

Industrializing Additive Manufacturing – Oerlikon as Your Solution Provider

Lucerne, April 10, 2018

Florian Mauerer – Head of AM Business Unit



With Additive Manufacturing (AM) Your Greatest Challenges Now Have Solutions



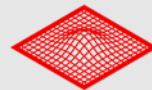
Enhanced
geometric
freedom



Fully optimized
performance



Shorter
innovation cycles



Customization
made easy



Shorter supply
chain



Driving new
business models

Metal Additive Manufacturing Market Has Strong Growth Potential

WOHLERS REPORT (2017): AM MARKET SIZE

Total AM market size 2016 (USD)

6.063 BILLION

~ 10-15% is metal AM

Total AM market size 2022 (USD)

26.2 BILLION

~ 20-25% is metal AM

43% CAGR
for metal AM

Source: Wohlers Report 2017

STRONG METAL AM MARKET

- AM is an established and developing market
- Metal AM market share of overall AM market is projected to increase according to standard industry reports
- Oerlikon supports a more conservative view of the market adoption rate

Case study: current part in production for US Apache helicopter



FOR 1 NEW AM PART

1 part per helicopter

×

~ USD 2500 / part

×

10 helicopters / month

=

~ USD 1.5m / 5 Years

AM Component Advantages Over Traditional Machining Work Even For Simple Components Like Brackets



Billet weight 4.85 kg
Scrap weight 4.08 kg
Buy-to-Fly ratio 6.3



Powder weight 1.08 kg
Scrap weight 0.31 kg
Buy-to-Fly ratio 1.4

AM ADVANTAGE

- 92% scrap reduction
- 3.77 kg scrap saved / part

BUSINESS CASE
for Boeing 737 engine bracket

FOR 1 NEW AM PART

1 Part / Engine

×

2 Engines / aircraft

×

47 aircraft / month

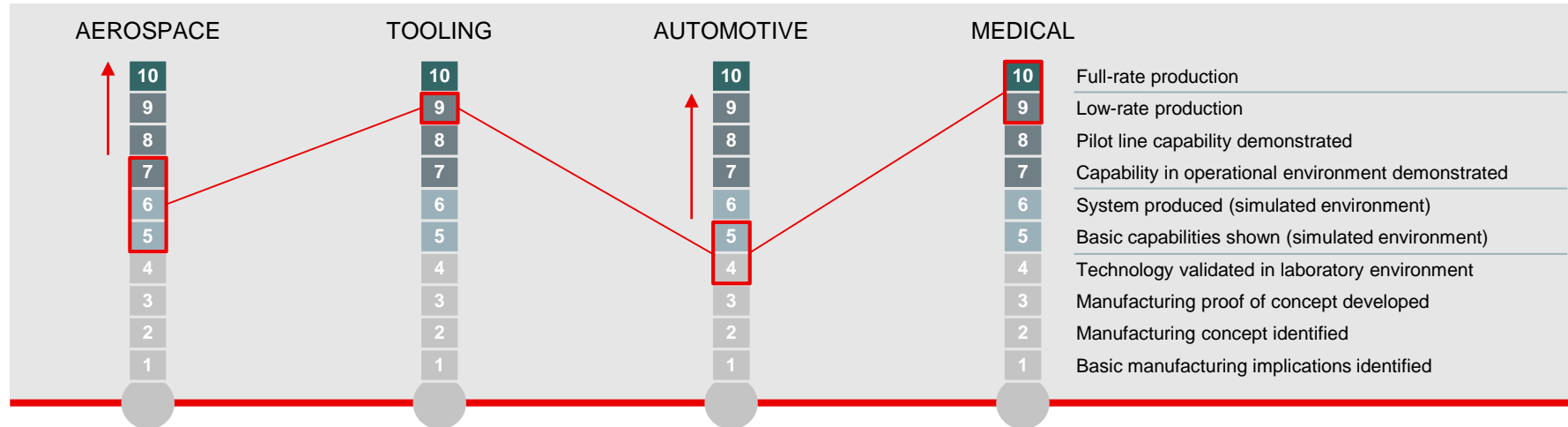
=

1128 Parts / Year

➤ 4200 kg / Year Scrap Reduction

➤ (~ USD 0.25M saving)

Series Production Manufacturing Readiness Level Differs by Application and Industry



- **Aerospace adoption varies by part types (static, loaded, rotating, etc.)**

▪ **Production examples:**

- Titanium bracket for Airbus A350
- Fuel injection for Leap engine

- **AM reduces lead time and cost**
- **Particularly effective for low-volume tooling or rapid replacements**

- Adopted for casting and molding processes

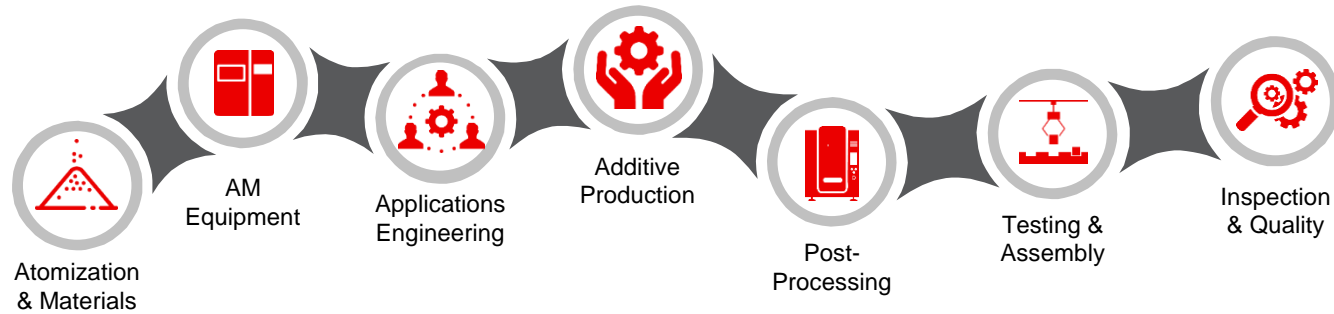
- **Production ready for niche / low volume applications**

- Brackets in BMW i8 roadster
- Bugatti Veyron / Chiron HX

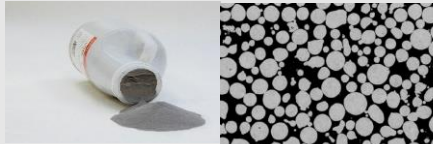
- **Widely adopted in market for dental and customized implants**

- Crowns and copings
- Artificial hip joints
- Medical instruments
- Dental reconstruction
- Craniomaxillofacial implants

Strong Materials Foundation Provides Excellent Base for AM Service Offering



MATERIALS FOUNDATION



- 18 AM qualified alloy powders in portfolio today
- 5 additional alloys launching in 2018



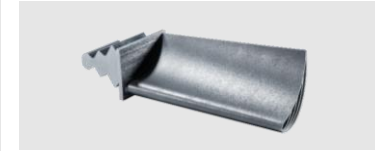
Training / Applications Engineering

- Design for AM expertise
- Component redesign
- Part screening



Prototyping

- Broad AM materials portfolio
- Prototypes for end-use parts
- Metals, plastics and ceramics



Series Production

- Process qualification
- Quality certifications
- Full-value chain offering
- Post-processing including coating

Future Success Factors to Advance Metal AM Market

RIGHT R&D FOCUS



- AM Technology & Innovation
- State-of-the-art AM equipment and labs
- Dedicated and experienced R&D team

KEY PARTNERSHIPS WITH GLOBAL MANUFACTURING LEADERS



- Driving market expansion through OEM partnerships
- Developing industry standards for AM

GLOBAL PRESENCE

Powder Atomization

Plymouth & Troy, MI, US

US R&D & Manufacturing

Charlotte, NC & Atlanta, GA, US

Europe Manufacturing

Magdeburg, Germany

Europe R&D

Munich, Germany



- 250 dedicated AM employees
- 6 facilities across US, EU
- Shared best practices

OERLIKON IS:

- Differentiated by a strong materials foundation and full AM value chain know-how
- Driving industry adoption with partnerships, academic collaborations and strong R&D footprint
- Poised to benefit as the AM market continues to mature and becomes increasingly driven by OEMs

Thank you.

