oerlikon

Additive Manufacturing
The next industrial revolution

Factsheet
12.2017

AM transforms how we manufacture and deliver products

Additive manufacturing (AM), more commonly referred to as 3D printing, is a driver of Industry 4.0 and a production technology that makes a three-dimensional solid object of virtually any shape from a digital model. The flexibility of digital design and that the item is created layer by layer (additively) opens up entirely new ways of designing and manufacturing products. In powder bed fusion processes for metal AM a laser or electron beam energy source melts a powder metal material to create a solid form.

Advantages of AM

Faster time to market — AM provides a fast track from concept to production, where complex objects can be manufactured in a single process step.

Optimized design and high complexity — AM allows highly complex designs in new geometries and materials to be developed.

Shorter innovation cycles – Innovations are designed, developed and tested more rapidly, eliminating the need for expensive and time-consuming part tooling and prototype fabrication.

Performance enhancement — AM manufactured parts can be designed with new properties, features or materials to improve performance.

Elimination of production steps — AM lowers cost of manufacturing by reducing outlay on high-value materials and shortens lead time.

Perfect for mass customization — AM's flexibility and customization at low unit costs make AM optimal for small production batches and mass customization of components and parts.

Less waste — AM allows for the efficient use of materials where material needs and costs can be reduced by up to 90%. No more scrap needs to be disposed of, and it requires fewer tools, molds and fixtures, saving resources.

Shorter supply chain — AM makes it possible for production to be done near the final destination, which leads to savings through reduced sub-suppliers, transportation and warehousing.

New business models — Parts or entire products can be built on demand that has enormous implications on how manufacturers design, build, and sell their goods.

On demand after sales service — Replacement parts are printed only when needed and wherever needed, reducing transportation, warehousing of spares and service costs.

AM Market at a Glance

The AM industry is advancing beyond its prototyping past toward an industrial production future. It is fast growing and a cost efficient solution for next-generation industrial applications.

Total AM market size 2016 in USD

6.063 billion

~10–15% is metal AM

CAGR 2013 to 2016

28%

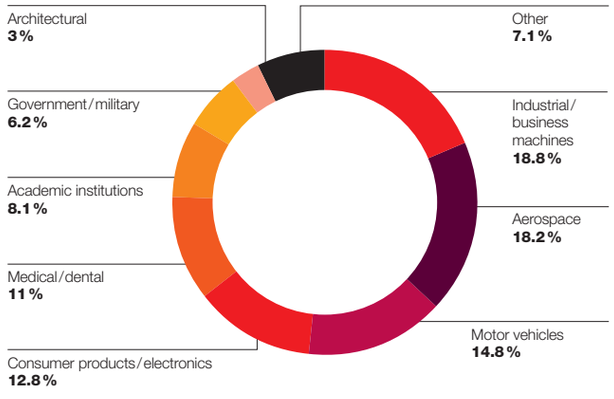
Estimated total AM market size in 2022 in USD

26.2 billion

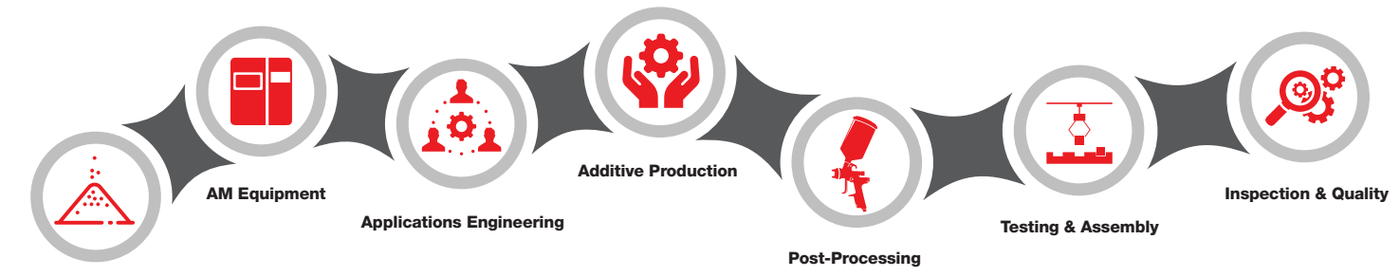
~20–25% is metal AM

Industries using AM and approximate revenues in % (2016)

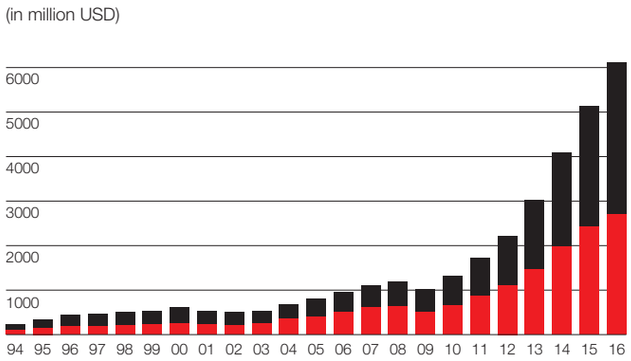
For much of the last decade, consumer products and electronics has been the leading sector adopting AM. Since 2015, industrial/business machines took the lead while Aerospace grew by 1.6% and motor vehicles grew by 1.0% in 2016.



The AM Value Chain



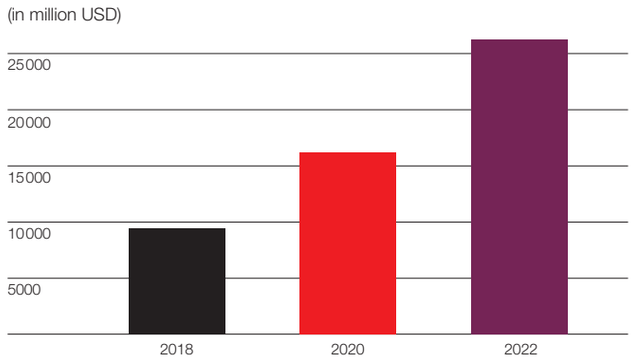
Revenues for AM products and services in the past years



The lower red segment of the bars represents "products", while the upper black segment represents "services".

- In the past 6 years, the AM industry has seen significant growth.
- About 44 percent of industry revenue, or $2.669 billion, was from hardware sales. Revenue from additive manufacturing services rose by 21.2 percent, to $3.395 billion.
- One of the fastest growing segments in 2015 was metal additive manufacturing machinery; unit sales jumped by 18.4 percent. Sales of additive manufacturing materials reached $903 million, more than double the level of 2012.

AM Market Forecast



By 2018, the sale of AM products and services is forecasted to be around $9.5 billion, and to reach nearly $26.2 billion by 2022.

Current AM challenges

Whilst AM has great potential, it has only gained broader usage in recent years. To accelerate the adoption of AM, there will need to be improvements in areas such as:

- **Size limitation:** size of components to be produced depends on machine chamber size
- **Printing speed:** time consuming printing process
- **Software:** most existing CAD software is designed for traditional manufacturing techniques and, therefore, difficult to use
- **Materials:** the range of AM materials and optimization of their properties is still limited
- **Standardization:** international standards and practices at early stages and need to be developed to help the technology to advance
- **Skills:** too few experienced specialists and trainings available for AM process
- **Automation:** lack of automation of AM process

All market data are from the Wohlers report 2017.