

The 3D evolution: from prototyping to mainstream manufacturing

Held in Berlin on the 3rd and 4th of March, 2015, the Inside 3D Printing Conference and Expo attracted around 1000 professional visitors from 46 countries, eager to learn if and how so-called 3D (or additive manufacturing) techniques could benefit their own businesses. Equally curious about this emerging technology Stainless Steel World also travelled to Berlin, to see if 3D prints can be made using corrosion resistant alloys.

By David Sear

The Inside 3D Printing event was kick-started on Tuesday by Terry Wohlers, who is a recognised authority when it comes to 3D printing. For 3D newcomers (such as this particular editor) Terry's fifty-minute keynote was most enlightening as he looked at many of the topics and trends in the industry. And in passing he also confirmed that 3D printed parts can most certainly be made from stainless steels, etc, although not (yet) feasibly in the dimensions likely to be of interest to readers of this magazine.



What networking is all about! A chance meeting during the coffee-break saw Stainless Steel World talking to Mr. Andreas Pelz, whose company supplies base metals for additive manufacturing. These are mostly iron or nickel based, but aluminium and titanium are also popular. Finally, Mr. Pelz notes that products are now available in the powder form, but he expects that wires could soon also be added to the portfolio.



The show featured a two-day conference as well as a very convenient "ballroom-style" exhibition, catering and networking area.

But first things first. Terry started his presentation by indicating how much interest there is in 3D – and how quickly that interest has been translated into investments and practical applications by manufacturing companies operating in a wide range of sectors. Factors helping to drive this development include new equipment which can operate at faster speeds, patent expiration which is opening up competition, and the wide range of machines available at prices starting from hundreds to millions of dollars. He then mentioned some drawbacks that especially apply to 3D printed metal objects, and in particular large or thick section items. These include the slow manufacturing speed and the possible need for finishing treatments, such as stress relief, machining, surface treatments, etc. Interestingly, he added that some developers are looking to combine a 3D printer with CNC equipment in a single machine.



Terry Wohlers kicked off the show with an excellent "State of the Industry" keynote.



Meet the man whose presentation completely captivated the audience: Mark Trageser, President and Founder of Kram-Co, who discussed how “3D printing has changed toy design, is reinventing everything and the amazing future ahead”.

Terry also considered some of the myths that seem to surround 3D printing. Firstly that 3D is a cheap technology. Not so, he indicated, as for example base materials for plastic items can be up to 100 times more expensive than the equivalent



Laser beam melting is a powerful additive manufacturing technique, explains citim’s Peter Böttner. Giving an example, he indicates that this particular 3D structure was printed with channels inside the blades for cooling and boasts a lattice-work arrangement for a high-strength, low-weight central shaft. Try making something like this using conventional techniques!

plastics required for conventional processing. Another myth he dispelled is that 3D printing is a fast technique, citing the case of an Inconel 718 component which had a build time of 14 days! “Powder-build fusion systems are simply not that fast yet,” he stated.

Versatile

Terry’s keynote set an excellent benchmark for the show which was maintained for the next two days. It would be impossible to report on everything that was said but it is possible to draw some tentative conclusions about the current state of 3D printing. For example, this technology can be expected to capture an increasing share of mainstream manufacturing in addition to its established role in rapid prototyping. As it stands, however, 3D printing is probably not an immediate choice for the manufacture of large metallic components due to the relative cost and time requirements. Indeed, one of the main messages to come from the conference is that 3D printing enables engineers to break free from restrictions imposed by standard manufacturing techniques. This became very evident during one presentation, when the speaker put up a slide showing a typical sub-assembly that consisted of several parts, all put together with nuts and bolts. Engineers



Prof. Franz-Josef Villmer was a busy man during the show: he delivered a superb keynote entitled “Additive manufacturing: from hype to reality” and also moderated one of the “Tracks” which included presentations on nickel superalloys, the process-microstructure properties of metallic alloys and the properties of metal powders.

realised that they could in fact design and build the complete unit as a single item on a 3D printer, which saves time and money when looking at the total assembly and production process. Another fine example comes from the aerospace sector, where engineers used topology optimisation to reconfigure a specific component. Their component produced via 3D printing has the same strength as the original but requires less metal, and hence has a lower weight. So whilst the 3D item is in fact more expensive to produce, it means the aircraft is that little bit lighter. And on an aircraft, every kilo saved means that the fuel bill over the lifetime of the aircraft will drop considerably. And finally, 3D printing can manufacture ready-to-use items with complex external and internal shapes. An example in point concerns miniature heat exchangers for electronics systems which are printed in metal with internal air cooling channels. Such products simply cannot be made using conventional techniques and demonstrate the incredible versatility of 3D printing.

Inside 3D Printing

Eight more “Inside 3D” events are planned in 2015, in venues from Melbourne to Mumbai and from Santa Clara to Shanghai. For info: www.inside3dprinting.com