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## Additive manufacturing on the brink of industrialization thanks to new technologies

**Munich, October 2018:** Additive manufacturing remains for many companies a niche technology: metal 3D printing is an expensive method of production that is primarily used for building prototypes and making special components for the aerospace and med-tech sectors. New technologies hold the promise of much lower costs, meaning that additive manufacturing may be on the verge of becoming affordable for mass-production applications. In their study, *Advancements in Metal 3D Printing* ([Download study here](#)), the Roland Berger manufacturing experts shine a light on the innovation potential within additive manufacturing.

"Additive manufacturing is not yet cost competitive with conventional mass-production methods," explains Bernhard Langefeld, Partner at Roland Berger. "We cannot expect any major advances from the established 3D printing technologies: the race is on for the next big thing."

The most widespread technology is powder bed fusion by laser, known as PBF-L. It involves building up a 3D component layer by layer using a fine powder as the printing medium. PBF-L is used in complex parts for aerospace applications and in prototype building, for example. The price of the technology has fallen in recent years and we can expect to see efficiency rise at double-digit rates in the period through 2020. But the costs are still 15 to 60 times as high as the cost of manufacturing identical parts in a conventional way.

**Many new technologies are ready to take off**

The Roland Berger experts focus on their study on new additive manufacturing methods such as direct energy deposition (DED), material jetting, material extrusion and binder jetting. DED is a method whereby three-dimensional parts are produced by deposition welding with wire or powder, or it can be used for repairing existing components. Material jetting works on a similar principle to inkjet printing to create metal objects through deposition of droplets of molten metal. Material extrusion involves joining powder with a binding agent to produce a rod or a kind of wire. This is then heated in a nozzle and deposited layer by layer. Binder jetting repeatedly deposits a binding adhesive agent onto the top layer of the powder bed to produce a component by building up the layers. The latter two technologies produce something called a green part that needs to be processed further.

Many of these new methods are still in the development phase and will gradually become increasingly relevant. As they do so, they will grow the market for additive manufacturing solutions partly by enabling the production of larger batch sizes. The resulting cost advantages over PBF-L can make such methods cheaper by as much as a factor of ten. "At the moment, these innovative technologies complement PBF-L. In the long term, however, they could partially replace PBF-L," predicts Langefeld. "However, we do not anticipate one single technology ousting all the rest. As we describe in the study, the future will feature a mix of different technologies, each of which will address specific needs in terms of material properties, production volumes and costs."

### **The right strategies for the right technologies**

The large variety of innovative solutions available gives manufacturing firms new options but presents them with challenges at the same time. An approach encompassing the following four steps has proven expedient for companies keen to analyze the full spectrum of possibilities in order to apply them specifically later:

- **1.Screen the full solution space**
- Given the complexity of all the technologies out there, the first step is to develop a detailed understanding of what each one has to offer.
- **2.Evaluate use cases**
- Equipped with this knowledge, companies can analyze their own product portfolio and look at whether they can benefit from the

use of additive manufacturing.

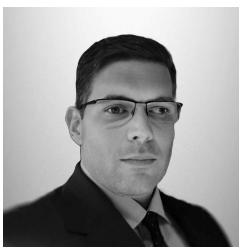
- **3.Cluster use cases**
- The individual applications can be clustered to produce a systematic overview. Companies should then develop specific scenarios for each of the clusters they come up with.
- **4.Institutionalize regular updates**
- This analysis is not meant to be a one-time thing but should be a regular exercise. Only then will it be possible to incorporate any technological improvements and innovations that occur.

"The media hype around 3D printing appears to have died down somewhat, but research and development are still proceeding apace. And the new technologies are fueling the innovation contest between all the different methods. That is why additive manufacturing should be right at the top of the agenda for engineering firms," says Bernhard Langefeld in summary.

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