

THE END OF OBSOLESCENCE?

The ability to print parts on demand anywhere in the world could help organisations avoid the costly threat of obsolescence, says Andreas Langfeld, Chief Revenue Officer at Stratasys



Cover image: 3D-printed grab handles installed on a train (source: Stratasys)

There is a paradox at the heart of industrial sectors such as defence, aerospace, and manufacturing that has historically been challenging to address. Complex equipment made by OEMs can last for many years, but internal components often have much shorter life cycles. What happens when a spare part, critical to overall system functionality, suddenly becomes unavailable? Operations halt, costs spiral, and equipment worth millions can become unusable.

According to a report by [The Economist Intelligence Unit](#), organisations have experienced financial losses averaging 6–10% of annual revenues due to supply chain disruptions, which often include obsolescence of parts and components. Parts can become unavailable for various reasons: logistics bottlenecks, product discontinuation, or suppliers exiting the market. Whatever the reason, the impact is the same – considerable disruption to operation.

But what if there was another way of duplicating spare parts – by printing them on demand, wherever they are needed? Such an approach would provide a means of recreating parts that are no longer available to buy, and in doing so, making

obsolescence obsolete. Some companies, such as Siemens Mobility, are employing the exact approach of 3D printing replacement parts on demand, allowing them to gain better control over spare parts while saving time and money in the process.

How to print spare parts without delay

So, how exactly does additive manufacturing solve the obsolescence problem? First of all, a decision needs to be made over whether additive manufacturing is a viable production technique for the part in question. Additive manufacturing is a broad term that encompasses a wide range of technologies with varying capabilities, utilising a diverse array of materials, including polymers, metals, and ceramics. However, despite this adaptability, some parts may not be suitable for additive manufacturing due to factors such as mechanical properties, part size, surface finish, or production volume requirements.

Once viability is established, the next consideration is whether or not a digital representation of the part in question exists. When original Computer-Aided Design (CAD) files are unavailable, as is often the case with older parts, manufacturers must create digital models through reverse engineering using 3D scanning technology. The resulting point cloud data must be processed through multiple steps, including mesh generation, optimisation, and creating a file suitable for 3D printing, often with design modifications to improve printability and performance.

Alternatively, a digital model of the part might already exist. In these cases, the models typically originate from CAD packages and may be available online or in company archives. The digital model must then be prepared for printing – this process involves converting it to a suitable file format, such as STL or 3MF. The file is then transferred to a 3D printer for production.

Depending on the type of printer used, the component may require post-processing after the print process to enhance its aesthetics or mechanical properties. This may include heat treatment to relieve residual stresses or polishing to improve the surface finish. The component would then be ready for installation as required.

The advantages of this approach are clear: printing on demand means obsolescence is no longer an issue, while large quantities of stock do not need to be held indefinitely to support long-life equipment.



Image 1: 3D-printed rail gauge (source: Stratasys)

Siemens Mobility leads the way

Several forward-thinking companies have already embraced this approach, demonstrating its real-world effectiveness across various industries. [Siemens Mobility's](#) Rhine-Ruhr Express (RRX) Rail Service Center in Dortmund, Germany is a case in point. At this facility, a hundred trains undergo maintenance every month. This level of throughput requires robust manufacturing solutions to fulfil wide-ranging repair and servicing needs. On-demand, customised production is particularly important in the rail industry, as vehicles that have been involved in an accident or vandalised typically arrive at the depot unplanned.

The Siemens Mobility team has been using a Stratasys Fused Deposition Modelling (FDM) machine to 3D print replacement parts on demand. It has already witnessed tangible benefits, alleviating concerns about obsolescence and increasing its flexibility to meet customer requirements. The RRX has 3D-printed multiple replacement parts, resulting in significantly lower turnaround times than would have been possible using traditional manufacturing methods such as casting. This approach has reduced the downtime of trains waiting for parts and significantly cut warehousing costs. Siemens does not need to stock parts that are critical to have, but only occasionally need to be replaced.

Obsolescence can also impact tooling by making it difficult or impossible to repair or replace broken or worn-out tools. Therefore, the RRX Rail Service Center is also using additive manufacturing to enhance its tooling capabilities and mitigate the lengthy lead times associated with traditional production methods. The ability to 3D print customised connector tools used to maintain train chassis and wheels allows Siemens Mobility to be much more agile in production and accelerate maintenance and repair times.

Militaries producing parts at the push of a button

While industrial companies like Siemens are pioneering commercial applications, militaries in countries such as the USA, UK, Spain, Germany and France are also recognising the potential of additive manufacturing to improve operational readiness. Most ministries of defence globally have a vast fleet of ageing equipment, and budget constraints mean they have to make it last longer. Many systems and solutions date back to the 1980s, making it increasingly difficult to obtain the required parts. In some cases, the original equipment manufacturers no longer exist. Therefore, AM provides significant opportunities to 'print what you need,' helping militaries overcome obsolescence in the supply chain.

The UK Ministry of Defence, for instance, has an inventory of 1.3 million items. A [recent report](#) says that the opportunity for AM to provide an alternative supply source for obsolescent items is substantial. Even with the most deliberately cautious estimates, the report suggests that if 15% of the defence inventory were additively manufactured, the net financial benefit would be £110 million over the next 15 years, with a net value per year thereafter of £ 35.5 million. That is a considerable amount of money, now and in the future.

The report provided an intriguing vision of the future, where military units can rapidly manufacture replacement parts on demand through mobile capabilities or by enhancing supply chain resilience. The authors teased a multi-pronged strategy starting at the component source, where parts are either designed for AM from the outset or reverse-engineered to enable a part that is no longer available to be additively manufactured. Meanwhile, a digital thread would allow the secure transmission of the information required to manufacture a part from a design library at the point of need. Mobile AM production units on the frontline would provide a network of global manufacturing 'spokes' enabled through information sourced from designs delivered through the digital thread, with a return loop to allow recycling of material as part of a circular economy.

The operational readiness potential of additive manufacturing is driving similar initiatives across Europe. A recent article in the [Handelsblatt business newspaper](#) discussed how the German armed forces are investing in 3D printing. The Bundeswehr,

for example, is testing 3D printing on board the frigate "Sachsen." According to the article, the pilot study involved housing parts and brackets that frequently fail during missions, which were produced as spare parts on the ship. Production took place in high volumes, in rough seas and salt spray. Meanwhile, another project previously occurred at the Mazar-i-Sharif field camp in Afghanistan. A containerised printer was put into operation to produce components on-site. The proof of concept was achieved with the printer functioning well in the heat and dust.

Meanwhile, for defence manufacturers, the use of additive manufacturing across activities such as prototyping, production, and tooling provides a flexible means of ramping up manufacturing output of platforms and armaments. This is a critical consideration as defence budgets rise worldwide and new orders are placed.

Making obsolescence obsolete

In conclusion, obsolescence remains a significant challenge across various sectors, including aerospace, defence, and manufacturing. Without access to parts, companies and militaries can encounter production delays, rising costs, and equipment downtime.

In certain circumstances, additive manufacturing can offer a flexible and sustainable solution to this challenge. It can result in the quick and cost-effective recreation of critical components, on demand. Indeed, for the right part in a suitable material, additive manufacturing holds the exciting potential to make obsolescence obsolete.