3DTALK: SMART FACTORIES AND 3D PRINTING

WORDS: LAURA GRIFFITHS

AT TCT SHOW 2018, WE HOSTED OUR THIRD **#3DTALK PANEL SESSION** WITH **WOMEN IN 3D PRINTING** AND **CYANT** TO DISCUSS THE CHALLENGES AND TRENDS SHAPING THE SMART FACTORIES OF THE FUTURE.

Stephanie DePalma, AddWorks Lead Engineer at GE Additive, Katy Milne, Chief Engineer for DRAMA at The Manufacturing Technology Centre, and Regan Hoult, PowderLife Apprentice at LPW Technology spoke on the TCT Tech Stage where I had the pleasure of co-moderating with Kadine James, 3D Tech Lead at Hobs 3D. Here are some of the highlights from the discussion.

What does the concept of smart factory mean to you and your current work?

Katy: The project that I'm running is called DRAMA. The 'D' in DRAMA is for 'digital' and we're building a facility at the UK's National Centre where we hope the supply chain companies will be able to come and use the machines themselves. Additive is a digitally driven process. Digitisation and getting rid of paper is one thing which I think makes sense to a lot of us. 'Smart' to me means that as you develop your process or run your process you are learning something, it's not smart if you are not learning and what I think is really interesting is how we can take that data, once it's digitised and use that to learn.

Regan: LPW has just moved to a new building so a smart factory is our every day. We have things called 'smart hoppers'. The smart hoppers have a powder eye which tracks the moisture and oxygen content, so we can track the life of the powder.

Stephanie: One of the things I love about the concept of the smart factory is the building block of it is really digital enabled and that marries so well with additive because it starts with a digital CAD file and everything throughout the entire process can be digital and if it's digital that means it can be easily tracked. If it's easily tracked that means that data can somehow be analysed and quantified to make our processes smarter.

AM is being supplemented by other emerging technologies such as robotics, artificial intelligence – what value are these technologies bringing?

Katy: The National Centre for Additive Manufacturing is part of something called the High Value Manufacturing Catapult. They recently released a paper on something called the 'digital twin' and the digital twin brings together concepts like artificial intelligence and simulation and in that they identify four applications in the factory space. One of them is process monitoring so collecting the data and having that digital process. One is process control and that can be an autonomous controlled, ▶

self-controlled factory but also remote controlled so your engineers could be on a beach but controlling the factory. The one I'm most interested in is rapid new product introduction and it's highly pertinent to AM so how can we use the data and simulation and machine learning to really accelerate that product introduction.

Stephanie, GE's Concept Laser M Line Factory is a modular machine architecture that brings set-up, production and dismantling processes together – do you think we will see a growth in these automated systems?

Stephanie: Absolutely, every customer that we talk to is hungry for the M Line Factory, I'm hungry for the M Line Factory to be released so our team can start using it. One of the benefits of it is it's primed for true AM, having some sort of volume of manufacturing such that you can establish your factory to all the lean and Six Sigma concepts and be enabled with Predix software that helps populate your data for analytical and self-correcting actions. It's also really complementary with automation so that you really reduce some of your labour and costs that goes into the printing process today.

Data traceability is one of the required components of a smart factory. Can you talk about how that can be implemented, and some of the challenges?

Regan: With the hopper, with the load cells and the PowderEye, we can track the life of the powder and we can be confident in the powder that we are selling and providing to other companies. So for example, say a part for aerospace, if something were to go wrong with that part then we can look at the life of the powder before the part was built and we can also look at the life after the part was built and we can find out where it went wrong.

Katy, the DRAMA project you're leading aims to establish AM 'test bed' facilities for aerospace suppliers – can you talk us through the benefits of being able to test these processes before implementation?

Katy: You really want to be able to print right first time and then when you're trying to validate your process, the current route to do a massive design of experiments where you might have to print the part 100 times in different parameters and that's extremely expensive, you're talking about millions of pounds potentially if you want aerospace pedigree data and so you can use machine learning and simulation to select within this and reduce the amount of waste testing that you do.

A major part of the smart factory is automation but there is a fear of automation displacing labour – can you comment on how this will impact skilled engineers?

Stephanie: I think that automation is complementary and doesn't necessarily replace jobs. When we think about the car, the first time the car came out it was very much a manual process that people had to build and assemble these cars and then came automated car production. Did that necessarily destroy our manufacturing industry and our labour force? It changed the skills that are required and some of the roles and responsibility but if anything, it just augmented the manufacturing workforce. I think it's an addition to it and maybe an opportunity for new types of jobs, I think the same would be applied for additive.

Katy: UK manufacturing is already highly automated and machine operator jobs are already quite skilled - machining is automated - so I don't think that's an issue. I think digital manufacturing generally or the opportunity of digitisation is to automate things that engineers do. For example, 30% of the work that people do in aerospace which is transactional, perhaps materials data handling, could be automated. The opportunity is amazing because we've got a massive skills shortage, those people are bored doing those transactional type jobs and they make them unhappy and so that time for us to be more productive and more creative and more innovative is just a huge opportunity.

Safety is, of course, a key concern – how are smart features helping to make manufacturing safer?

Regan: Working with powder, there are a lot of safety [concerns] around it, especially when it comes to the hoppers and decanting, so moving powder from one pot to another but with the hoppers that we've got now and the technologies, this is a lot safer for our engineers. They're not inhaling as much powder because we've got the technology now that's going to take powder from one hopper and put it straight into another. We're also being environmentally friendly because we're not using as much plastics and our hoppers are totally recyclable as well.

On AM for production – do you think better connected, smart processes are going to help us to optimise the process to get to production faster?

Katy: If it doesn't, it would just be a massive missed opportunity. AI, it's all coming on a pace and additive, they're next to one another but if additive is matured without taking advantage of those other things it would just be a ridiculous missed opportunity, I think.

Stephanie: I think additive in itself is a smart technology and needs to be developed more to work closer with some of those other technologies that are coming up next to them and like Katy said, it's a massive missed opportunity if they don't marry together to create the ultimate smart factory.