

testing and quality assurance especially for regulated industries. Manufacturing centers need to have an agile and structured order management procedure in order to fulfil the demands of high quality, rapid prototyping and small series orders.

4. Production Management

For AM to succeed, the production process itself needs to be adapted according to the pitfalls related to the specific technologies. To assure a reproducible, traceable manufacturing workflow, the task of production managers will be very different to **what was done before; from handling materials, to scheduling and ordering materials, right through to post processes.**

5. 3D Printing

The process of 3D printing itself will also introduce unique new challenges to the factory floor. Staff will **need to be retrained to use and monitor 3D printing hardware, as well as understand how to assess output.** Each system manufacturer and 3D technology comes with its own specific challenge for machine operators, which they will need to learn and supervise.

6. Post-Processing

On completion of a piece, manufacturers will need to develop new processes for unpacking and delivering final parts. The level of automation in this sector needs to increase significantly. For both powder bed fusion metal 3D printing and plastic 3D printing, the support removal processes are major pain points which need to be automated. Powder recycling, sorting and other post processes such as heat treatment, milling, colouring and finishing also need to be seamlessly integrated.

This new approach to manufacturing will require businesses to make significant changes to their processes. Making these changes requires investment and long-term planning -but failure to do so will mean 3D printing cannot reach its full potential. Without these changes there will be inconsistency in output and standards and customers will lack clarity on the right products for AM and its full potential.

Indeed, as the AM sector grows, there have been growing calls for regulation of Additive Manufacturing, to ensure customers get the best end-product – and this is especially so in highly regulated sectors such as healthcare, aerospace and automotive.

Certification will differentiate between AM businesses and industrial AM ready businesses

Manufacturing centres can't shoulder all the responsibility; technological solution providers such as hardware, software and material manufacturers need to adapt their products to the requirements of industrial additive manufacturing.

The industrial AM sector is going through a period of rapid growth. However, as Gregor Reischle, TÜV SÜD's Head of Additive Manufacturing suggests, the sector will run into a 'glass ceiling' unless it begins putting into place processes which can regulate the sector, demonstrate the highest quality, and set standards. Currently, TÜV SÜD bridges the gap of technological readiness and the proof of concept for AM manufactured products.

At present, relatively few 3D printing businesses are certified, and the market is something of a 'Wild West'. For customers, this means confusion and uncertainty – it's almost impossible to know which manufacturer, or which technology is ready for industrial AM, and which will let them down. And for manufacturers themselves, this lack of clarity over standards means they must develop their own quality standards and testing models in-house – which is costly, time-consuming and hard to verify.

Certification, therefore, is not only necessary for the industry, it's also welcome. **It will allow high quality businesses to differentiate themselves, improve customer trust and therefore allow the industry to flourish.**

At TÜV SÜD, we're actively working to improve and enhance global AM standards, and have developed our industrial AM ready initiative (i AM Ready) including training courses to help certify businesses in the sector. We've also launched the first certified industrial additive manufacturing centres for 3D printing in Germany which coincide with the DIN standard and ISO/ASTM standards. These efforts will help AM firms move the sector beyond **its glass ceiling.**

To learn more about the i AM Ready (industrial Additive Manufacturing Readiness initiative) training and services, visit <https://bit.ly/2XJBfKP>