

AM Forum – Show Report

Unlike the previous week's shows - Automatica and Laser World of Photonics in Munich - AM Forum in Belin was small - even intimate – with just under 1000 attendees and 75 exhibitor stands outside the conference hall. The smaller size of the event was beneficial for exhibitors who felt that attendees “had their guard down” and it was a unique opportunity for international attendees to reach an audience they would not normally have found easy to connect with. Conversations during the frequent network breaks were unhurried and candid between additive users and solution providers.



Figure 1 The conference and exhibition have a relaxed, uncrowded atmosphere – good for deeper conversations

Sustainability was a common theme for many of the panels and presentations. There are justifiable claims that some companies are greenwashing and talk on stage was at times rather vanilla. The best soundbite came from Joris Peels who claimed sustainability was like “going to the gym, everyone’s soul is pure”, but following through is often problematic. Sherri Monroe, from the Additive Manufacturing Green Trade Association, said business economics and sustainability can track together rather than a view where “no-one’s interested in taking their medicine”. Stefanie Brickwede, head of AM for German rail giant Deutsche Bahn, said they planned to release 110 million Euros into their business by converting 10% of their 1.1 Billion Euro warehoused parts into “print on demand” digital inventory.



Figure 2 Sustainability in a Volatile, Uncertain, Complex and Ambiguous World had some interesting insights during the many presentations and panels, especially when viewed as returning value and maximizing resource, instead of simply a cost burden

Eliminating the waste of warehousing parts certainly promises huge returns if the dream of digital inventory can be achieved. Deutsche Bahn is banking on its suppliers to invest more in 3d printing technology, as well as for the required post processing capability to exist close to the point of use. Angeline Goh from Shell Global Solutions also hopes to use local infrastructure to print and finish parts around the World – the vision is not that every oil rig or process plant would have its own capability, but that this would exist nearby. However, the digital thread is often broken when parts must move between machines, much less between companies. A final insight on the challenge of achieving digital inventory was the printing process itself may sometimes have its lead time advantage throttled by not having a suitable (size/material) substrate to print on (for larger parts made using Directed Energy Deposition).

Sustainability generally has a longer and broader frame of reference than lean manufacturing principles. However, viewing sustainability as an opportunity to improve business performance vs seeing it as a cost burden can transform the “going to the gym” lethargy. Sherri Monroe talked about how additive manufacturing would fundamentally enable certain new technologies that will have a positive impact on society. The printed components might be expensive, but the systems they enable will have long term environmental benefits. This total cost of ownership model can be hard for a company, and even a country, to adopt. Health care is an example where more expensive treatments and personalized devices may have lower societal costs but can be hard to introduce when the only KPIs are next year’s budget figures.

Selecting the best parts for 3d printing at agricultural and construction equipment giant CNH has evolved from a simple “engineering” analysis based on cost/quality, to a total cost of ownership analysis. Now supply chain issues such as minimum order quantity vs predicted spare part demand, and tooling cost are considered. A family of parts approach is then taken to identify similar clusters of parts suitable for printing vs conventional manufacturing.

Perhaps the most inspiring story around adoption of 3d printing came from Marcus Goehl, plant manager at a Siemens facility in France making advanced flow meters. Marcus told how some of his 800 employees came to him and asked for a new way of solving production headaches. Instead of designing a solution and then having it reviewed, approved, and procured from outside suppliers, they asked if they could simply print a solution in-house with no order process rules or restrictions. Marcus (bravely) agreed, and his plant moved to focus almost entirely on the speed with which a solution could be printed, versus keeping printers at high utilization. The results were dramatic. Solutions were tried within days, and then an improved solution was tried. Instead of waiting months for one external solution with a moderate return, in-house printed solutions delivered immediate benefits. The improvements accumulated with each cycle of printing, just as you would expect with an engaged user workforce. Marcus went from having just 3 or 4 printing experts to having over 40 employees involved in 3d printing improvements. Any manufacturing company can follow this approach, as nowhere were finished parts being printed, just solutions to manufacturing problems.

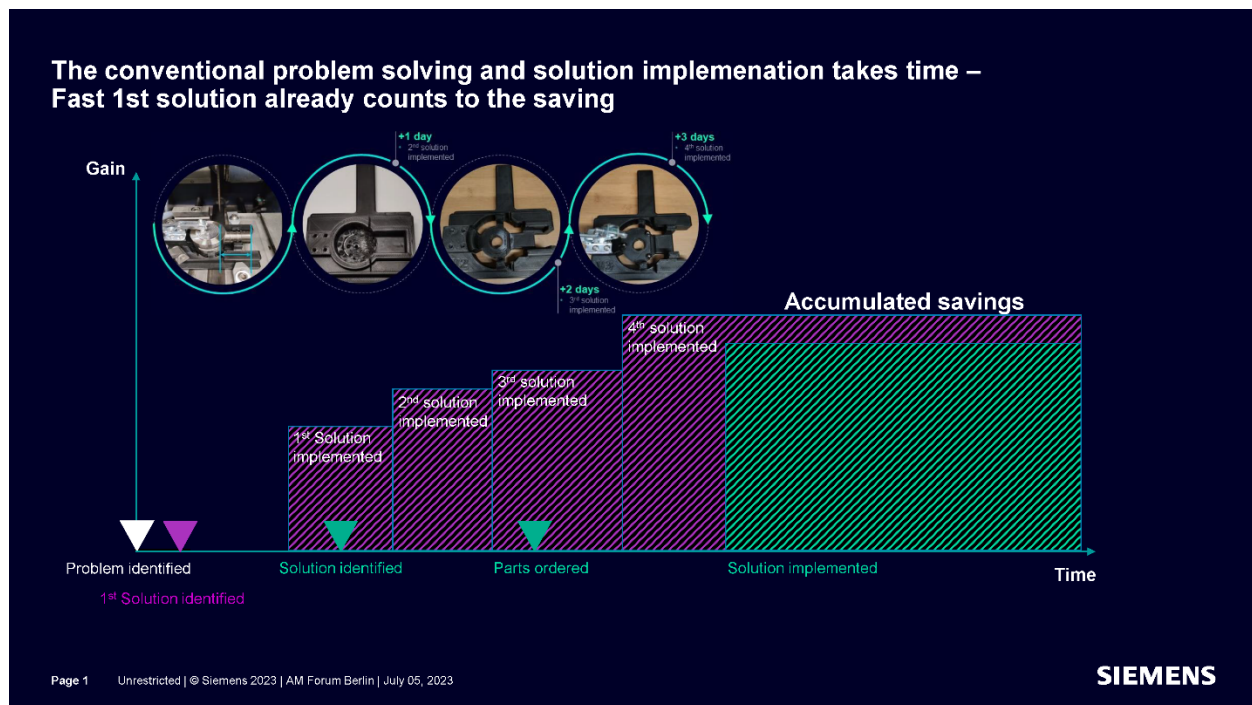


Figure 3 The purple power of printing better solutions, sooner – a brilliantly simple story told by Marcus Goehl from Siemens

Matthias Schmidt-Lehr from AMPower gave a short summary of the AM market from their 2023 report, showing that revenues were continuing to rise, with equipment sales expected to show compound growth rates of 25%, rising from roughly 0.5Bn Euros in each of the major regions (Europe, Americas and Asia-Pacific) to over 1.0Bn in each market by 2027. Metal feedstock looks to have even stronger growth at 40%, although global consumption for printing is still far below that consumed by press and sinter processes. Matthias also showed an interesting study of European additive manufacturing hotspots. 3 key ingredients were deemed essential to create a hotspot – the presence of universities, startups and finally user demand to drive application development. Munich and Barcelona were almost tied for largest hotspot by total employee count (both with around 2500), and Berlin had the largest number of AM companies at 44.

Technology Snapshots and Snippets

Postprocessing of metal parts after printing remains a significant challenge, both technically and economically, with claims that up to 40% of a product cost is incurred during eg machining, heat treatment, inspections etc. that all happen after printing. Holding high value printed organic shapes for finish machining - both rigidly and without distortion - is not straightforward. Modular clamping for a printed metal manifold was shown by AMF. Alongside AMF's booth was Berlin based Trinkle, showing their CAD fixture product Paramate, for designing work holding nests suitable for polymer printing. Perhaps combining the reusability (and rigidity) of modular clamping elements with an easy-to-use CAD layout design tool could be a winning combination?

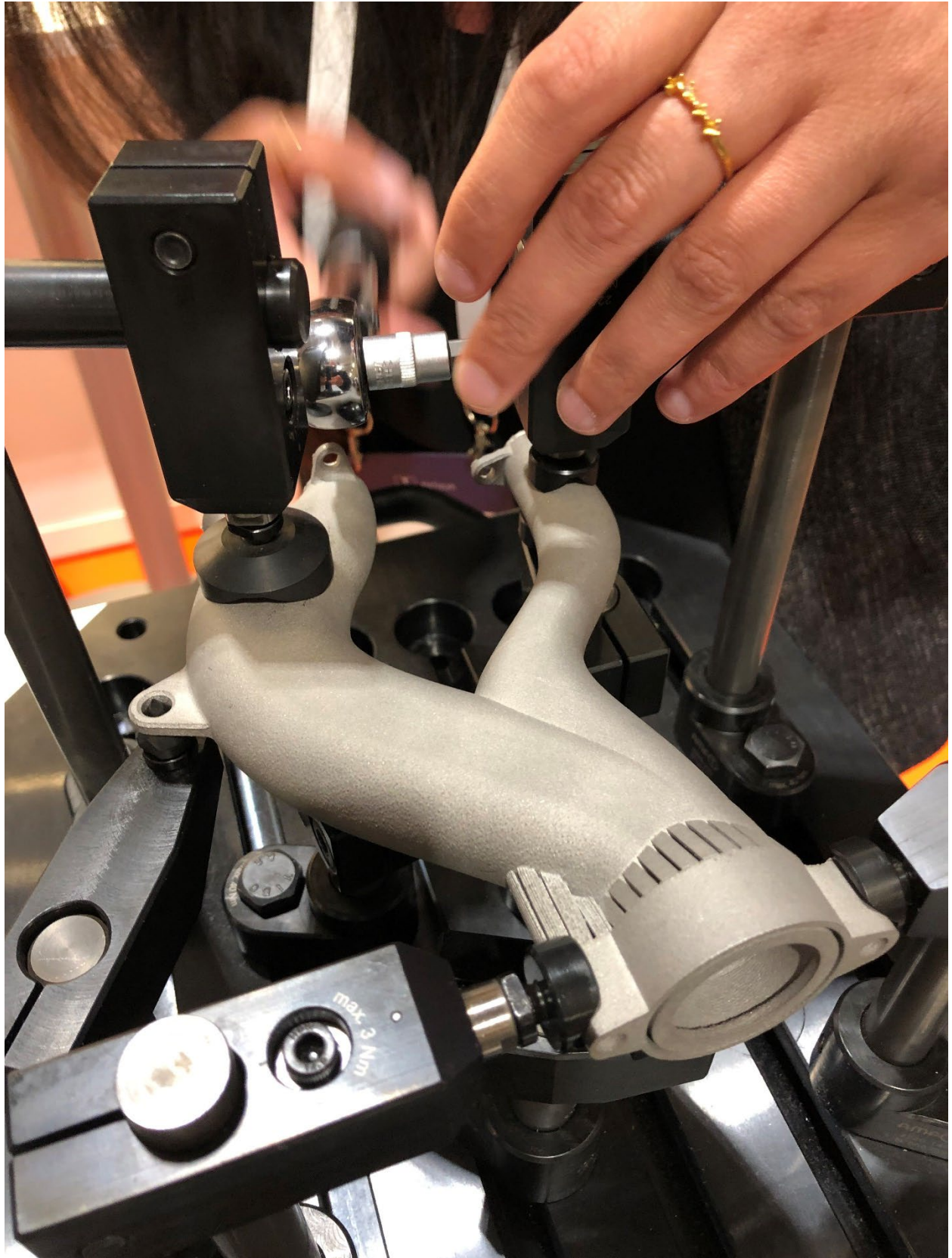


Figure 4 Modular fixturing from AMF for clamping metal additive parts prior to finish machining

Universities and research organizations were well represented at AM Forum. Laser Zentrum Hannover (LZH) had displayed a model of their MOONRISE laser package for melting lunar regolith at Laser world of Photonics. When asked what other exciting (possibly nearer term!) ideas they were working on, the LAMUC program was mentioned - combining additive with high precision trimming using a pulsed laser.

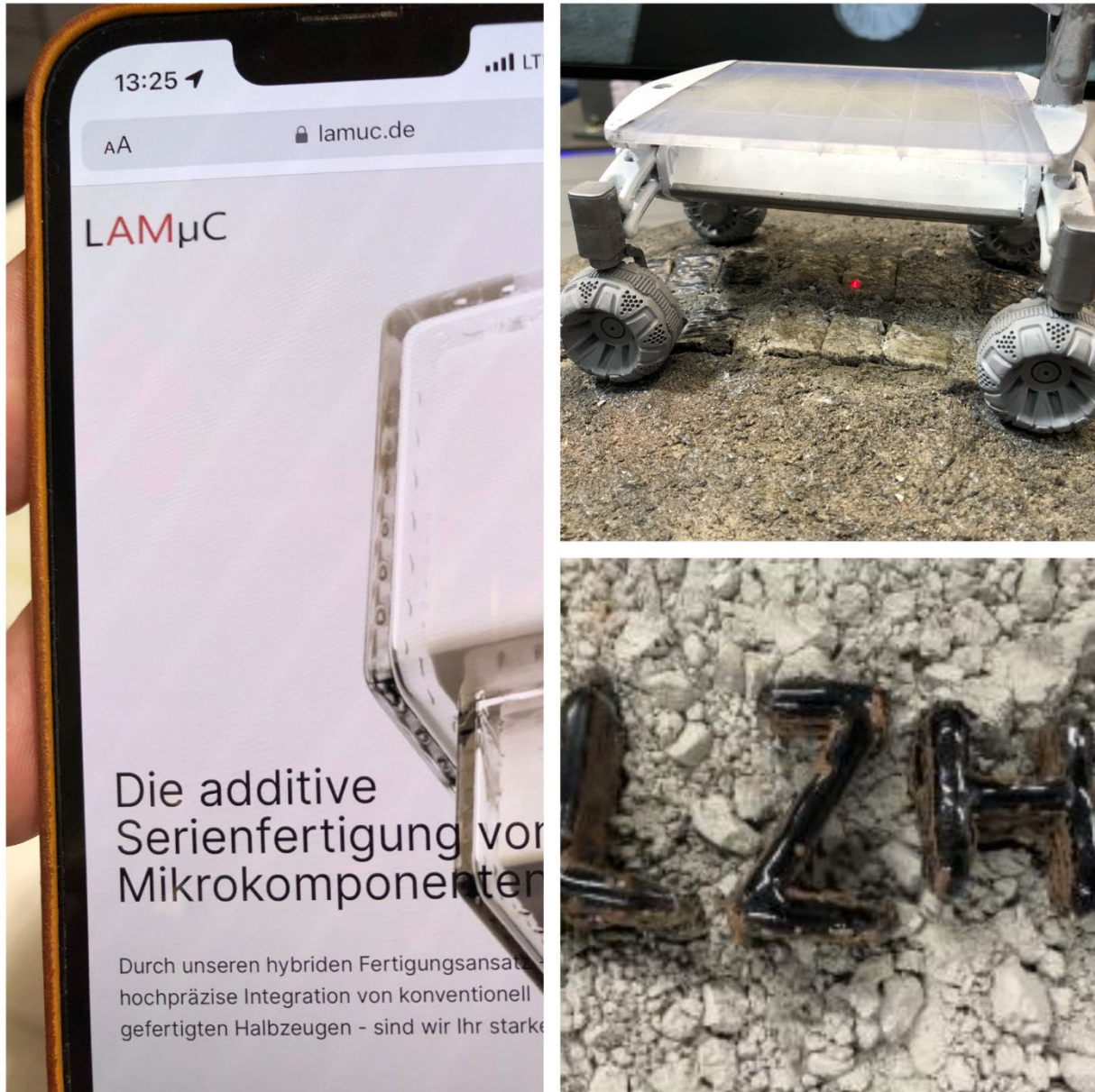


Figure 5 Developing low power, lightweight laser packages for melting lunar roads, as well as more immediate innovation with the LAMuC programme were shown by the non-profit photonics and laser research institute Laser Zentrum Hannover

Elsewhere innovative designs for electric motor components and new materials were shown by DMRC (Direct Manufacturing Research Center) from the University of Paderborn. A very ambitious program to predict AM component performance using limited coupon testing, process monitoring, physics simulations and machine learning was outlined by Fraunhofer with their AMCOCS platform. Series production parts in Ti6-4 made with binder jet were shown by Lea Reineke from Fraunhofer IFAM in

Bremen. Lea said the development of novel binders was critical to success, along with physics-based software prediction of shape change during sintering. There will be a workshop devoted to sinter based additive manufacturing this Sept 13-14 at Fraunhofer IFAM.



Figure 6 Novel electric motor designs and new materials from DMRC, the ambitious AMCOCS (Additive Manufactured Component Certification Services) and serial production binder jet parts in Ti6-4 from Fraunhofer IFAM

It can be intimidating to walk up to a Fraunhofer booth, knowing the caliber of the highly qualified people who work for this powerhouse organization. However, picking up some parts from the display and asking, “what is your favourite story?” is a great icebreaker and often starts a very different, more human conversation. Paul Wegwerth, Head of AM Polymers at Fraunhofer IAPT was a perfect example, when he explained how their team had developed a novel process - LuMEX (Laser Assisted Material Extrusion) - for dramatically improving the surface finish during FDM printing. Not only is surface finish

improved, but material properties are more isotropic, and parts can be watertight – all without increasing print time as the patented process uses a ring of diodes around the extrusion nozzle.



Figure 7 You meet the nicest people when you stop and talk to them! Paul Wegwerth shared his story on LuMEX improved FDM parts, and Tatjana Dams explained how Fraunhofer was helping restore the mobility of fingers with damaged joints via its FingerKit project.

So is AM Forum 2024 for you? If you want a relaxed atmosphere to talk with some key customer targets or niche suppliers, then yes. As for all international exhibitions it's important to have a plan before you even book a plane ticket. Set up a few meetings with some of your existing German customers (nothing beats face to face for deepening a relationship). Schedule some aspirational (longer term) preliminary meetings, take in some of the presentations and panels. Always stop at the booths and listen to the story that the people there want to tell – it's almost never what you first think when you walk past!

Is AM Forum value for money? At nearly 1000 Euros and with fewer than 1000 visitors (nearly all from Germany), and less than 100 exhibitors, it certainly seems expensive in comparison to a show like Automatica where a 4-day ticket cost 70 Euros, with 41,000 visitors and 650 exhibitors! Berlin is obviously an attraction by itself (as is Munich). Ultimately the AM Forum is probably best described as an acquired taste for the strategically focused additive business, while Automatica is literally a crowd pleasing 10/10 event for almost anyone in manufacturing.



AM Forum
Berlin



automatica

