoring Manufacturing and Strengthening Supply Chains Through Additive Manufacturing

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INTRODUCTION

Overview

The past decade has revealed the vulnerability of global supply chains. Pandemic shocks, geopolitical tensions, and transportation bottlenecks have exposed the risks of overreliance on offshore manufacturing.

Long lead times, rigid production systems, and uncertain logistics have left many companies unable to respond quickly to demand shifts or disruptions. What was once considered efficient globalization has, in many sectors, become a source of fragility.

Reshoring has emerged as a necessary strategy—not just to secure supply, but to create a more adaptive and resilient industrial base. Yet reshoring cannot succeed by simply duplicating outdated production models at home.

Competing with low-cost, high-volume offshore manufacturing requires a fundamentally different approach, one that emphasizes speed, flexibility, and localized value creation. Additive Manufacturing (AM) provides exactly that.

By removing the dependency on costly tooling, enabling faster design cycles, and supporting on-demand production close to end users, AM is reshaping the economics of where and how products are made.

However, realizing the full potential of AM in reshoring efforts is not only about adopting new machines and materials. To truly move from fragile to agile, manufacturers must invest in process innovation, rethinking workflows, integrating digital design and simulation, optimizing part consolidation, and embedding AM into broader production systems. Without this step, the promise of additive will remain underutilized, and the advantages of reshoring will fall short.

This paper examines the role of Additive Manufacturing in strengthening supply chains and advancing reshoring strategies. It also explores why process innovation is the critical lever that transforms AM from a promising technology into a driver of long-term competitive advantage.

Figure 1. 3D printing enables distributed manufacturing with its rapid production times and low-cost implementation in comparison to traditional production lines

2 Why the Need for Reshoring?

The push to bring manufacturing back home is not wishful thinking—it's rooted in real vulnerabilities and shifting economics.

Trade tensions are a clear driver: A survey by the U.S. Chamber of Commerce showed that over 90% of American companies are already implementing a supplier diversification model or planning to do so soon. Similarly, more than 75% are seeking to mitigate the impact of disruptions in any single geographic region by working with suppliers from various parts of the world.[1]

A 2024 survey of CEOs and COOs of mostly $1 billion plus multinational companies by Bain found that 81% plan to bring their supply chains closer to home, up from 63% two years prior.[2]

But there are other motivations that include an overall need for improved supply chain resilience, including environmental and weather impacts as well as disruptions in shipping lanes such as the Red Sea and the Sudan coast. The COVID 19 pandemic clearly demonstrated supply chain weaknesses as well as war in the Ukraine and its effect on Europe and nearby countries. As a result, supply chain footprints have been evolving, with 73% of survey respondents reporting progress on dual-sourcing strategies. Additionally, 60% of respondents are acting to regionalize their supply chains.[3]

Reshoring has been gaining further traction in recent years due to the growing need for economic self-reliance and national security. According to Reshoring Now, new investments in U.S. manufacturing by domestic and foreign companies surged after President Biden's Inflation Reduction Act and Chips and Science Act were passed, and new jobs announced in 2022 from domestic and foreign direct investment (FDI) were a record-breaking 364,000 - up from 238,000 in 2021[4] with domestic reshoring job creation outpacing jobs from FDI by 42%.

In Europe the EU Chips Act introduced in September 2023 is intended to reduce external dependencies and build EU foundry capacity, and the Net-Zero Industry Act (NZIA) is targeting ~40% EU domestic manufacturing of strategic clean-tech by 2030. Both of these are spurring planning for EU manufacturers to reshore or nearshore.

In Europe, manufacturing dominates EU reshoring activity: one recent review of recorded EU reshoring cases shows that the manufacturing sector represents 86% of the reshoring activity in the EU, including 11% for the apparel industry and 9% for food production. High-tech products such as machinery and equipment or computers and electronics represent 8% each of total reshoring cases.[5]

Further, as a result of US tariff activity, many European manufacturers are considering adding production in the US, especially in automotive sectors, including Volvo, Mercedes-Benz, Stellantis and others.[6]

[1] "12 Supply Chain Trends for Businesses to Watch in 2025." Netsuite. March 2025.
[2] "Businesses accelerate reshoring and near-shoring amid heightened geopolitical uncertainties and rising costs, Bain & Company finds." Bain & Company, November 2024.
[3] "Supply Chain: Still Vulnerable." McKInsey and Associates. October 2024.
[4] "Reshoring Initiative® 2022 Data Report." Reshoring Initiative, 2023.
[5] "The Manufacturing Reshoring Phenomenon: A Policy-Oriented Analysis of Factors Driving the Location Decision." Xavier Bornert, Dario Musolino, 2024.
[6] "European vehicle makers navigate the challenging US tariffs." Automotive Manufacturing Solutions. July 2025.

3

Key Barriers to Reshoring

There are multiple barriers preventing easy reshoring, including the price-competitiveness of overseas production, regulatory controls, workforce availability, and high up-front costs.

3.1 Price Competitiveness of Overseas Production

Overseas manufacturing still retains an edge on cost over US manufacturing costs, which remain 10-50% more expensive than foreign alternatives[7] and drives continued reliance on imports in the USA. This is despite advanced automation and manufacturing methods that only partially narrow the gap because of the process innovation and investment required to fully implement it.

In Europe, companies are considering reshoring production closer to home in central and eastern Europe citing domestic demand (40%), availability of qualified specialists (37%) and low labor costs (33%) as an attraction to invest production in Poland, Romania and Ukraine.[8]

3.2 Regulatory Compliance

Federal regulations impose substantial costs to all businesses in the USA and a 2023 study by NAM[9] also finds manufacturers bear a disproportionate share of the regulatory burden, and that burden is heaviest on small manufacturers. The analysis finds that the average U.S. company pays approximately $13,000 per employee per year to comply with federal regulations. The average manufacturer in the United States pays more than double that amount, over $29,000 per employee per year. The burden is even greater for small U.S. manufacturers, or those with fewer than 50 employees, which incur the highest regulatory costs of all U.S. firms: an estimated $50,100 per employee per year. This is more than three times the cost borne by the average U.S. company.

In the medical and life sciences manufacturing sector, regulatory roadblocks and reshoring obstacles, notably high labor and operational costs as well as a domestic skilled worker shortage, are among the key issues facing this sector, according to a new industry survey.[10] Regulatory roadblocks are regarded as the highest barrier to reshoring by 42.4% of companies surveyed, while 27.3% list production costs as the highest barrier.

3.3 Workforce Availability

Skilled labor shortages remain a serious constraint. A 2025 reshoring survey in the USA reveals firms are still offshoring primarily because of cost (69%), but workforce availability (31%) and workforce skills remain significant factors[11] slowing reshoring decisions.

But US-based manufacturing jobs have been increasing since 2022: A 2024 report by Deloitte and The Manufacturing Institute found that there could be as many as 3.8 million net new employees needed in manufacturing between 2024 and 2033, and that around half of these jobs (1.9 million) could remain unfilled if the talent conundrum is not solved.[12]

Adding to that, U.S. manufacturers face a complex paradox: While wages can be up to 16 times higher than in developing economies, manufacturing jobs still fail to attract domestic workers—resulting in a sector that remains underpopulated and under-skilled.

Europe has a similar challenge, overall, with manufacturing employees, assemblers, welders, engineers all being noted as in short supply in Germany, Ireland, France and other western European countries, but are more in surplus in Eastern European countries in 2024.[13]

Multiple manufacturing workforce initiatives across the United States are gradually creating a more positive perception of manufacturing jobs, and are starting to have a positive effect on workforce training and recruitment: A high-profile example is one by the US Navy, managed by Blue Forge Alliance, to boost and accelerate manufacturing workforce availability through its "Build Submarines" initiative which offers focused, on-site vocational training, at no charge, with a path to employment when complete.

Technical Colleges and universities across the country have followed suit and are offering attractive, affordable and even free training courses in everything from welding, CNC machining, non-destructive testing, robotics, additive manufacturing and more. These shortages can delay reshoring efforts and with US and European companies set to invest billions in new plants, they face the fact that nearly half of the skilled roles are unfilled today.[14]

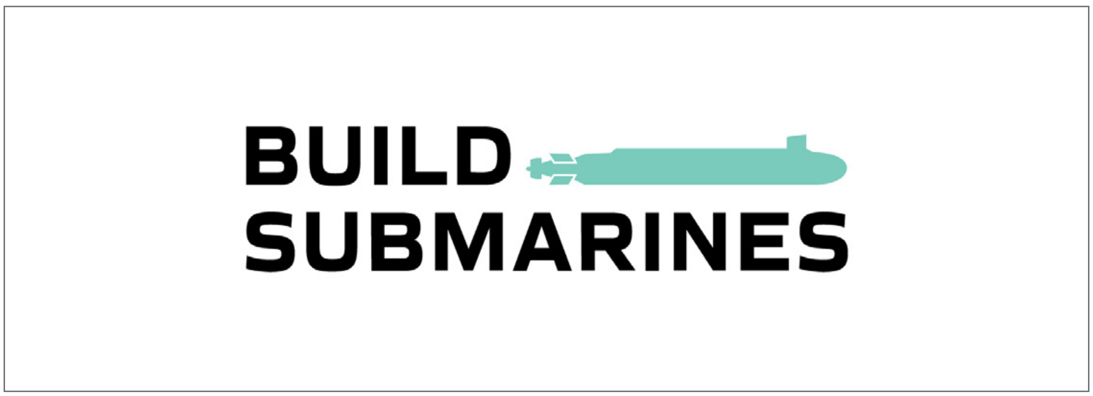

Figure 2. The U.S. Navy's campaign for workforce recruitment

3.4 High Upfront Costs

High upfront costs remain a major issue in reshoring traditional manufacturing. Building new domestic facilities comes with a steep price tag and many executives now estimate the cost to establish a domestic supply chain could be double or more than current offshore costs.[15]

As a result, most reshoring plans are on hold or still in planning, while boardrooms remain skeptical that current tariff conditions will remain stable enough to justify new, reshored facilities.

As indicated by the Financial Times, "Relocating manufacturing production involves substantive fixed costs, often at multiples of average gross operating surplus. Rational boardrooms will not risk years of profit by breaking ground on new facilities if tariff rates shift again and render investment less competitive. Across many industries, US production costs are significantly higher than the top three countries currently exporting to the US, according to Goldman's analysis.[16]"

Figure 3. Industrial robots in action

As a result, while 81% of CEOs and COOs say they are planning to bring supply chains closer to home, only 2% have fully completed those plans.[17]

Even the temptation of adding advanced industrial robot hardware, the total cost, including infrastructure, safety installations, and integration, can run up to $150,000 per robot. This makes automation—and thus reshoring—a tough sell for many small or medium-sized manufacturers.[18]

While barriers exist, the push for reshoring makes sense at many levels. Big investments are not casual decision, and it might be time to look at less expensive alternatives.

[7] "Reshoring Initiative® 2024 Annual Report." Reshoring Initiative. June 2025.
[8] "Survey by KPMG AG Wirtschaftsprüfungsgesellschaft and the German Eastern Business Association" KPMG February 2025.
[9] "The Cost of Federal Regulation to the U.S. Economy, Manufacturing and Small Business." National Association of Manufacturers. 2023.
[10] "Regulatory and Reshoring Barriers Cited as Key Challenges Facing Medtech, Survey Says." Plastics Today. April 2025.
[11] "2025 Reshoring Survey Report". Reshoring Initiative. 2025.
[12] "Taking charge: Manufacturers support growth with active workforce strategies."
[13] "What's the latest on labour shortages and surpluses in Europe?" EURopean Employment Services (EURES) July 2025.
[14] "Reshoring's Fatal Flaw: Manufacturing's Labor Crisis Has Arrived." Emerging Strategy. March 2025.
[15] "Reshoring American Manufacturing: Why It May Not Be Possible—or Even Desirable." BRG. Summer 2025.
[16] "Donald Trump's investment deals are a mirage." Financial Times, June 8, 2025.
[17]" Reshoring American Manufacturing: Why It May Not Be Possible—or Even Desirable." BRG. Summer 2025.
[18] "Why robots are not the answer to US manufacturing reshoring hopes." Financial Times, Feb 2025.

4

Key Benefits of Reshoring

Reshoring isn't just a defensive, and potentially expensive, move. It unlocks strategic, operational, and even competitive advantages that offshoring can't match.

4.1 Proximity of Production to Engineering Departments

In the 2025 USA Reshoring Survey[19], 45% of OEMs cited co-locating manufacturing near engineering teams as a top reason to reshore. This proximity speeds up product development, design iterations, enhances feedback loops, and fosters innovation that can be lacking with off-shored operations.

4.2 Reduced Logistics and Recurring Delays

45% of those companies also highlighted lower freight and duty costs as key reshoring advantage, reflecting the savings and reliability gained from shorter supply chains. This also involves the ability to build responsiveness and credibility to US customers.

Surface freight from inland China to the U.S. Midwest typically takes six weeks[20] even without unexpected disruptions, and reshoring slashes this timeline dramatically. The same applies to Western Europe, with the added complexity of diversions away from the Red Sea adding time and cost.[21]

4.3 Willingness to Pay for Speed

Product delivery delays aren't just frustrating, they're expensive. Cutting freight time from six weeks down to days isn't luxury; it's leverage.

According to recent surveys, around 40–43% of OEMs say they'd gladly pay 10–20% more for components if they can be delivered five weeks faster. That kind of agility, plus reduced inventory carrying costs, pays dividends[22] in both the long- and short-term.

[19] "A Stronger Skilled Workforce Would Boost Reshoring." Industryweek, July 2025.
[20] "2025 Reshoring Survey Report". Reshoring Initiative. 2025.
[21] DHL Global Forwarding "Asia–Europe Ocean Freight Update Q4 2024"; Maersk Spot; Drewry World Container Index; Flexport Transit Time Tracker 2025.
[22] "2025 Reshoring Survey Report". Reshoring Initiative. 2025.

5

Why Look at Additive Manufacturing?

Reshoring of traditional manufacturing is often hindered by cost, uncertainty and complexity. Additive Manufacturing provides a direct path to speed, agility, and long-term competitiveness. Here's how the economics stack up:

5.1 Traditional vs. AM-based Reshoring

5.1.1 Traditional Manufacturing Reshoring Costs

Cost Factor	Impact
Tooling Costs	High upfront cost - often $50,000–$500,000+ for molds, dies, and fixtures.
Lead Times	Long - 12 to 24 weeks for tooling and offshore parts.
Labor Costs	Significantly higher - 2×–5× offshore wages.
Minimum Order Quantities (MOQs)	Large batch production required to justify cost.
Inventory & Storage	High - bulk runs + long shipping = warehousing needs.
Adaptability	Low - design changes mean retooling and downtime.

Estimated cost disadvantage: Reshoring of traditional manufacturing can be 10%–50% more expensive than offshore production unless offset by automation or scale.[23]

5.1.2 AM-driven Reshoring Costs

Cost Factor	Impact
Tooling Costs	Minimal or nome - parts produced directly from CAD.
Lead Times	Very short - days instead of months, especially for prototypes and low-volume runs.
Labor Costs	Lower-impact - AM is highly automated, requiring fewer operators.
Minimum Order Quantities (MOQs)	Large batch production required to justify cost.
Inventory & Storage	None – Relatively economical event at batch size of one.
Adaptability	Very high - design changes require no retooling.

5.1.3 Estimated Cost Advantage of AM

30%–90% savings in tooling and prototyping. 50%+ reduction in lead times compared to offshore.[24]

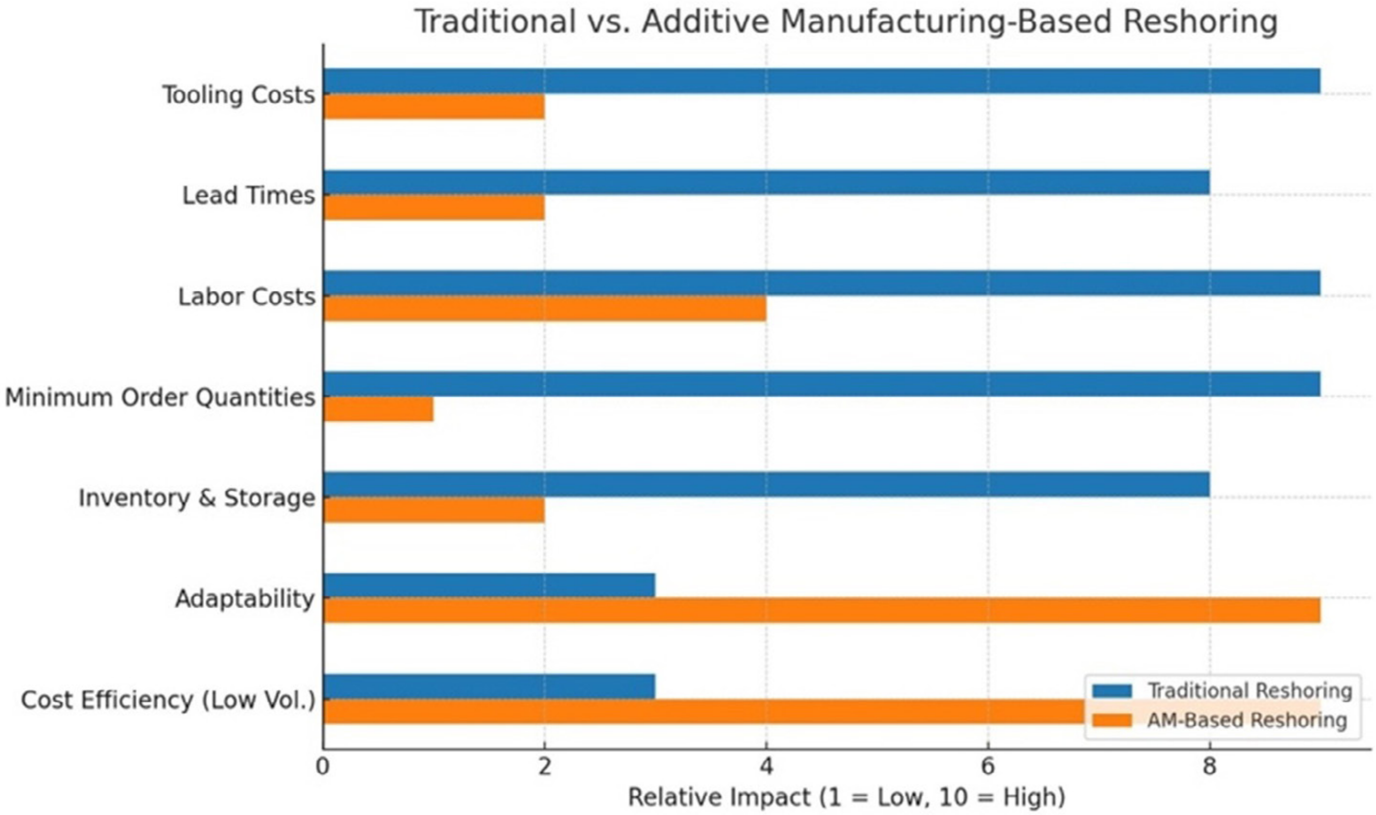

Figure 4. 3D printed casting patterns can accelerate foundry processes, reducing time, cost and complexity

[23] "2025 Reshoring Survey Report". Reshoring Initiative. 2025.
[24] "Strategic Reshoring with AM". 3dprint.com. April 2025.

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BEYOND COST

Strategic Advantages of AM in Reshoring

Having AM involved in reshoring efforts has advantages beyond production cost alone. A lot of AM equipment and materials, in both plastic and metal, can now deliver production-grade parts at ever faster velocities.

AM is typically faster to implement into the production workflow with lower investment required.

6.1 Simplified Supply Chains & Cost Reductions

Additive manufacturing slashes traditional logistics and inventory costs by enabling on-demand, localized production—dramatically simplifying supply chains and reducing transportation and warehousing expenditures.

Proximity with a Small Footprint: AM machines can be deployed closer to engineering teams, located in an office or light industrial space, reducing design-to-production loops.

Responsiveness to Market Change: AM enables manufacturers to pivot quickly, scaling up or down with little friction.

Sustainability: Studies show AM can reduce material waste by up to 90% compared to subtractive processes and cuts logistics emissions by producing closer to demand centers.[25]

[25] "An overview of the impact of additive manufacturing on supply chain, reshoring, and sustainability". Flaviana Calignano 1, Vincenza

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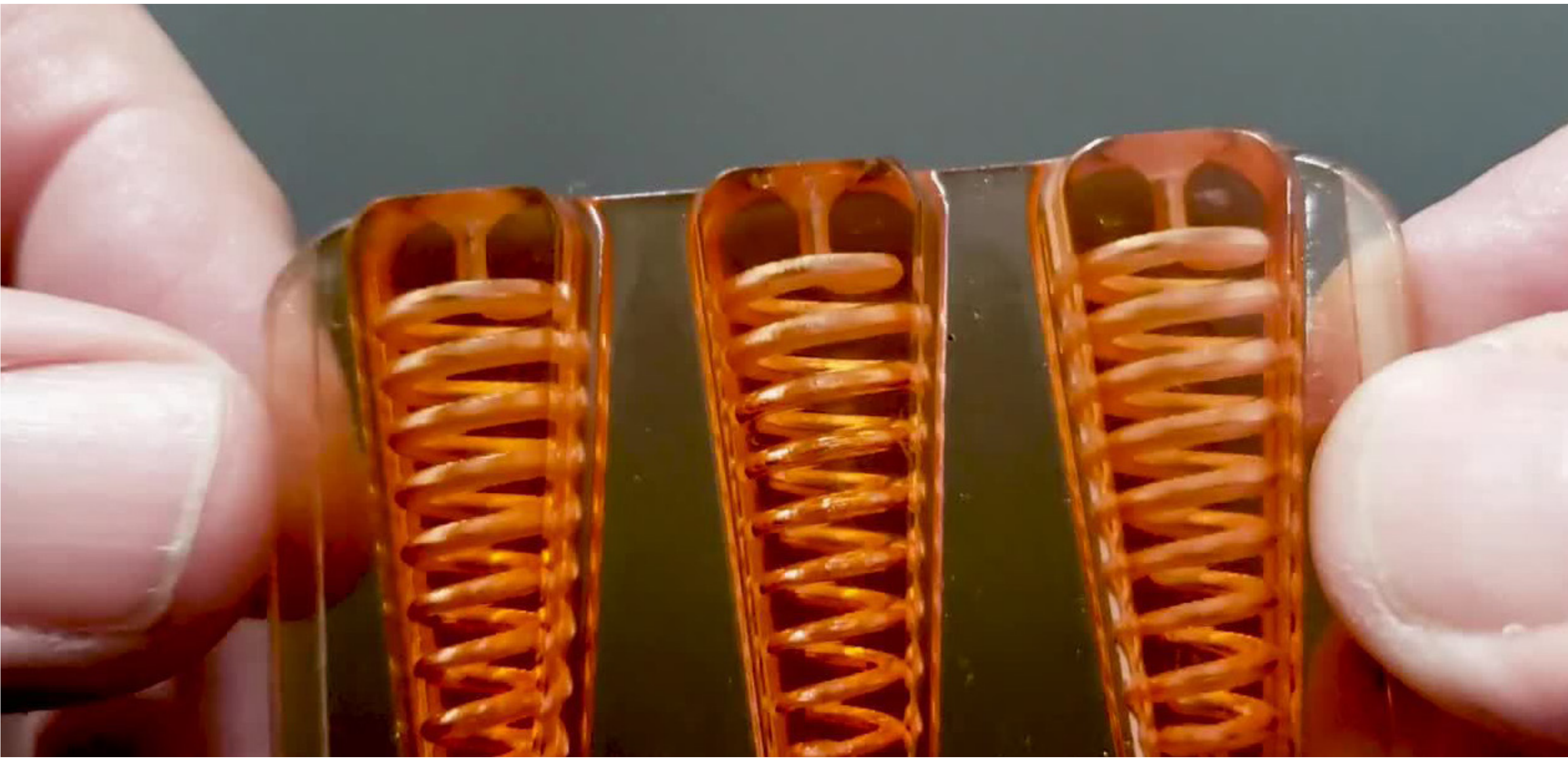
Additive Manufacturing Applications for Reshoring



AM enables innovative and agile solutions such as localized production of spare parts that demonstrates applications that are mission-critical or high maintenance cost, avoiding long shipments and lowering downtime.

In high precision and regulated environments such as semiconductor capital equipment, AM allows more aggressive design optimizations (e.g., fewer assemblies, more integrated parts) with performance improvements.

In aerospace, defense and space, weight, material performance, and reliability are more important than just unit cost; AM's ability to deliver novel geometries and materials with lighter weight is a strong reshoring-enabler in these sectors.

7.1 Real World Examples: 3D Systems & Strategic Reshoring

7.1.1 Daimler Truck | Daimler Buses — On-Demand Spare Part Production

In collaboration with 3D Systems, Daimler Truck | Daimler Buses has established a system where certified AM partners produce spare parts locally (e.g., under-hood and cabin interior covers, pins, inserts).[26]

Figure 5. DuraForm

Through this arrangement, lead times for spare parts can be reduced by up to 75%, compared to reliance on centralized warehouses or long supply chains.

This shift supports resiliency (less downtime for vehicles), reduced inventory and storage, and more responsiveness in maintaining fleet operations.

7.1.2 Wilting & Semiconductor Capital Equipment

Wilting, a precision machining company, worked with 3D Systems' Application Innovation Group (AIG) to adopt metal additive manufacturing for localized production of complex components in semiconductor capital equipment.[27]

Typical results include:

Figure 6. Manifolds designed for AM optimize fluid and gas flow to reduce pressure drops and minimize mechanical disturbances and vibration

Optimized fluid flow. It is possible to reduce liquid induced disturbance forces by as much as 90% with AM solutions.

Reduced weight and volume. Additive manufacturing light-weighting can reduce weight as much as 50%, as well as optimize volume claims in limited spaces versus conventional manufacturing.

Increased reliability. Compared to a traditionally manufactured manifold assembly (20+ parts), additive manufacturing can deliver a single monolithic part for increased reliability, and improved manufacturing and yield.

AM enabled Wilting to scale from prototyping to production more quickly, improving Total Cost of Ownership (TCO) for its OEM customers.

7.1.3 Space Missions / Aerospace Research

3D Systems has supported research with NASA, Penn State, and Arizona State University to develop novel thermal control/radiator systems using AM (e.g., titanium and nitinol passive heat pipes) for space applications. These parts achieved roughly 50% less weight and improved thermal operating performance.[28]

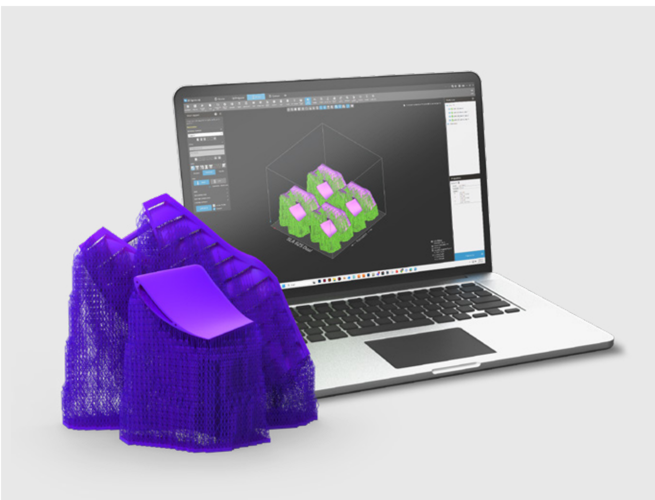


Figure 7. Using integrated solutions from 3D Systems, designs can be optimized, prepared for print and produced

More than 2,000 Ti or AL-alloy components for space flight produced since 2015.

More than 200 critical passive RF flight parts since 2018.

More than 15 satellites with 3D Systems-produced flight hardware on board.

The collaboration (including 3D Systems' DMP technology and AIG expertise) enabled faster iteration and development of materials and part geometries that would be very difficult or too slow/expensive via conventional manufacturing.

7.1.4 Financial and Government Incentives

Programs like the Inflation Reduction Act, CHIPS Act, and Department of Defense backed AM Forward fund are providing tax credits, financing, and support that make AM adoption—and reshoring—more feasible in the USA. In Europe some EU-led initiatives to help fund new manufacturing efforts have been launched including the 'Clean Industrial Deal' and the Clean Industrial State Aid Framework (CISAF) to encourage strategic manufacturing and clean-tech projects.

Additive manufacturing isn't a futuristic buzzword—it's a tactical and strategic asset. When matched with reshoring, AM transforms cost structures, accelerates timeframes, and reduces complexity. If resilience, agility, and sovereignty matter—and they do—AM isn't optional; it's foundational.

[26] "3D Systems & Daimler Truck | Daimler Buses Innovations Maximize Vehicle Uptime by Decentralizing Spare Part Production." 3D Systems.
[27] "Increasing Performance, Productivity, and Reliability in Semiconductor Capital Equipment." 3D Systems.
[28] "3D Systems' Additive Manufacturing Solutions Enable Pioneering Research on Advanced Thermal Control Systems for Next Generation Space Missions." 3D Systems.

8 Barriers to AM Success

Even as Additive Manufacturing promises to supercharge reshoring, it comes with its own set of structural obstacles. Here's where things get real:

8.1 Machine, Material & Process Challenges

Across the years, AM equipment and materials have been beset by issues of quality, repeatability and reliability, features that have been a huge focus in R&D for AM OEMs and materials producers for the last decade. But problems, both in the systems and in perceptions, continue to exist, for example:

According to a 2024 survey by 3D Printing Industry, the top-ranked barriers for wider AM adoption are machine and process reliability, followed by part quality, material costs, and scaling difficulties—with machine cost itself also ranking in the top six pain points[29].

As reported by Automation Alley in May 2025, initial hype had given way to reality: AM systems have often struggled with high parts costs, slow speeds, and inconsistent quality. For instance, FDM printers can suffer from defects like ringing and layer shifts at high speeds, and laser powder-bed-fusion metal systems often need extensive post-processing—stress relief, CNC milling, and more—to deliver acceptable parts[30].

GAO workshop discussions reinforce this: Quality depends on consistent machines, materials, and practices—and variability in any of these can prevent repeatable, reliable production of functional parts.

In reality, the recent, intense R&D has achieved major steps forward in machines, materials, process and software.

Reliability and Repeatability Improvements: 3D Systems' Figure 4 systems have consistently shown capability of single digit standard deviations of +/- 50 µm tolerance with a Cpk greater than 3, during benchmark studies.

Speed and Cost Improvements: Laser beam shaping technology in combination with new high-performance AM-optimized materials and software has enabled highly precise metal 3D printed parts at up to 9 times faster than previously, with a reduction in part production costs of 80%.[31]

These two examples are simply the tip of the iceberg as AM equipment pushes forward into production speeds, accuracy and reliability that concur with industry standards.

8.2 Workforce Availability & Skills Gap

The industry still suffers from a severe skills shortage. A 2024 Deloitte + Manufacturing Institute study found that over 65% of manufacturers name attracting and retaining talent as a primary business concern—workforce issues have been top of mind since 2017.[32]

3D Printing Industry's executive survey also flagged operator expertise and limited material options, especially for post-processing, as critical hurdles to adoption.[33]

In healthcare and specialized fields, the skills hurdle is even steeper. AM professionals in MedTech must bridge knowledge in both biomedical engineering and compliant manufacturing, which isn't easy or common. Efforts for workforce development throughout Europe and North America are coalescing across high schools, technical colleges, universities and government-funded initiatives. Opportunities for accessible training and certification for employers and their employees are growing rapidly.

8.3 Regulatory & Security Issues

Regulation remains a major drag. Certification and material/process qualification rank high among AM barriers, as noted in that same survey by 3D Printing Industry.

GAO panel participants stressed obstacles around standards, traceability, and industrial infrastructure, highlighting the need for better regulatory frameworks, coordinated standards development, and policy support for AM growth.[34]

Security is often overlooked. A study among AM professionals in the America Makes network revealed that many organizations are not prepared to detect or prevent AM-specific cyberattacks. This is being tackled first by the US Department of Defense, with its Cybersecurity Maturity Model Certification (CMMC) Program, and related 3D printing software such as 3D Systems' 3D Sprint solution is being upgraded to comply with American and European cybersecurity requirements.

[29] "8 Challenges Additive Manufacturing Needs to Solve to Become Viable for Production." AMFG. January 2019.
[30] "The Gap Between Hype and Reality in Additive Manufacturing." Automation Alley. May 2025.
[31] "Faster builds, Lower Cost, and Excellent Surface Finish – Who Says You Can't have it all?" Equispeheres, August 2024.
[32] "Taking charge: Manufacturers support growth with active workforce strategies." Deloitte 2024.
[33] "Executive survey: overcoming barriers in 3d printing: a comprehensive guide to addressing 3d printing industry pain points." 3DPI. February 2024.
[34] "Opportunities, Challenges, and Policy Implications of Additive Manufacturing." Government Accounting Office. June 2015.

9

The Importance of Process Innovation

Adopting additive manufacturing hardware is one thing. Transforming manufacturing culture and workflows is quite another.

Process innovation is the indispensable step that turns AM from a novelty into a competitive asset.

9.1 Academia's Role in Process Innovation

Academic institutions worldwide have taken major steps in research of new AM machine, material and process innovation, with notable centers of excellence at Germany's Fraunhofer IAPT, the UK's Loughborough University, Research Institutes of Sweden and more. In the US the NIST AM Research Center, University of Illinois, UTEP and others work with major manufacturers and US institutions to advance AM's abilities.

The National Science Foundation (NSF) has poured serious resources into forward looking manufacturing research—targeting AM's systemic bottlenecks, workforce development, and process optimization.

America Makes enables technology Research, creation and innovation in AM across the country.

These programs aren't about flashy machines—they're about embedding AM deeply into production and education systems. That's process-oriented thinking in action.

9.2 Process Innovation Supports Modern Production Goals

Process innovation isn't just a buzzword—it delivers tangible, measurable impact. 3D Systems' Application Innovation Group is a global operation that utilizes its AM expertise while researching and developing innovative new processes designed to apply AM successfully into manufacturing operations for greater production speed, improved part quality and part cost reduction.

Reduce assembly times and errors: A major AM solution from 3D Systems, the Figure 4 135, eliminates tooling, slashes lead times, and achieves precision with minimal variation. It's designed to meet stringent quality thresholds (e.g., CpK ≥ 1.33), ideal for critical plastic components in medical, consumer, or HMLV (high-mix, low-volume) manufacturing.[35]

Accelerated innovation: 3D Systems' support for BWT Alpine F1 team drastically cut development cycles. Their engineers now produce hundreds of intricate wind-tunnel parts weekly—things that used to take weeks can now be printed in hours.[36]

Improved responsiveness to market changes: AM ushers a new kind of agility. With 3D printing solutions by 3D Systems, manufacturers dodge entire tooling lifecycles and pivot quickly when demand or design needs shift, even in highly traditional industries such as investment casting.

More sustainable production models: While not specific to one company, research consistently shows that AM can significantly reduce material waste—up to 90% compared to subtractive methods—especially when paired with smart design-for-additive techniques and efficient workflows.

9.3 Building an Agile Design Ecosystem

Process innovation isn't just about tools—it's about culture, systems, and collaboration:

9.3.1 Integrated Digital Workflows

End-to-end digital workflows from CAD to slicing, build planning, post-processing, and quality control are essential. 3D Systems' closed-loop digital manufacturing solutions integrate the entire additive workflow—from design through printing, post-processing, and quality assurance—into a continuous, data-driven cycle.

Figure 8. Lightweight aerospace bracket for Thales reduced assembly time and decreased part weight by 50%

At the core are digital platforms like 3D Sprint® that connects design to production, combined with advanced hardware such as the SLA 825 Dual, PSLA, Figure 4 with industry-leading materials that deliver high precision and finish. These solutions enable predictable part quality, reduced waste, shorter lead times, and lower total costs by creating feedback loops where process data continuously refines future builds.

The result is a highly automated, sustainable, and agile manufacturing ecosystem designed for industrial reshoring and critical applications.

9.3.2 Cross-Functional Collaboration

Process innovation demands designers, engineers, application specialists, and operators work shoulder-to-shoulder.

Figure 9. Additive manufacturing enabled BWT Alpine F1 Team to maximize the length of the dampening coil while packaging complete functionality within a restricted space.

The BWT Alpine F1 partnership is a prime example: close collaboration between engineering teams and 3D Systems' experts made design freedom and production speed possible.

9.3.3 Flexible Production Capabilities

Manufacturing environments must flex on the fly: handle rapid turnarounds, mix materials, scale batch sizes, or switch designs without infrastructure overhaul. Systems like the EXT Titan Pellet Printers are built with that flexibility in mind, supporting High Mix, Low Volume outputs at high speed for medium- to large-format parts while maintaining precision and production-grade parts manufacturing.[37]

If the goal is agility, sustainability, and responsiveness, process excellence, not just machines, is the force multiplier.

Figure 10. 3D Systems' Customer innovation Centers are providing critical process innovation and technology transfer to customers worldwide

[35] "3D Systems Transforming Manufacturing with Application-specific Solutions at RAPID+TCT 2025." 3D Systems. April 2025.
[36] "3D Printing Productivity Drives R&D at Alpine Formula One Team." 3D Systems. April 2025.
[37] "EXT Titan Pellet 3D Printers." 3D Systems.

10 How to Access the Right AM Solutions and Expertise

Bringing additive manufacturing into reshoring strategies isn't just about buying equipment—it's about tapping into deep application knowledge, validated processes, and integrated support systems. Here's how to evaluate and partner effectively.

10.1 Key Evaluation Criteria for Technologies and Partners

When assessing potential AM technology providers, focus on:

Reliability and repeatability of machines and validated workflows.

Breadth of materials expertise (e.g., polymers, metals, elastomers, etc.).

Digital integration, including software that spans design to post processing.

Hands-on expert engineering support and training, to accelerate adoption and minimize risk.

10.2 Why Engineering Expertise Matters — The AIG Advantage

3D Systems' Applications Innovation Group (AIG) brings together engineers, designers, and technicians who bring expertise to customers to co-develop solutions.

AIG collaborates across industries, especially in complex, regulated sectors such as healthcare, aerospace, and semiconductor manufacturing.

The AIG helps customers go from concept to validated production—assisting with design, material qualification, regulatory clearance, tech transfer, and on-site implementation.

10.3 High-End Technology, Materials, and Workforce Development

3D Systems' advantage isn't just breadth—it's integration:

Technology: Offerings include platforms like Figure 4, EXT Titan Pellet extrusion tools, SLS and SLA (polymers), and Direct Metal Printing (DMP) systems.

Materials: A library spanning thousands of engineering-grade plastics, elastomers, metals, and biocompatibles plus custom formulation capability.

Training and Upskilling: AIG complements technology with on-the-ground training and workflow coaching, arming customer teams with real-world skill, not just manuals.

10.4 Real-World Success Stories with AIG

Precision Resource Partnership: AIG and Precision Resource integrated DMP Flex 350 Dual printers into an aerospace-grade, AS9100-certified workflow. The result: high-quality, high-criticality metal parts, rapid vertical integration, and improved total cost of ownership.[38]

Node Audio (3D-printed Speakers): AIG enabled Node Audio to design and manufacture intricate, acoustically optimized speaker geometries that were previously impossible—showcasing design freedom powered by AM-enabled expertise.[39]

Wilting: Working with 3D Systems, Wilting leveraged AM to build more reliable, high-performance components for semiconductor capital equipment—scaling from prototypes to production with AIG support.[40]

Automotive Fixtures via Service Bureau: A service bureau, supported by AIG, dramatically sped up delivery of AM fixtures for automotive lines—reducing lead times and optimizing production workflow.[41]

Diabatix: Developed world's most powerful AI-designed and metal 3D printed liquid nitrogen (LN2) heatsink for extreme CPU cooling. With 3D Systems' help, Diabatix set a new benchmark in thermal management.[42]

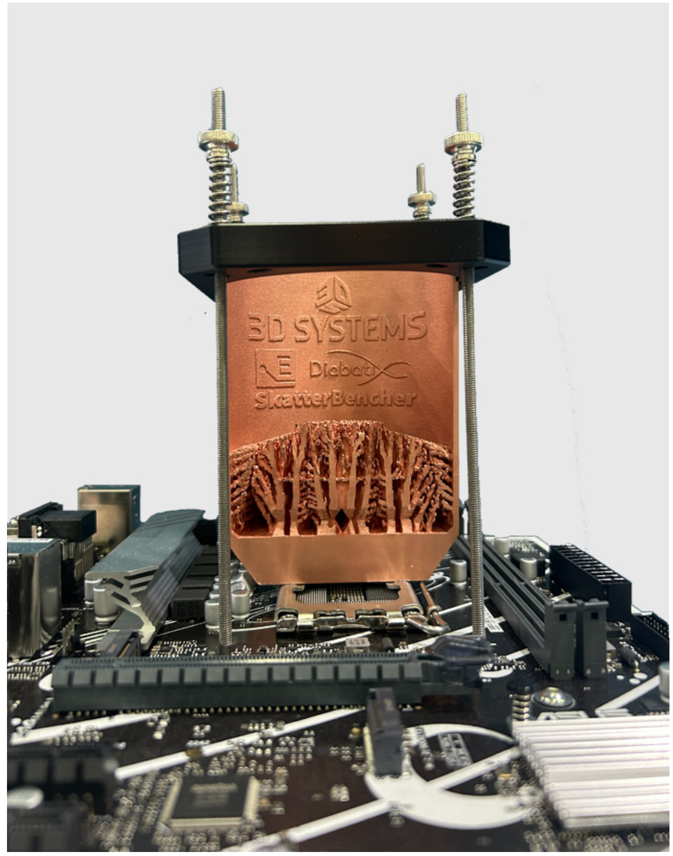


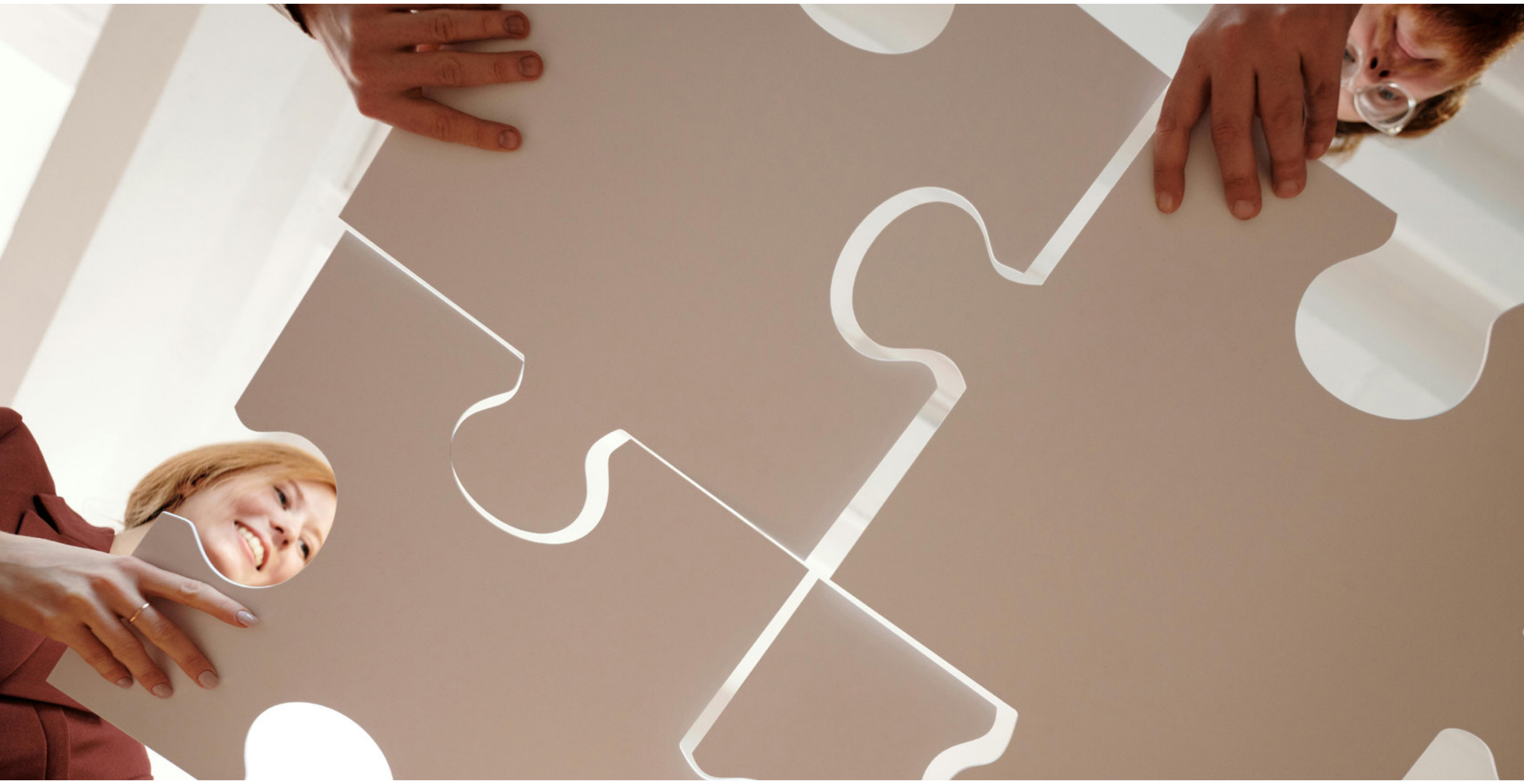
Figure 11. Diabatix Gen-AI technology generates world's most powerful heatsink for extreme CPU cooling

Astech: AIG enabled Astech to transform traditional foundry processes via AM, unlocking performance improvements and scalability through expert-designed workflows.[43]

[38] "3D Systems & Precision Resource Announce Strategic Partnership to Advance Metal Additive Manufacturing." 3D Systems.
[39] "Node-Audio Evolves Hi-Fi Sound with 3D Printed Speakers." 3D Systems.
[40] "Increasing Performance, Productivity, and Reliability in Semiconductor Capital Equipment." 3D Systems.
[41] "Service Bureau Accelerates Delivery of 3D Printed Fixtures for Use in Automotive Industry." 3D Systems
[42] The World's Most Powerful Heatsink for Extreme CPU Cooling with Diabatix Gen-AI Technology and 3D Systems Metal 3D Printing.
[43] "Astech: A Foundry Transformed by Additive Manufacturing." 3D Systems.

11

What AIG Means for Your Manufacturing Reshoring Efforts



AIG enables full-stack integration from design all the way to part, ensuring systems, materials and workflows align.

The hands-on, in-person engineering support accelerates adoption, cuts risk and delivers tailored ROI.

With real-world winds, from Formula 1 agility to advanced aerospace innovation and reliability, you can also access proven, high-impact deployments. AM mastery comes from marrying equipment with expert-led deployment, training, and optimization.

That's what AIG delivers.

3D SYSTEMS

Scan the code to begin a conversation with one of our experts

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