

Additive Manufacturing in Automotive Industry:

Past, present and future challenges

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Salon Metalelektro Oy
17.03.2021

SME Elektro-Group

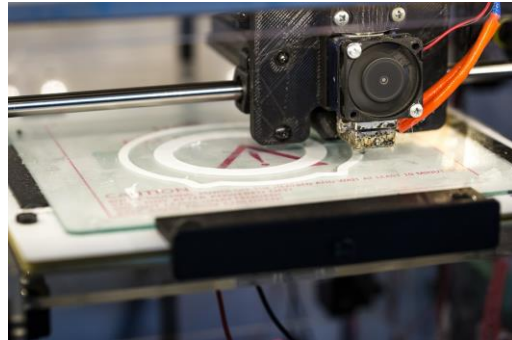
MEKANIIKAN JA ELEKTRONIIKAN SOPIMUSVALMISTUSTA

- Two companies
 - Salon Metalelektro - 1971
 - Mechanical subcontracting
 - ISO9001:2015
 - Sorv-Elektro - 1986
 - Electronics subcontracting
- Finnish family-owned
- Additive manufacturing since 2020
 - Metals
 - Polymeers
 - Composites
- Video: <https://www.youtube.com/watch?v=-prm0sUHs4A>

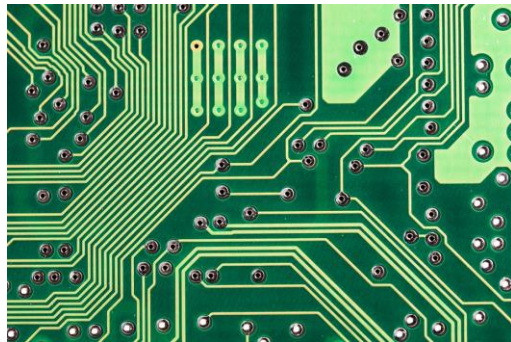
**SALON
MetalElektro Oy**

Sorv-Elektro Oy

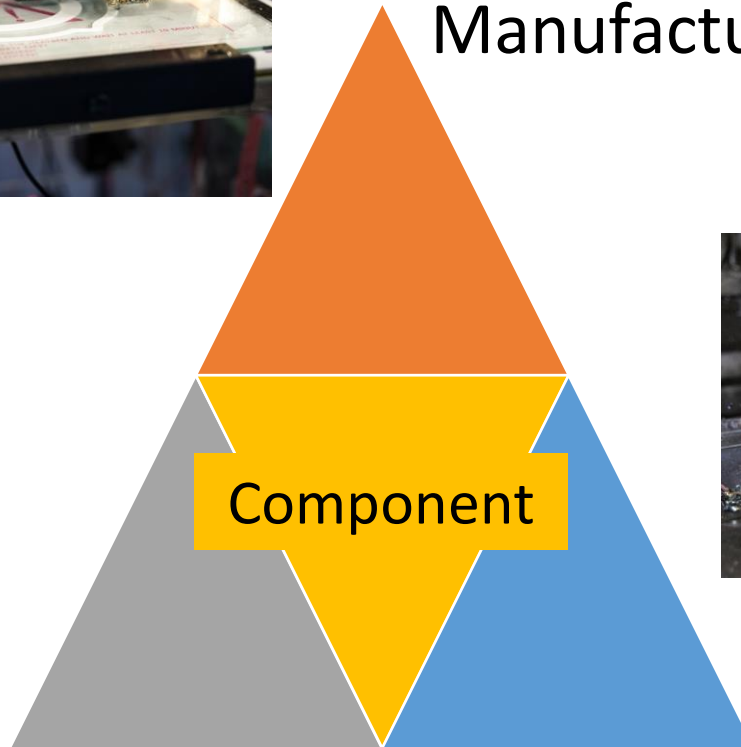
SME Group - Unique Value Proposition



Additive
Manufacturing

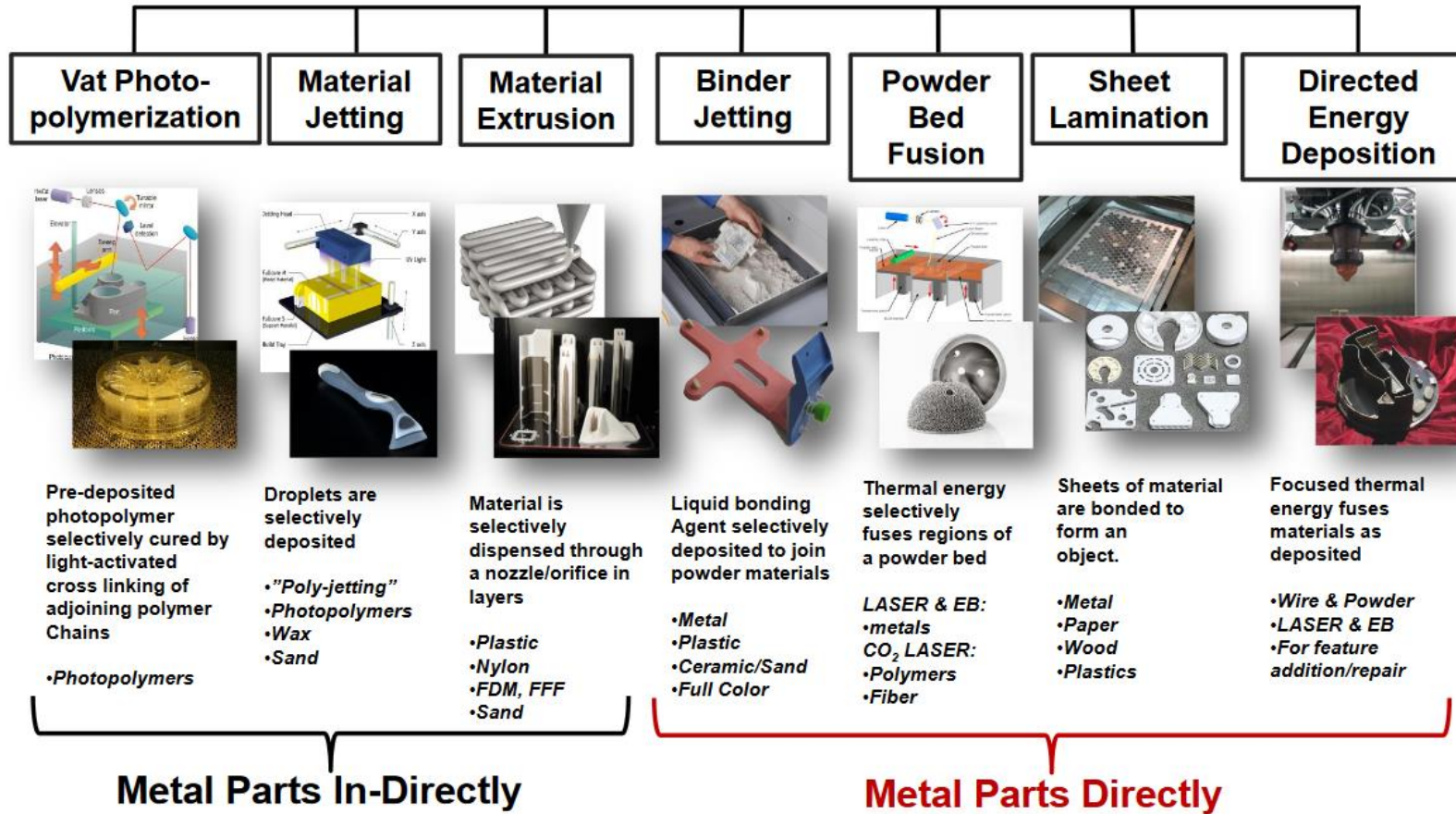


Electronics
Manufacturing



Mechanical
Manufacturing

What is Additive Manufacturing



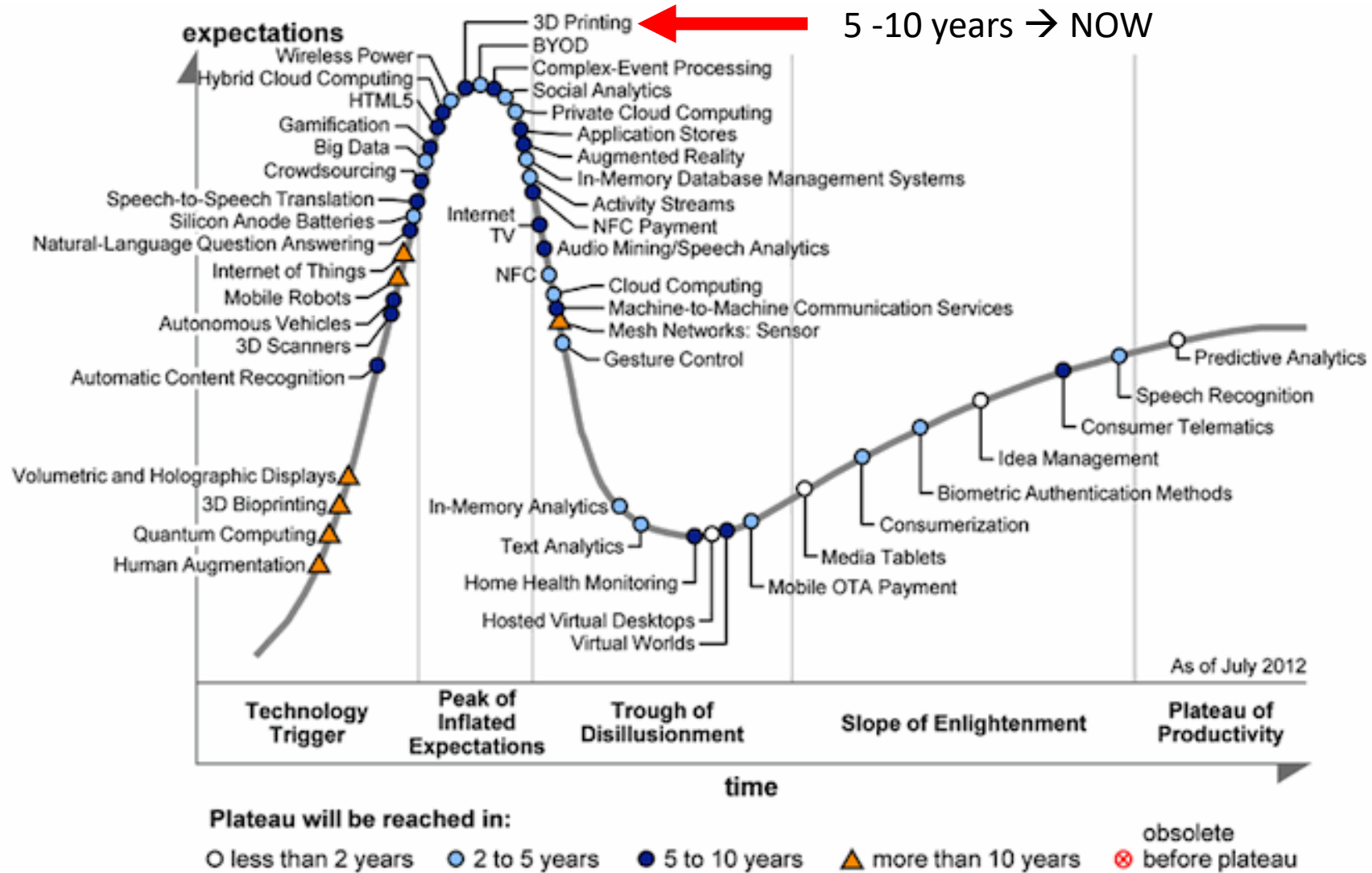
- Metallic materials
- Polymeric materials
- Ceramic materials
- Composite materials

Additive Manufacturing is a group of manufacturing methods. Here are the seven main categories defined by the ASTM F42 standardization body

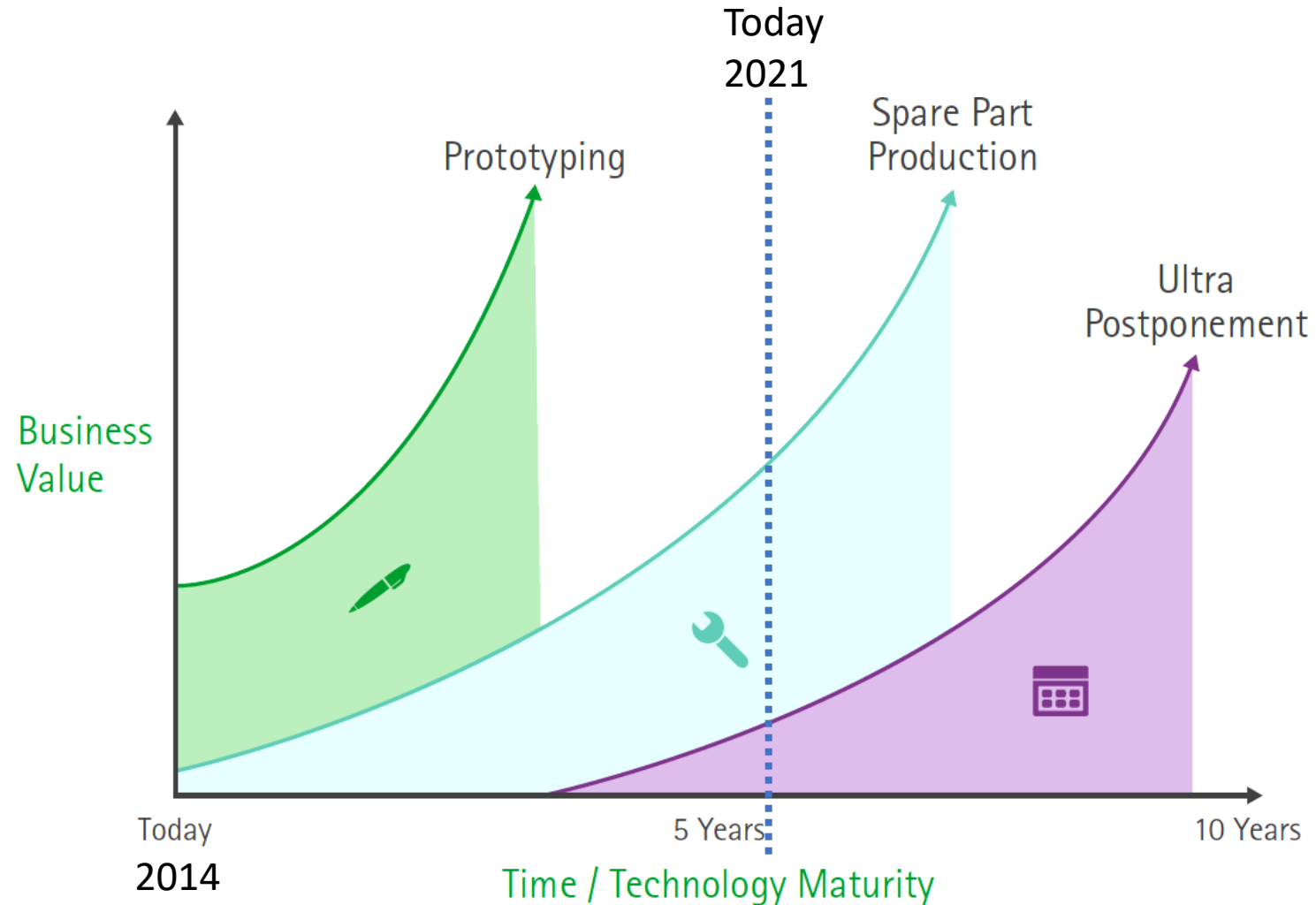
5 Decades of Additive Manufacturing

- 1980's The founding decade
- 1990's The decade of exploration
- 2000's The decade of technical feasibility
- 2010's The decade towards maturity
- 2020's The decade of utilization

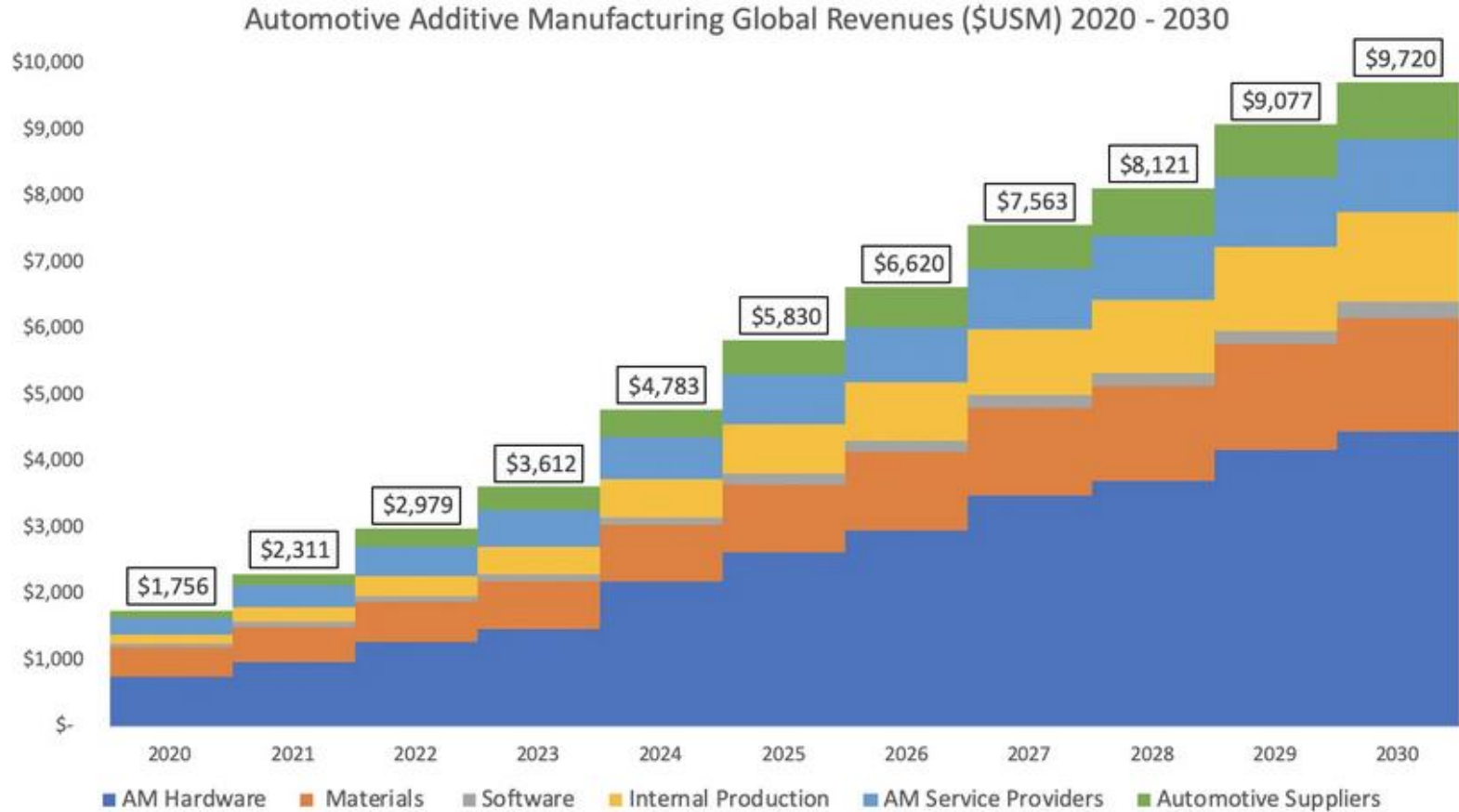
The Hype 2012



Where did we see the value in 2014?

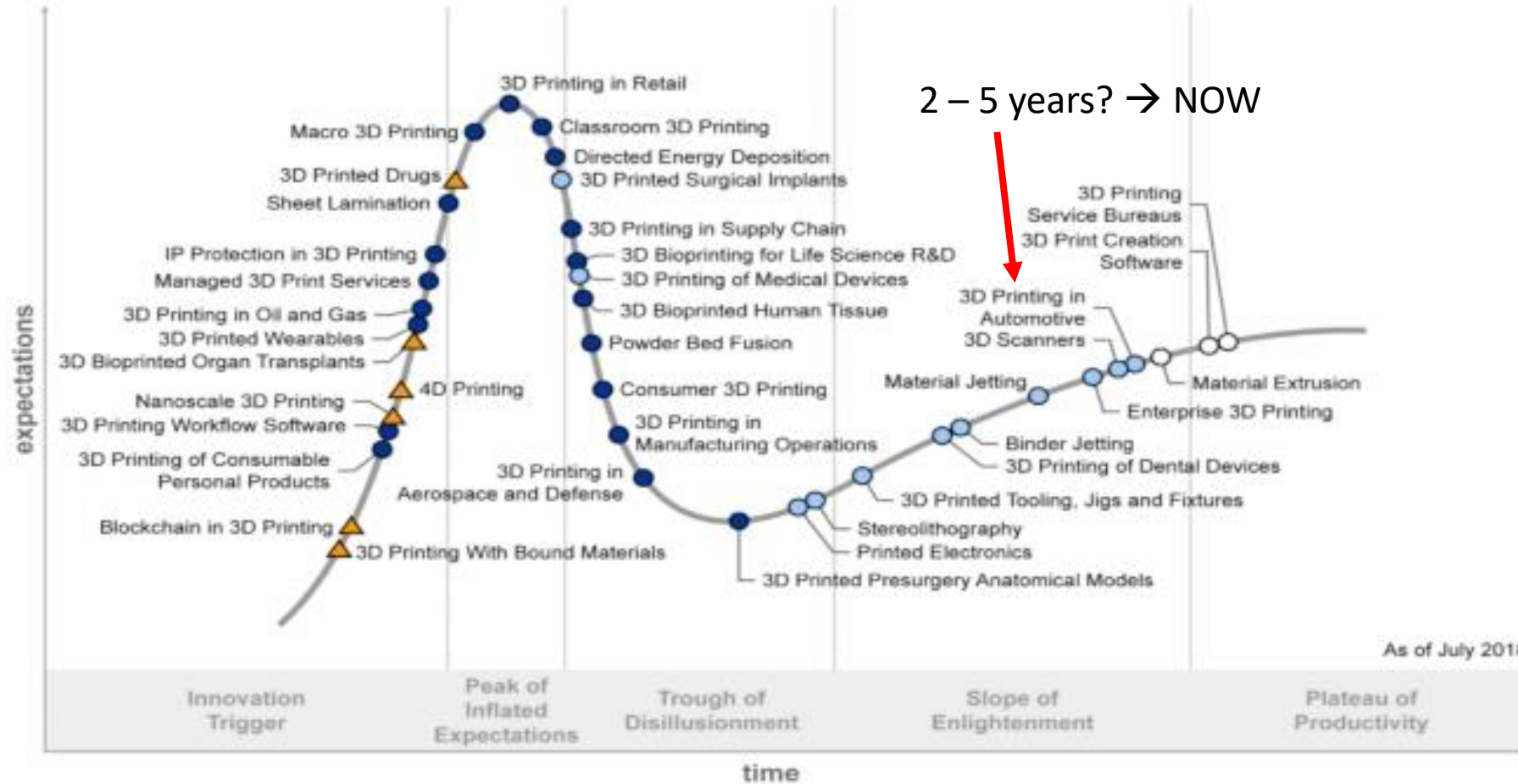


Value in the future?



5th decade of AM

2018 AM Hype Curve



Plateau will be reached:

- less than 2 years
- 2 to 5 years
- 5 to 10 years
- ▲ more than 10 years
- ⊗ obsolete before plateau

© 2018 Gartner, Inc.

General Benefits - Harnessing the Impossible

- Time save from idea to object
- Abundant material save (e.g. lifecycle costs)
- Utilizing different design constraints (new features)
- Removing manufacture steps (assembly and labour)
- Improved automisation (personnel costs)
- Improving quality (less human factor)
- Reduced need of qualifications

Quality in training and operations?



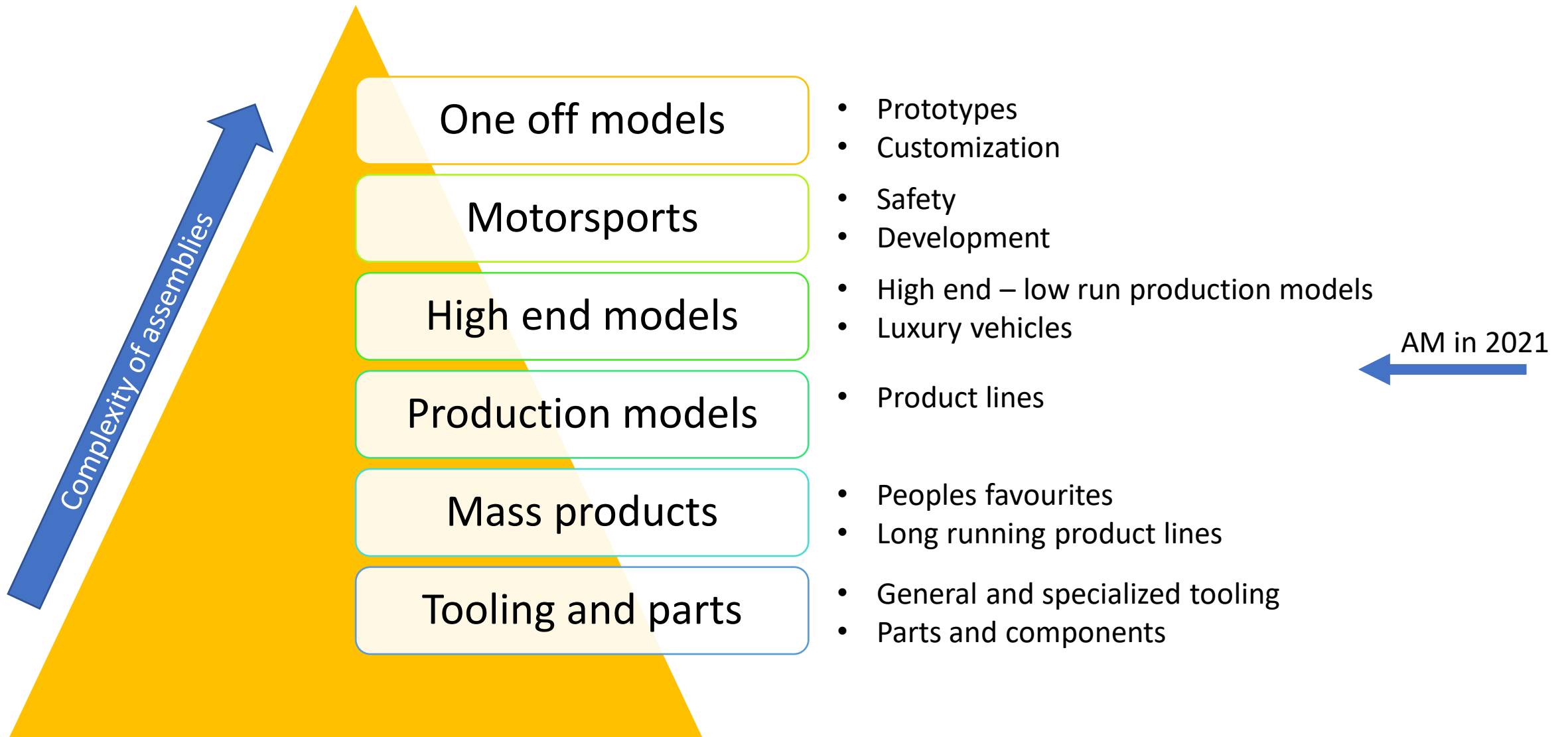
Trained specialists

VS



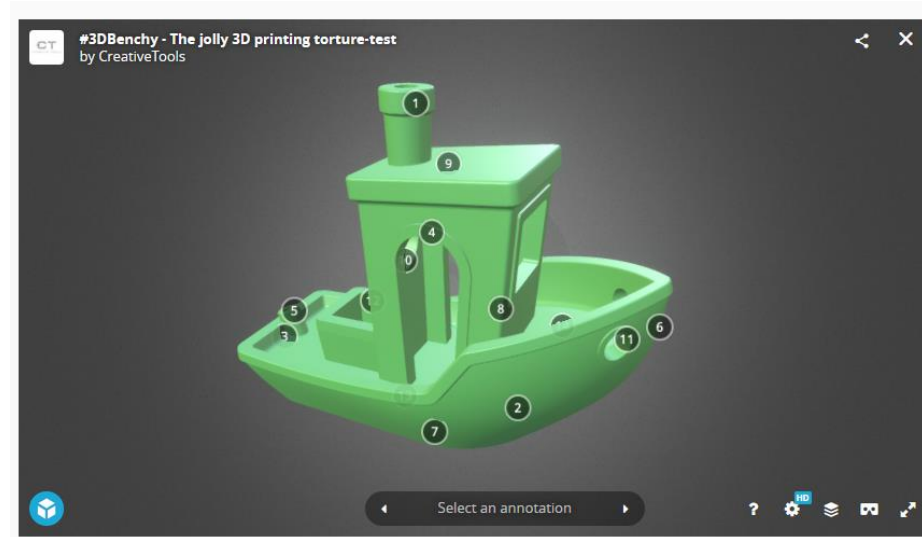
General personnels

Automotive Industry Possibilities



Why Rapid Prototyping Started All?

- Different prototypes
 - Visual
 - Functional
 - Development cycles
- Requires skilled labor and is usually time consuming to manufacture
- Bridge an access from CAD towards final product



Automotive modelling

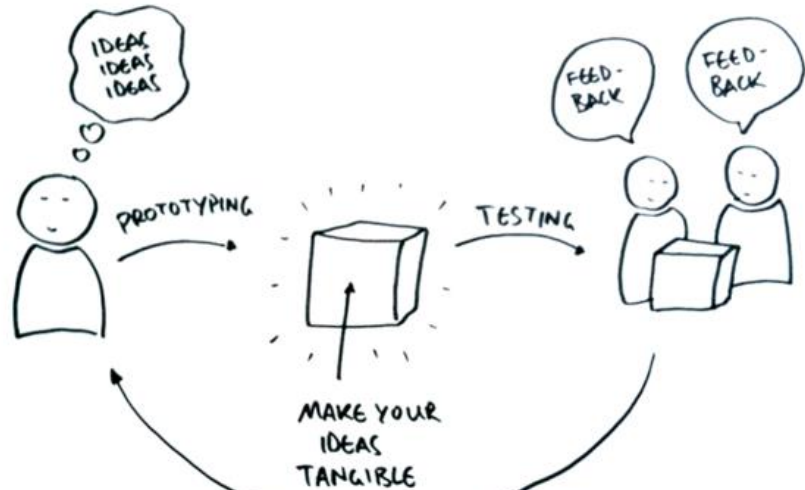
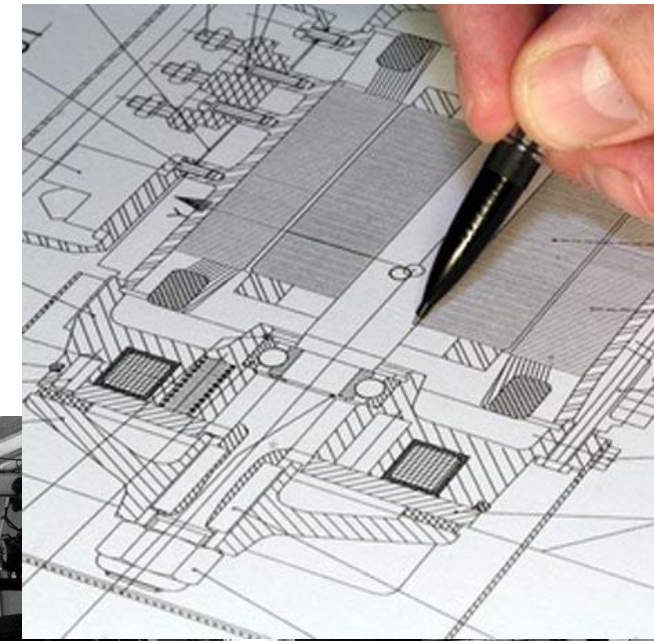
Clay modelling



Wood modelling



One off components vs. assembly line



<https://indico.cern.ch/event/740819/contributions/>

<https://www.lateliercanson.es/node/535>

<https://www.pinterest.at/pin/462533824204513752/>

<https://www.whichcar.com.au/news/how-a-mclaren-f1-prototype-was-destroyed>



Tooling, testing and jigs



A 3D printed liftgate badge tool, used to accurately apply a car's model name. Photo via Ultimaker

Seven 3D printers, one-thousand parts

<https://dewesoft.com/application-notes/road-load-data-logger-and-signal-conditioning-for-mts-test-bench>

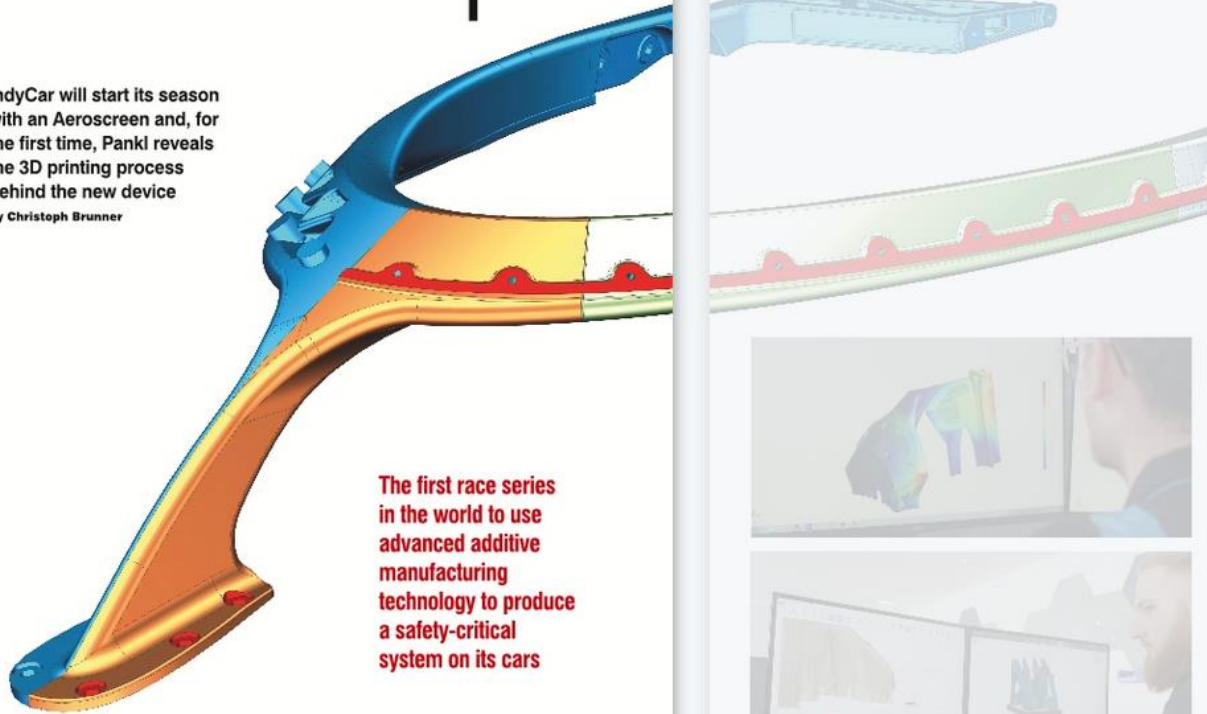
<https://3dprintingindustry.com/news/volkswagen-saves-160k-tooling-costs-using-desktop-fdm-3d-printers-116640/>

Safety

TECHNOLOGY - 3D PRINTING

Frame up

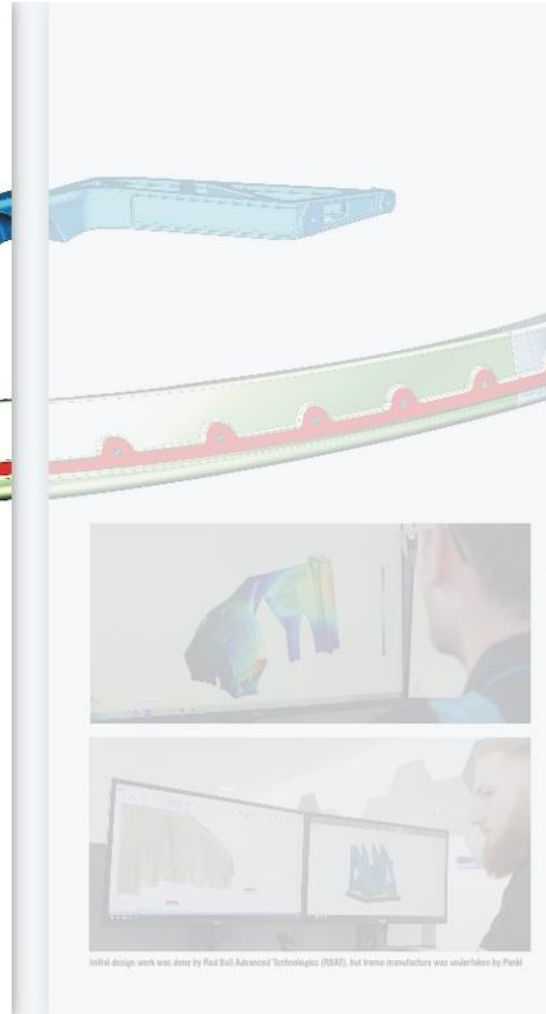
IndyCar will start its season with an Aeroscreen and, for the first time, Pankl reveals the 3D printing process behind the new device
By Christoph Brunner



The first race series in the world to use advanced additive manufacturing technology to produce a safety-critical system on its cars

It is no coincidence the basic shape of the titanium structure that supports the polycarbonate screen echoes that of the FIA-sectioned Halo safety device

18 www.mazda-engineering.com JULY 2020



Initial design work was done by Red Bull Advanced Technologies (RBAT), but frame manufacture was undertaken by Pankl



Automotive industry cases

- High end cars and parts

FCA – 3D Printing a World First



A world first: FCA and Fraunhofer's suspension with integrated brake caliper. (Source: Fraunhofer Institute for Additive Production Technologies)

Bugatti – Printed Titanium Aids Extreme Performance



The Bugatti Chiron is a car quite unlike any other. (Source: Bugatti)

Lamborghini – New 3D Printed Parts for Hypercar Twins



Sold out but still spectacular. (Source: Lamborghini)

Automotive industry cases

- Classic cars
- Replicated new parts
- Spare parts

Neues McLaren Artura Hybridauto mit 3D-gedruckten Kernen

Auf 23. Februar 2021 von **Isabell I.** veröffentlicht



Renault – 3D Printing For Reconditioned Cars



Renault's Flins site will see a hugely exciting new project begin soon. (Source: Renault)

Elevate Parts • 2nd
Für das Team von Elevate Parts stellen historische- (erhaltenswerte-) sowi...
4mo • Edited • 🌐

In Zusammenarbeit mit unserem namhaften Fertigungspartner, der M & H CNC Technik GmbH (www.mhcnc.com), haben wir den auf den nachfolgend angeführten Bildern ersichtlichen Zylinderkopf eines Fahrzeuges aus der Vorkriegszeit, rekonstruiert, entsprechend optimiert und reproduziert. Vom Fahrzeug selbst, gibt es laut dessen Besitzer weltweit nur mehr 2 Stück. Nach dem durch uns erfolgten Reverse Engineering und Erstellung eines 3D-CAD Modells, erfolgte die Überführung in die Produktion. Der Zylinderkopf wurde im sogenannten 3D-Druck Verfahren hergestellt. REKONSTRUKTIONEN & REPRODUKTIONEN VON BAUTEILEN MIT MODERNSTER 3D TECHNIK.

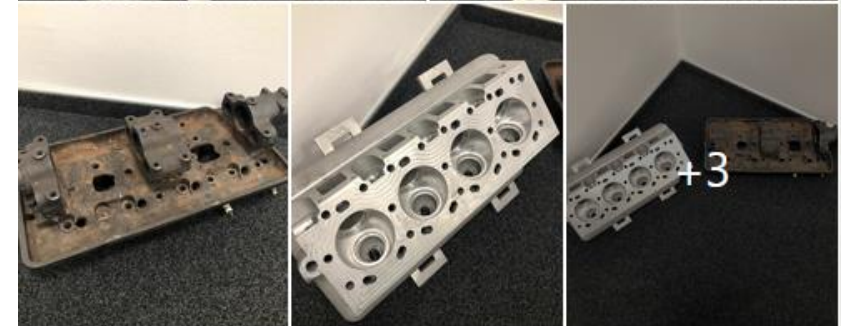
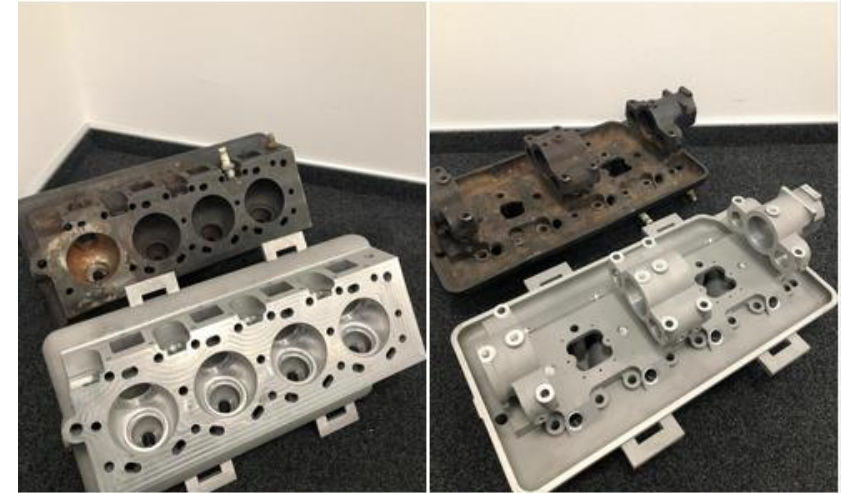
Für Anfragen dazu stehen wir Ihnen gerne unter folgenden Kontaktdaten zu Verfügung:

Phone: +43 3112 38 911 10

E-Mail: office@vc-ec.at

www.elevate.parts

[See translation](#)



- <https://all3dp.com/1/cars-3d-printing-additive-manufacturing-am>
- <https://www.3dnatives.com/de/mclaren-hybridauto-3d-druck-230220211/#>
- <https://www.linkedin.com/feed/update/urn:li:activity:6733272114993864704/>

Automotive industry cases

- Tooling and manufacture

Volkswagen – 3D Printing for Production Line



A 3D printed jig on a Volkswagen assembly line. (Source: Volkswagen)

Industry specific use topics to read from big Automotive players:

- <https://all3dp.com/1/cars-3d-printing-additive-manufacturing-am>
- <https://www.3dprintingmedia.network/volkswagen-additive-manufacturing/>
- <https://www.3dprintingmedia.network/general-motors-additive-manufacturing/>
- <https://www.3dprintingmedia.network/daimler-benz-additive-manufacturing/>
- <https://www.3dprintingmedia.network/ford-additive-manufacturing/>
- <https://www.3dprintingmedia.network/bmw-additive-manufacturing/>
- <https://www.3dprintingmedia.network/psa-additive-manufacturing/>

BMW – 3D Printing Factory Opens



The new Additive Manufacturing Campus will have a huge influence on future BMW Group production. (Source: BMW)

What if additive finally makes it into a Volkswagen?

“Today, the Volkswagen Group utilizes metal Additive Manufacturing in tooling and prototyping, with first serial products in our Sport & Luxury brands such as Bugatti. The Area Printing technology by Seurat will open a whole new market opportunity for automotive OEMs. We expect applications to become commercially feasible in mid volume production which will enable us to increase the performance of our electric power train platforms.”



Gero Corman

Head of Digital Innovation
Group Production
Volkswagen AG



www.seuratech.com

Automotive industry standardization

- ISO/ ASTM standardization efforts towards automotive manufacture and Additive Manufacturing



CASE STUDY: Automotive | Faurecia

<https://www.iso.org/committee/629086.html>

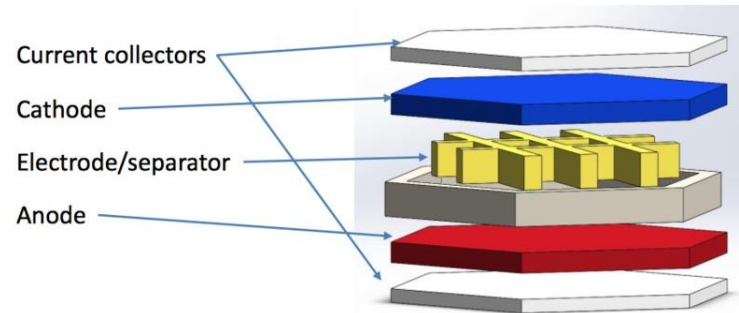
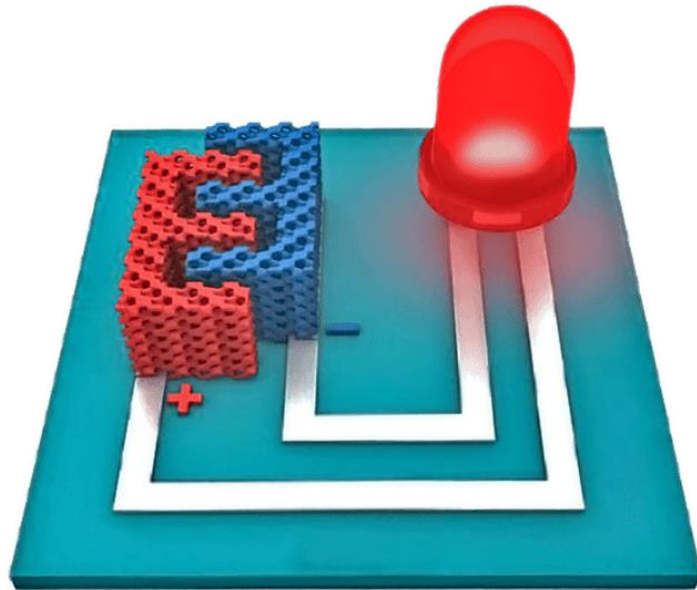
<https://www.astm.org/COMMITTEE/F42.htm>

<https://optimas.com/resources/achieving-commercial-strength-through-part-standardization/>

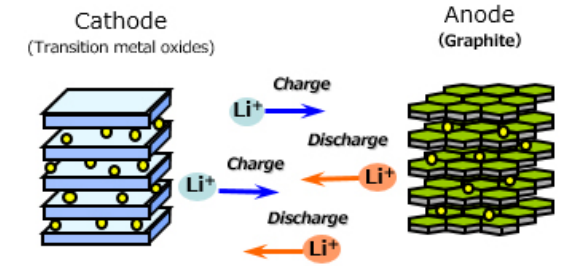
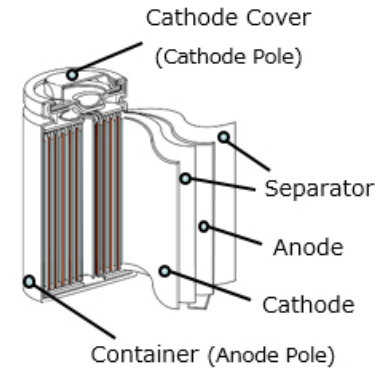
Future

New possibilities

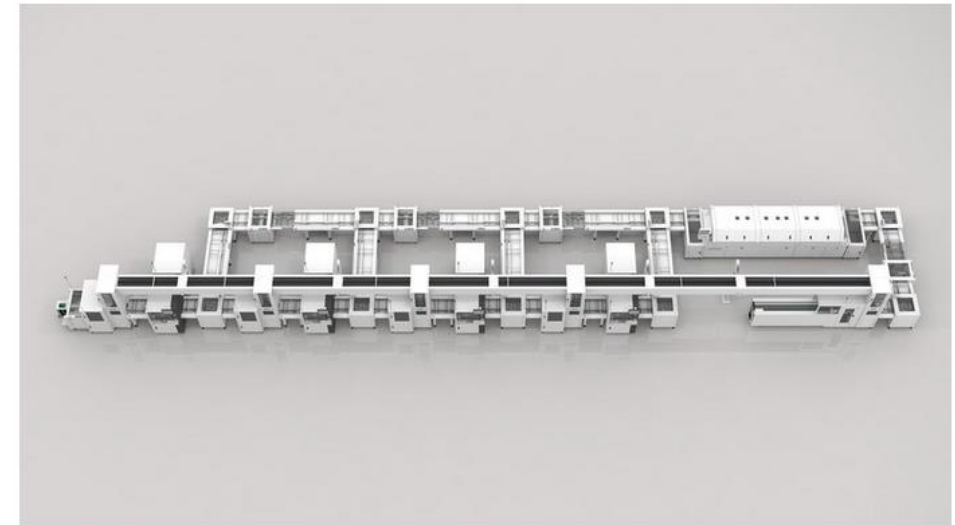
- Shapes
- Materials
- Composites
- Create everything in one step instead of assemblies!



Conventional design



3D Printed Solid State Batteries



- <https://www.3dprintingmedia.network/blackstone-develops-3d-printed-solid-state-batteries-with-an-eye-on-teslas-strategy/>
- <http://www.graphene-uses.com/unveiled-the-worlds-first-3d-printed-graphene-battery/>
- <https://www.advancedbatteriesresearch.com/articles/21738/3d-printed-solid-state-batteries>
- <https://industrial.panasonic.com/ww/products/batteries/secondary-batteries/lithium-ion>

Factory of the Future





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