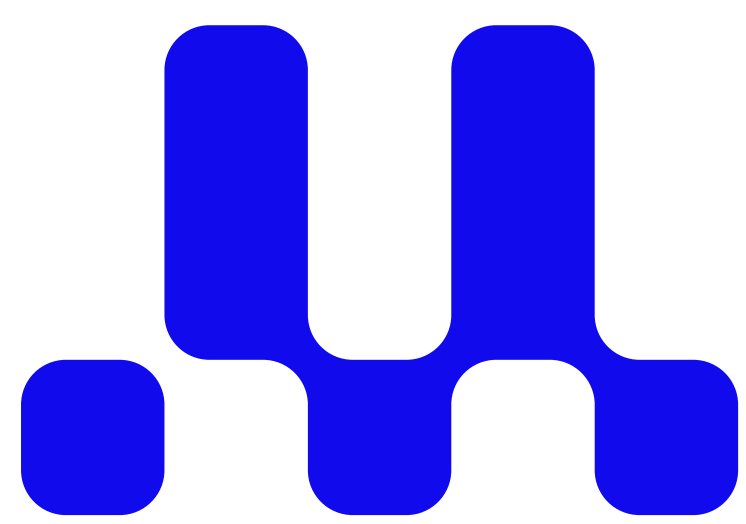




UltiMaker white paper

How 3D printing makes production more cost-efficient

What's inside

- Cut costs with in-house tooling
- Validate designs faster
- Produce custom parts at scale
- Scale manufacturing affordably
- Speed up model making

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Introduction

Additive manufacturing is revolutionizing production processes. Fused deposition fabrication (FDM) 3D printing, in particular, has been adopted by diverse industries around the world, from automotive engineering to the health and fashion industry. Global brands use 3D printing to shrink production costs, accelerate time to market, and outpace their competitors.

In this white paper, we highlight the five areas on which to focus to make your production processes more cost-efficient, and look at just a few of the industry leaders already using FDM 3D printing to reduce production costs.

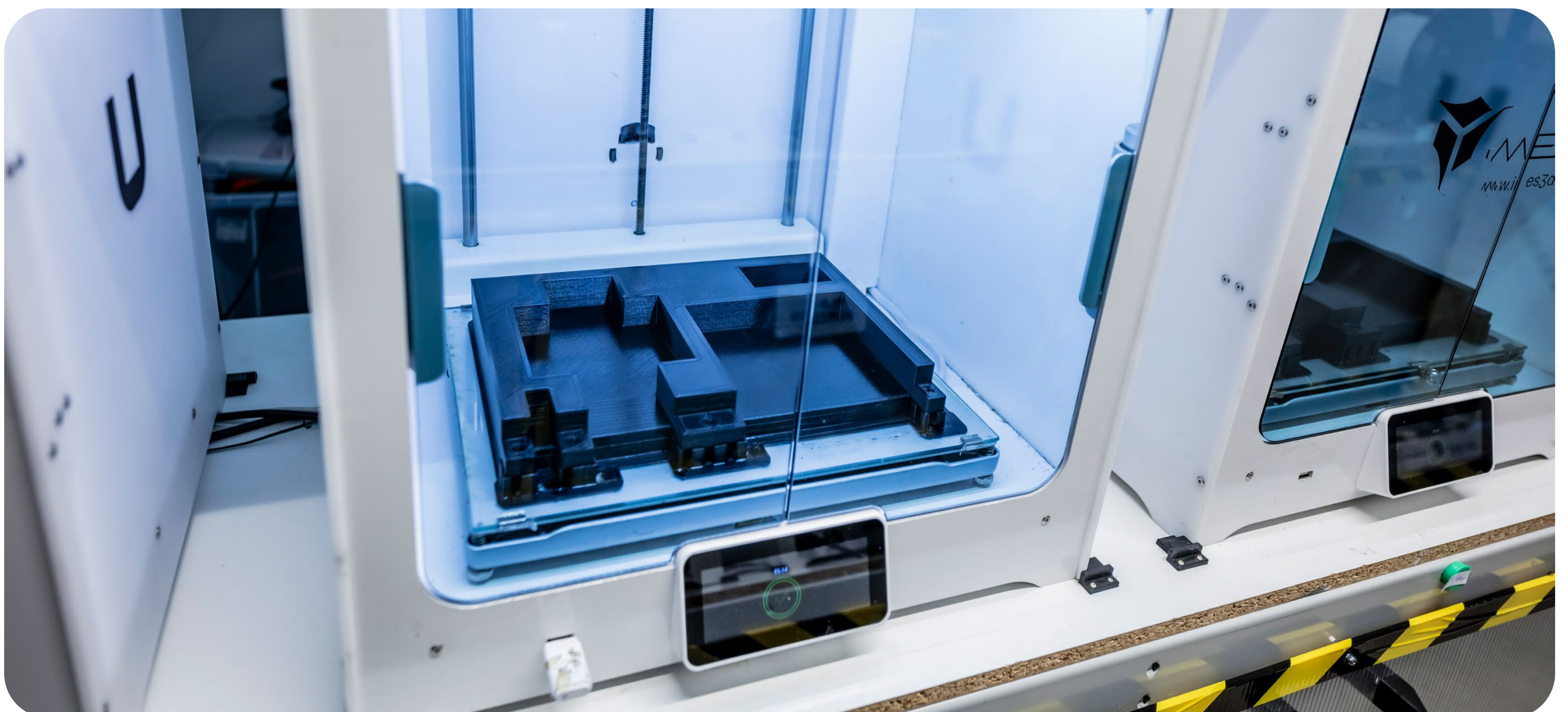
Print tooling in-house

3D printed manufacturing aids elevate quality and effectiveness, and reduce costs.

Factories and workshops rely on manufacturing aids to streamline production. Jigs, fixtures, and quality gauges facilitate faster machine setup, reduce deviations during assembly and fitting, and hold parts securely. But manufacturing aids are often highly customized items.

Outsourcing production results in long lead times and additional costs, placing your manufacturing at the mercy of the supplier. When design changes are necessary, the cycle must begin again, causing additional delays to product delivery. 3D printing, on the other hand, provides flexibility and removes these constraints. Since each item is produced in-house, manufacturing is entirely under your control.

Moreover, 3D printed polymers offer a range of properties, such as toughness, strength, flexibility, and chemical resistance. Materials are inexpensive, allowing for more extensive design iteration. So if tooling changes are required, or the workflow suggests ergonomic improvements to a tool, a new design can be 3D printed and deployed in a matter of hours. And if the new design doesn't meet the mechanical requirements, it can be reprinted with a stiffer or tougher material, or a new iteration can be produced. If more parts are needed, simply print more.



Streamlined production. Reduced costs.

- Stay ahead – fewer than 1% in manufacturing use 3D printing
- Lower costs expand applications without compromising ROI
- Items are easy to customize, refine, and adapt at minimal cost
- Tool development time shrinks from months to just days
- Cost-effective gains in yield and production efficiency



Ford Motor Company was able to implement more than 50 3D printed tools for high volume production of the all-new Focus, with considerable cost savings per tool compared to conventional methods. The alignment tool pictured ensures that emblems and decals are consistent for each vehicle that rolls off the assembly line.



3D printed manufacturing aids are used by Volkswagen Autoeuropa to maximize production efficiency. For example, the pictured wheel protector jig prevents scratches and damage to wheel rims and simultaneously aligns an operator's pneumatic impact gun to speed up the fitting process and reduce scrap costs.

Wheel protector jig	External supplier	UltiMaker 3D printers
Cost per item	€800 (\$900)	€21 (\$24)
Development time	56 days	10 days



Performing maintenance on complex and customized aircraft can be an expensive challenge. By adopting 3D printing, The Royal Netherlands Air Force is able to affordably create tools for specific applications within hours. 3D printed parts cost approximately \$10 to produce, while traditional methods can cost over \$1,000 for the same part.



3D printed manufacturing aids make production easier, faster, and cheaper for world-leading beauty company L'Oréal. The pictured gauge keeps product packaging consistent by verifying that labels are correctly positioned. With standardized label placement and quality assurance, deviations are unlikely to hit the shelves.

Validate designs faster

Keep up with rapidly changing consumer trends and outpace your competitors. 3D printed prototypes are cheaper and faster to produce, allowing you to verify your design before further investment.

In-house 3D printing accelerates prototyping cycles so that your products reach the market faster. Accurate and functional 3D printed prototypes are inexpensive to produce and can be shared with clients and customers to test form, fit, and function. A refined 3D printed prototype can also give other departments a head start on marketing communications and sales strategies, before the first production item is ever manufactured.



British manufacturing company Sylatech uses 3D printing to verify that pre-production items are dimensionally accurate and function as intended. When design requirements are met, these items are used to manufacture metal parts through investment casting.

Yacht propeller	Conventional tooling	UltiMaker 3D printers
Project cost	£17,100 (€20.305)	£660 (€784)
Development time	4 weeks	5 days

Polymers such as nylon or polypropylene can be 3D printed, so in some cases, you can test prototypes with the same material properties as the final product. Items intended for production with expensive materials, such as precious metals, can be produced as an inexpensive prototype to verify physical characteristics. 3D printing can also be used for mold making or for applications external to the product, such as packaging prototypes.

Faster prototyping. Better end products.

- Be confident of a product concept before investing in expensive production
- Prove a concept’s viability before producing it in more expensive materials
- Prototype with the same materials as production items, e.g., nylon or polypropylene



Image courtesy of L’Oréal

Before adopting 3D printing, L’Oréal spent as long as 18 months on packaging prototype development. Now, designs can be validated in days.

Create customized end-use parts

3D printed parts can be manufactured at low cost, enabling you to customize existing products.

Have you ever needed to repair products or machinery made of parts that are expensive to replace, or have been discontinued? 3D printing enables you to rapidly print high-quality functional parts, locally, and at low cost.

3D printing is unlike conventional methods such as injection molding, which must follow restrictive design-for-manufacturing rules. Instead, 3D printing enables the production of complicated geometries, and an iterative design process. This improves structural performance, saves material, and streamlines the design-to-manufacturing cycle.

The range of available 3D printing materials is expanding every day, so you’re likely to find a material that matches your application requirements – whether you need reinforced, ESD-safe, chemical-resistant, or other types of engineering-grade materials.

Flexible manufacturing. Bespoke solutions.

- Create complex parts quickly and cheaply
- Remove the limitations of outsourcing and design-for-manufacturing
- Benefit from an iterative design approach

If you’ve seen snow in a recent film or television production, 3D printing has likely played a part in producing it. Snow Business, based in the UK, is the world’s biggest supplier of winter special effects to the film and television industry. The diffusion nozzle is a critical part of their snow machines. After years of R&D, this nozzle has a liquid and airflow geometry so complex that it can only be made by 3D printing.



3D printed nozzle	SLS service	UltiMaker 3D printers
Cost per iteration	£125 (€148)	£2.50 (€2,97)
Lead time	7 days	7 hours

Accessible, scalable manufacturing

3D printers are easy to set up and use, with minimal training or additional staff requirements. And their low cost means that you can easily scale production with additional 3D printers.

UltiMaker 3D printers are easy and safe to use and are compliant with international standards for safe unattended professional use. So you are safe to leave them to do their job, while you do yours.

UltiMaker Digital Factory enables you to operate a short-run production facility by enabling 3D printers to process a queue of jobs and manufacture items in parallel. All of this can be controlled from a single device.

Scale-up for less

- 3D printers can produce a variety of shapes, without the need to change tooling
- Transportation, scrap, and waste disposal costs are reduced
- 3D printers are easy to use, so staff and training costs are reduced
- UltiMaker 3D printers are compliant with international standards for safe unattended professional use
- Network-enabled UltiMaker 3D printers are an automated and scalable production solution



IMES3D, a technical service bureau based in Barcelona, has scaled its fleet of UltiMaker 3D printers to an impressive 60 machines. With a diverse pool of clients, IMES3D supports various industries in creating 3D printed solutions. By leveraging Digital Factory, experts at IMES3D can easily follow the print processes and create print queues remotely.

Simplify model making

3D printing frees your staff to develop concepts by enabling an iterative design process.

Model making is an essential step in architecture, product design, and other creative industries. These industries already rely on CAD modeling to convey ideas, so converting this data into a 3D print is a simple process. 3D printing models eliminate the time-consuming and labor-intensive aspects of conventional model making, doesn't require skilled labor, and creates less waste than conventional methods such as woodworking.



Architects are rapidly adopting 3D printing to create intricate prototypes, and no longer need to compromise on model detail or accuracy. From small models of intricate features to huge context models, precise and detailed prototypes can be accurately produced within hours.

Unlike CAD designs, 3D printing lets clients see, touch, and feel concepts to get a clearer idea of the spatial relations of a design. And if ideas need to be communicated rapidly across a large distance, CAD data can be shared and printed at each location.

- Clearer concepts. Meaningful innovation.
- Clearly communicate ideas, with a model produced directly from your CAD data
- Create complex geometries that are difficult to make by hand, with detail at large or small scales
- Reduce development times from months to just days
- Duplicate models as needed

Make architects in London used to outsource model making. A third-party supplier would build timber feasibility study models at a cost of approximately £20,000 (\$26,500) and a lead time of up to six weeks. Using 3D printing, hundreds of individual structures can be produced in two days at a cost of £2,000 (\$2,650) for labor and materials, and with a total build time of two weeks. This iterative design approach adds value and allows Make to better communicate their ideas to partners and stakeholders.



London-based MATT architects uses 3D printed concept models to communicate complicated ideas to their clients. Previously, they used hand-made paper or cardboard models. This was a labor-intensive and slow process that limited the range of ideas that could be conveyed. Now they can produce high-detail concepts within hours.

Cityscape models	Conventional model making	UltiMaker 3D printers
Cost per iteration	£400 (€475)	£15 (€18)
Iterations	1-2	3-4

Don't let the hurdles of traditional manufacturing slow down your good ideas.

At UltiMaker, we understand the need to keep workflows and production budgets under control. That's why we have built an integrated eco-system of 3D printing hardware, software, and materials to reduce the hurdles of manufacturing.

Every day, over 300,000 designers and engineers around the world rely on our 3D printing solution to improve their processes through local digital manufacturing, so that they can spend time on what matters most – innovating.

UltiMaker S6: Faster, smarter, more accessible



Starting with 3D printing doesn't have to be complicated. With the new UltiMaker S6, you can innovate with ease. Building on the award-winning S5 legacy, now with up to 4× productivity.

Experience powerful innovations like UltiMaker Cheetah motion planner, better bed leveling, and flexible build plate option – leverage the full power of the UltiMaker ecosystem.

Explore more 3D printing knowledge

You can learn more from industry leaders and experts, and compare the specs of our 3D printers on the [UltiMaker website](#).

Choose the right 3D printing ecosystem for your business needs

Discover the UltiMaker ecosystem that will streamline your workflow and deliver the quality results you need.

3D printers fit for every application

A comprehensive lineup of professional 3D printers designed to meet the needs of everything from design studios to factory floors. All our machines share the same UltiMaker DNA: reliability, quality and ease of use, while excelling in different applications.



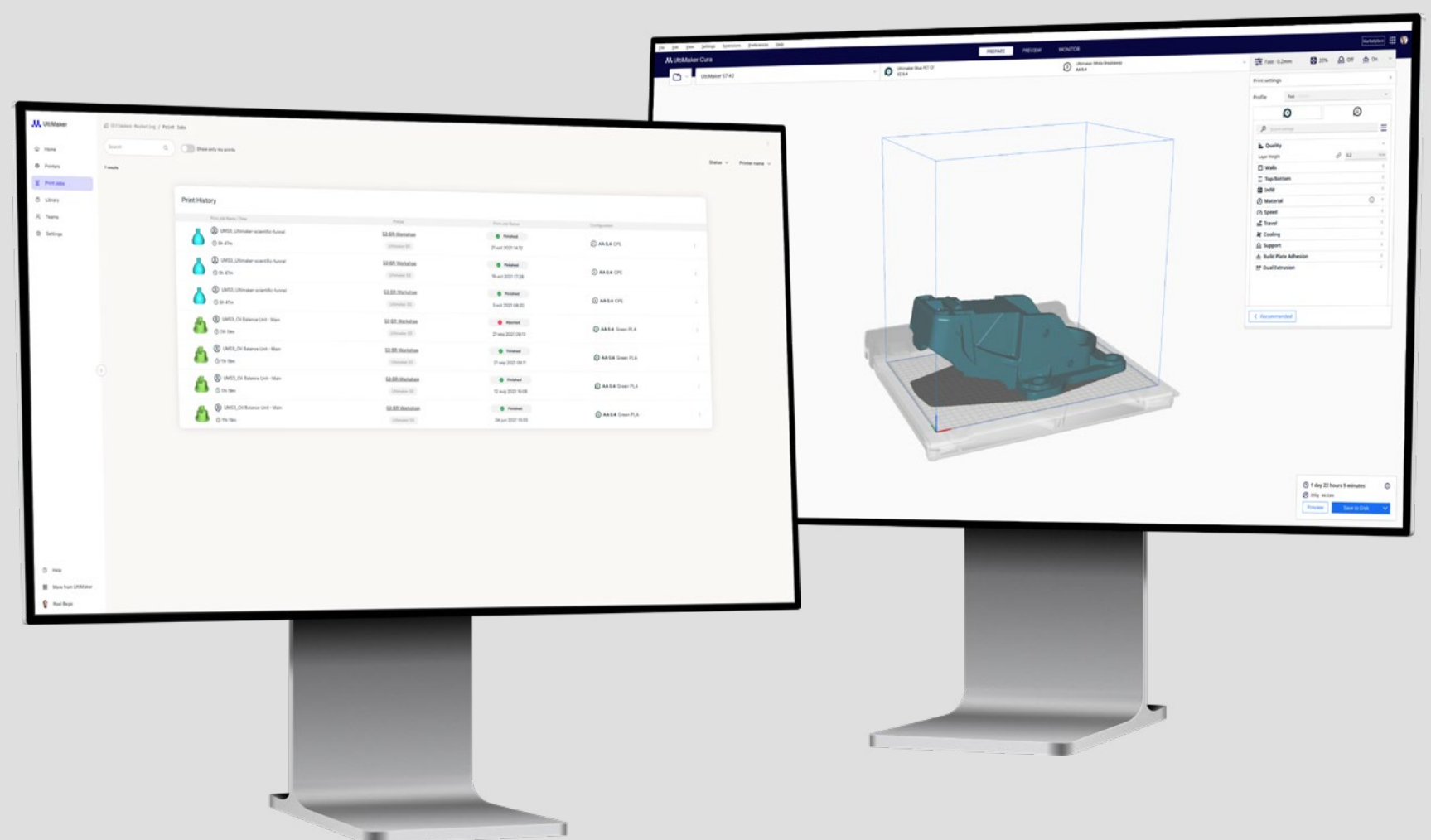
One click print with over 240 materials

The widest range of materials on the market, enabling innovative and complex applications. Our high-performance materials are tested for reliability and accuracy, while the broad selection of certified options expands possibilities for various applications.



Secure cloud software for easy remote printing

A secure and streamlined platform for preparing, organizing and monitoring your 3D printing operations. 3D printing software trusted by millions of users. Fine-tune your 3D model with 400+ settings for the best slicing and printing results.



Over 1000 years of accumulated knowledge

The expertise of hundreds of people with over 10 years of experience ready to help you. Our dedicated customer support and application engineer teams multiply the value of UltiMaker products with their knowledge.

