

FROM ADDLAB TO ADDFAB

Three years ago, Additive Industries opened the doors of AddLab in Eindhoven, the Netherlands. Eight partners from the manufacturing industry joined this pilot plant for 3D metal printing, which became a hot spot of the Dutch additive manufacturing (AM) industry. Last month, the AddLab initiative officially ended and continued as AddFab, aimed at moving from the laboratory to industrial fabrication. KMWE, NTS-Group and Machinefabriek de Valk will run together the new AddFab.

1 The official handover from AddLab to AddFab. From left to right, Edward Voncken (KMWE), Daan A.J. Kersten (Additive Industries), Marc Hendrikse (NTS-Group), John Hagelaars (Machinefabriek de Valk), Arno Gramsma (KMWE) and Remco Pennings (Additive Industries). (Photo by Harry Kleijnen)

AddLab was the first Dutch 3D printing pilot factory for the production of industrial metal parts. It was built on the ambition to develop a broad range of high-tech and high-end manufacturing applications for 3D metal printing. As a privately funded, shared facility, AddLab was run by a team of AM professionals who supported the partner companies in the exploration of the AM technology and the production and supply of 3D printed metal parts for end-users. The success of AddLab is reflected by the fact that all partners will continue to invest in AM, each with their own focus and vision.

New initiative

As of 1 October 2016, KMWE, NTS-Group and Machinefabriek de Valk have officially continued their AddLab collaboration within a new initiative, the privately funded AddFab. Their former AddLab partners Frencken and MTA remain involved as second-line parties for the 3D printing of parts. The ambition for this shared printing factory is to develop world-class metal AM applications by creating lighter, compact, integrated, more complex 'functional' products and parts with better performance/characteristics. The AddFab facilities include various high-end 3D printers, a heat treatment oven, a 3D scanner and more. Additionally, AddFab is backed by the manufacturing and qualification capabilities of the partner companies.

AddFab is located in Eindhoven, currently on the Strijp-T industrial estate, and is set to move to the Brainport Industries Campus; the green light for realisation of this future home of the high-tech manufacturing industry in the Dutch Brainport region has recently been given. "Our move from Strijp-S, where Additive Industries has taken up all of the AddLab space, to Strijp-T really is an intermediate step", Edward Voncken, CEO of KMWE and one of the driving forces behind the Brainport Industries Campus, says. "On the campus AddFab will become part of the shared facilities in the so-called Atrium. AddFab will retain the way of working of AddLab for another period of three years. Through collaboration and risk sharing we want to strengthen our leading position. When AddFab has become a success, KMWE and Machinefabriek de Valk may open up an industrial print factory within their companies."





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2 Example of the freeform design and realisation of a heat exchanger. Pictures provided by Machinefabriek de Valk

Industrialisation

“We have shifted our focus, hence the new name, towards fabrication, industrialisation, quality management and commercialisation”, Arno Gramsma, director of the KMWE 3DP business unit, explains.

“We want to build on what has been learnt from AddLab and produce industrial cases that can set engineers thinking and convince customers of the potential. For conventional manufacturing, such as machining, the level of knowledge and experience is very high and standards have evolved, but even there discussions about design and manufacturability occasionally arise. For 3D printing we have to go through a similar learning curve, but hopefully it will be steeper. The design consequences for serial production and post-processing have to be considered carefully. For example, preparing a printed product for post-process machining requires a zero position for reference; its definition is not self-evident in the case of an organic design. And will shot peening work for complicated structures with holes and cavities? Also, the supply chain will have to be prepared for the 3D printing of parts. Etcetera, etcetera.”

AddFab will extend the collaboration with software companies and educational partners. Education and training will be an important task of AddFab, Gramsma continues. “We have to train engineers to take a different perspective on the design and the lifecycle of products. When to use 3D printing, and when conventional, subtractive production methods, such as machining for highest accuracy? How to ‘build up’ material to create a hole instead of drilling it? We

also have to educate our future customers, show them what is possible with 3D printing and what is not. They have to understand the business case, for example lowering the total cost of ownership. Therefore, AddFab also has to take on the consultant role.”

Design principles

In its three years of existence a great deal has been learnt at AddLab, Jeroen Jonkers, design engineer of NTS-Group, confirms. “We have explored all the relevant aspects of AM, for a large variety of products, materials, applications and post-processing options. We have solved many issues and now have a clear perspective of the possibilities. Individually, the partners could not have reached this level. Now, in AddFab we want to refine our knowledge and extend our experience to industrial applications.”

One of Jonkers’ goals, from the NTS-Group perspective, is to apply design principles in AM designs to develop high-tech mechanisms. Such mechanisms may contain, for example, leaf springs and struts for high-precision positioning. Jonkers: “The advantage of 3D printing is that you can design lightweight yet stiff parts with organic shapes which avoid the build up of stress and strain concentrations. We already produced a monolithic alignment mechanism with four degrees of freedom, which has an amazing number of functions united in one part. It is nice to see that system architects can come up with theoretical design concepts which can actually be produced. 3D printing bears the promise of becoming a serious production technique for fine mechanics.”



3 AddFab is making the transition from the lab to the fab, from pioneering with 3D printing designs and processes to industrial applications and series production.

Quality management

With the handover from AddLab to AddFab the years of pioneering have come to an end, Edward Voncken states. “We have made large investments, which have resulted in a lot of knowledge but no significant turnover yet. 3D metal printing has been a hype for a long time, but now the market signals a transition from the lab to the fab. Airplane manufacturers are taking the lead. Airbus has selected parts for 3D printing, and GE already uses printed parts in the construction of engines. Moreover, it has recently taken over the printer manufacturers Arcam and SLM Solutions.”

Nowadays, quality management and validation of printed parts are crucial issues, according to the AddFab partners. Parts built up from powder differ in their material properties from products machined from bulk. Supplying the product with a material certificate attached does not make much sense for 3D printing, as end product properties will be different from the powder specifications. Engineers, but also quality managers and certifying bodies, have to get used to that fact and qualifications processes have to be reconceived.

Voncken concludes: “So the concept of making a design and sending it online to an arbitrary print shop is not yet feasible. It will take some time before ISO standards for 3D printing are in place.” Therefore, the three AddFab partners promote the Brainport Industries Campus as a place to be for industrial 3D metal printing.

AddFab founding fathers

KMWE

KMWE, headquartered in Eindhoven, the Netherlands, is a supplier for the high-tech equipment industry and the aerospace industry, specialising in the high-mix, low-volume, high-complexity machining and 3D metal printing of functional critical components, and in the assembly and engineering of fully tested mechatronic systems.

The KMWE 3DP business unit offers engineering and 3D metal printing services and supports its customers in the technical and commercial trade-off between the unique 3D printing feasibilities and the established machining technologies. The 3D printing services include topology optimisation and engineering, prototyping for both 3D printing and machining, and business case validation.

WWW.KMWE.COM

NTS-Group

As a first-tier supplier Eindhoven-based NTS-Group develops, manufactures and optimises opto-mechatronic systems, modules and components for international, leading and high-tech OEMs that develop and market high-mix, low-volume, high-complexity machines.

For 3D printing, NTS-Group has various interests. Firstly, applying the AM development knowledge in designs for customers when it has added value.

Consequently, the manufacturing with 3D printing in-house in order to support NTS-Group's understanding of 3D printing in development. In parallel, NTS-Group is a development and construction partner of printing equipment OEMs.

WWW.NTS-GROUP.NL

Machinefabriek de Valk

Based in Valkenswaard, close to Eindhoven, Machinefabriek De Valk is specialised in the production of mechanical components in all common steel types, non-ferrous metals and plastics, as well as in the full production and assembly of modules and machines. De Valk offers additional services such as hardening, anodising, nickel plating, sheet-metalworking and engineering.

It is de Valk's vision that 3D printing is a design-driven innovation that indicates a radical shift in the technological perspective and will create new markets. It introduces bold new ways of competing as it can radically change the appearance and functionality of products.

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