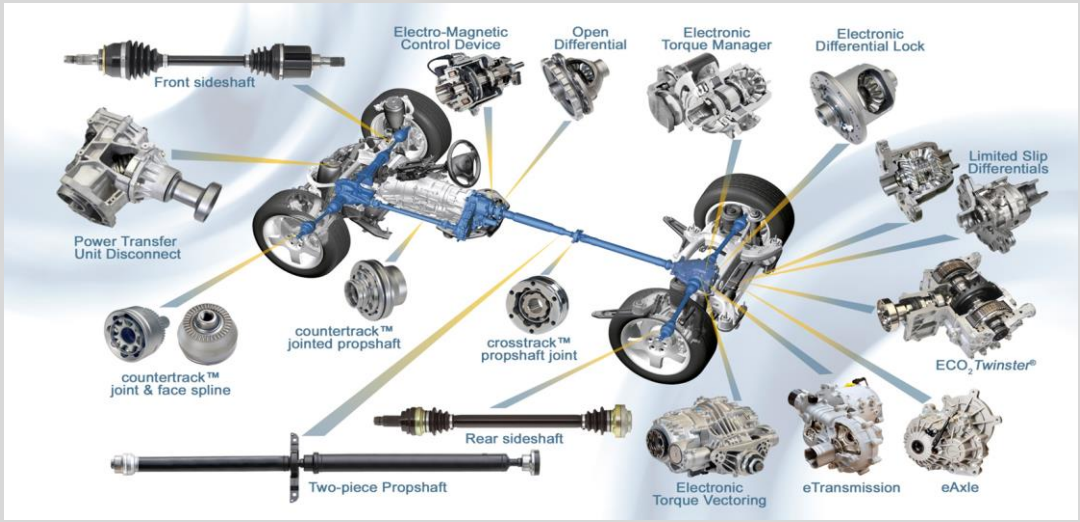
GKN Driveline and Additive

3D-Metal Printing for Spare Parts

What benefits brings GKN to the market?

GKN DRIVELINE

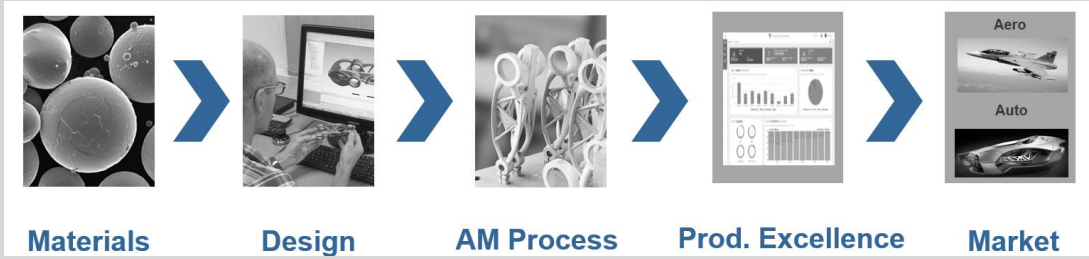
GKN Driveline is the market leader in the development and delivery of contemporary and electrified driveline systems and solutions.



GKN POWDER METALLURGY

GKN Powder Metallurgy combines advanced powder metals with innovative production technologies to create unique metal powder product solutions.

Powder Metal Solution Provider



Vertically integrated, Global footprint, Digital agenda

From sustainable Mass Production → **To On Demand Production**

Disruptive potential of AM

Disruptive in Product Design

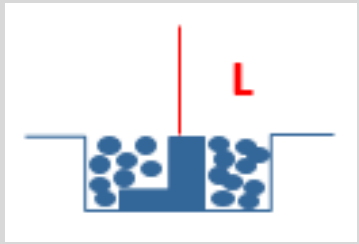
Potential to transform future product thinking

Disruptive in Manufacturing

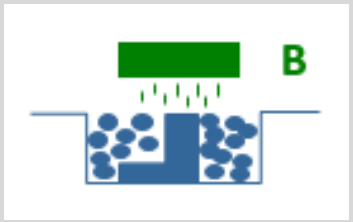
Metal AM Powder Bed Technology Overview

Processes

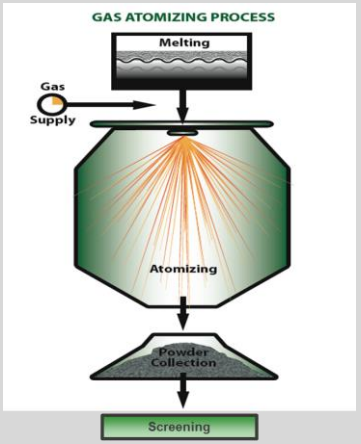
Selective Laser Melting



Binder Jetting



Materials



Commercially Available AM Powders
Titanium Alloys
Stainless Steels
Tool Steels
Copper Alloys
Aluminum Alloys
Cobalt Alloys
Nickel Based Alloys
20MnCr5

Characteristics

- Productivity 15 - 100cm³/h
- Density 100%
- Mechanical Properties as wrought materials
- Part Size < 500mm
- Surface 40Rz
- Limited material variety

- Productivity 1000 - 8000cm³/h
- Density 95%
- Mechanical Properties as MiM
- Part Size < 300mm
- Surface 40Rz
- Limited material variety

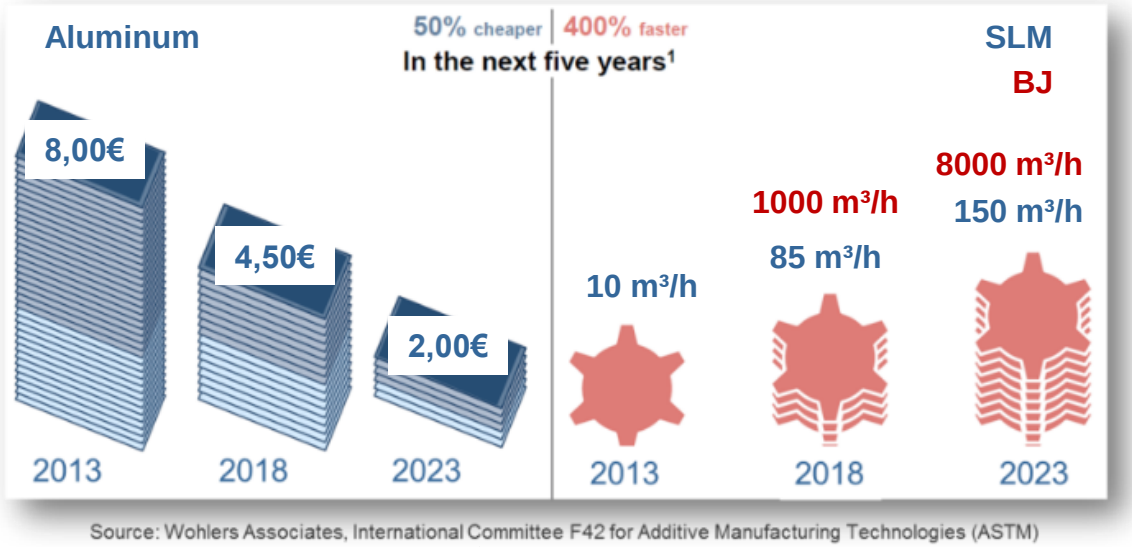
Economics and Technology Developments

Selective Laser Melting

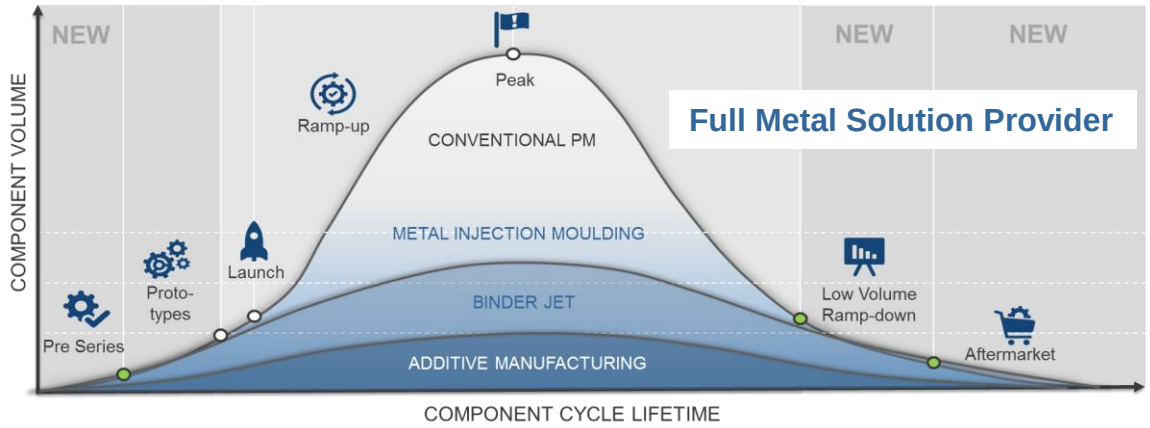
- Multiple Laser Machines with max 4 Lasers today up to 10
- Water atomized powders increase the productivity and decrease Material costs
- Control microstructure through melting pool
- Process Atomization

Binder Jetting

- High Productivity production rate of 1000 cm³/h up to 8000 cm³/h
- Water atomized powders increase the productivity and decrease Material costs
- Process Atomization



Source: Wohlers Associates, International Committee F42 for Additive Manufacturing Technologies (ASTM)



More than just manufacturing ……our advanced digital systems

INSTMETAL POWERED BY GKN

EXTERNAL
Customer Facing

INTERNAL
Eng & Ops Facing

AOD

Virtual Storefronts

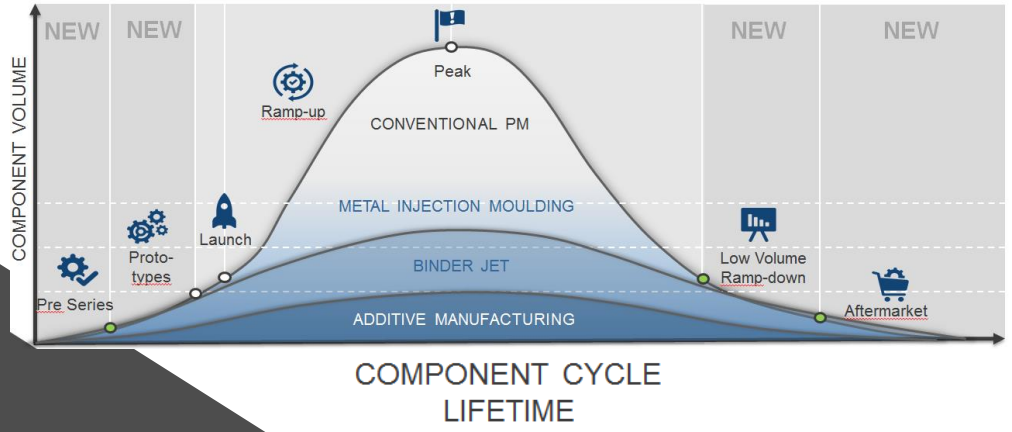
Global Print network

Real Time Visual Shop floor & Manufacturing Execution System

Global Print network

Value for Traders and Distribution Channels

Source: https://amicale-citroen.de/2013/studie-youngtimer-oldtimer-markt-deutschland/



OES	IAM
End-of-Service obligation (15yrs)leads to reduced batch sizes Cost-Benefit: - Reduced Tooling Costs - Reduced Setup costs compared to conventional productions methods - Lead time	Access to niche segments, e.g. old-timer/vintage cars Cost-Benefit: - Scanning/remodelling Parts where no documentation is available - Individualisation - No tied up cash in inventory

Future

Replacement of conventional OE manufacturing methods by AM:
- Full range availability of B and C parts by suppliers. Stock reduction opportunity at distributors
- De-centralized production opportunities leads to reduced stock level at component manufacturer and reduced transport costs