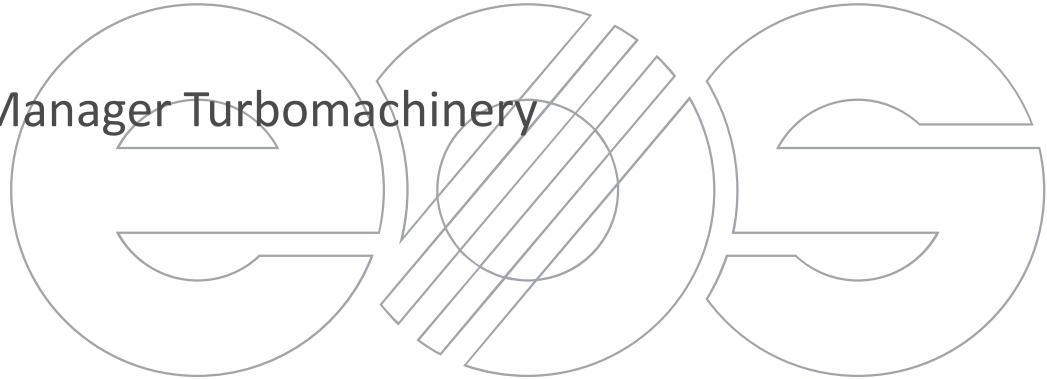
EOS technology driving the way towards serial production in turbomachinery

ETN Panel discussion

Lukas Fuchs, Business Development Manager Turbomachinery



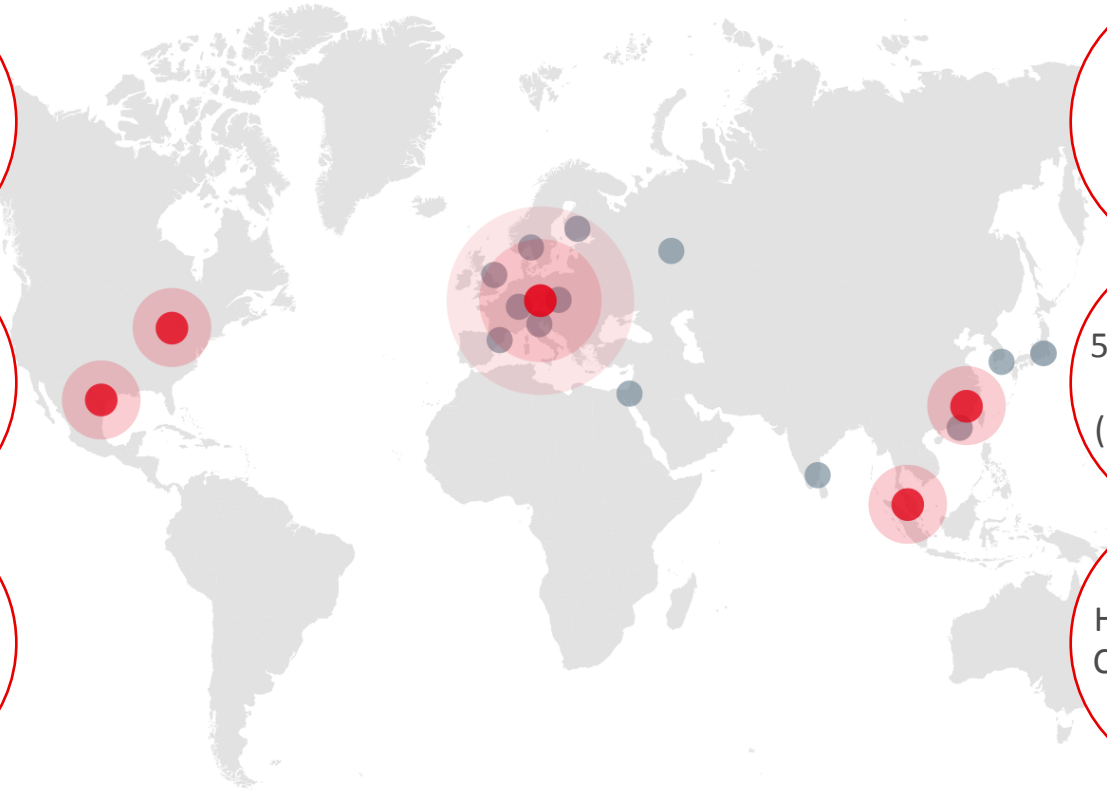
30 years in Additive Manufacturing

EOS is Market Leader in Industrial 3D Printing

Family owned approx. 1,250 Employees

EOS Sales & Service offices in 15 countries

Revenue ~350 Mio € CAGR: ~ 10%



3,500 EOS systems installed worldwide

51% M systems / 49% P systems (in 65 countries)

HQ &Technology Center Krailling / MUC

EOS Vision is reality – AM in Production !

Air & Space Enablement

BLUE ORIGIN
SAFRAN
senior Aerospace
RR
MTU
AIRBUS
HONDA

Humaneering & Healthcare

ottobock.
smith&nephew
Lima Corporate
Johnson&Johnson

Efficient Energy & Advanced Production

ARCONIC
WALLENBERG
BAKER HUGHES
SIEMENS

Advanced Mobility

GM
DAIMLER
Ford
BMW

https://www.youtube.com/watch?v=dy9c3kRs23I

Our DNA: Innovation with Quality – a peek into the lab

New digital business models including an open material platform

Smart systems & data analytics tools for improved productivity

Innovative materials and processes

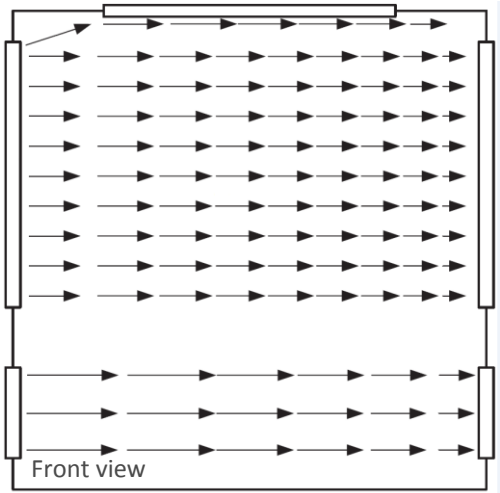
High productivity factory line platforms

Industrial-grade periphery for powder & job handling

Source: EOS

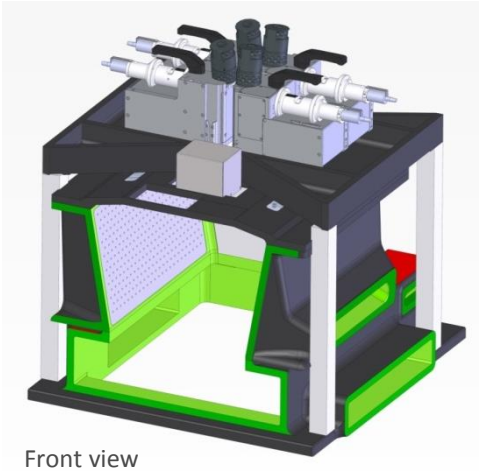

EOS M 300-4

M300 features many major improvements:



Improved process chamber gas flow

- Optimized gas flow in 3 areas



Robust casted frame

- Thermal and mechanical compensation
- 24/7 process capable for highest reproducibility

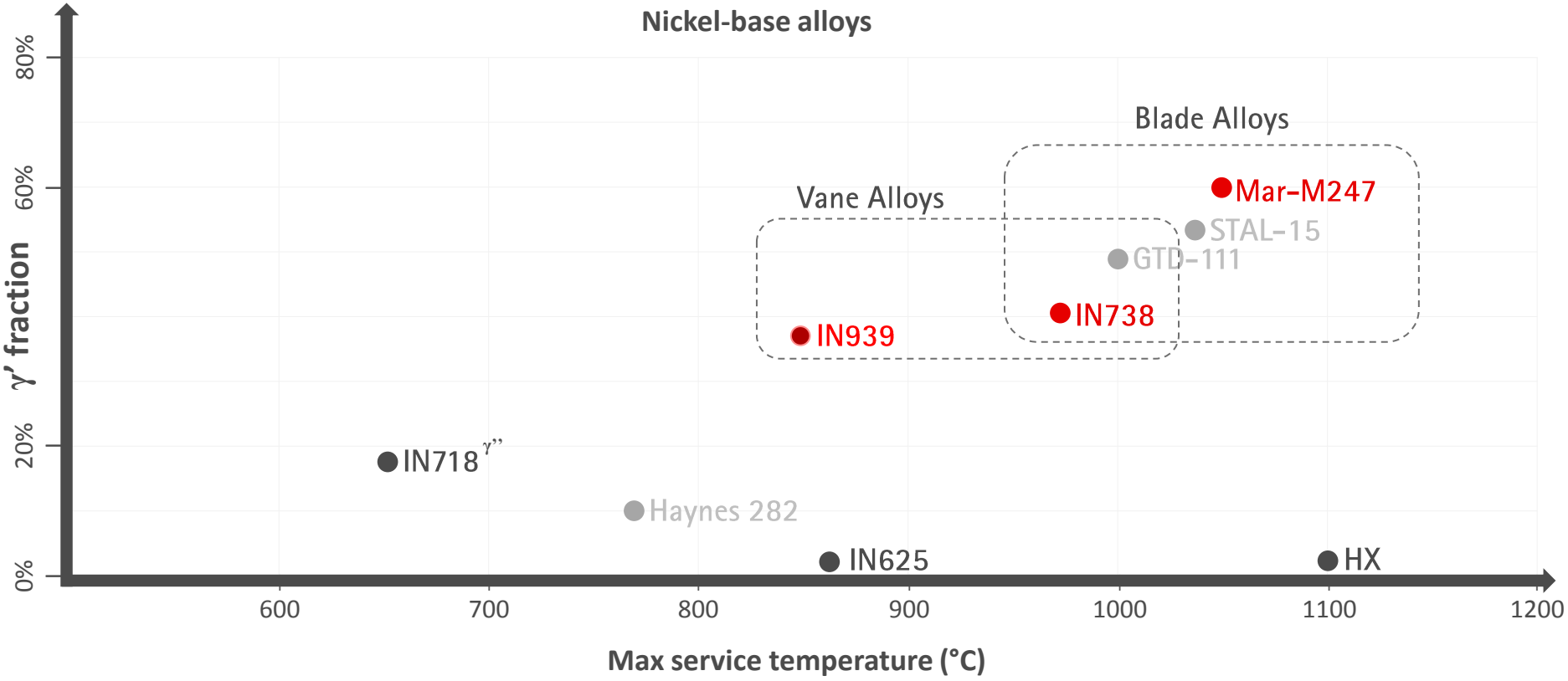
Filter system RFS 2.0

- No filter change needed – even in the case of material change
- No interruption for filter cleaning and emptying waste bin

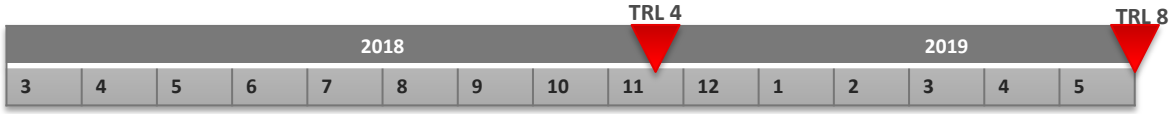
… to reach robust and repeatable part quality

Source: EOS

Let’s stop talking about material names – let’s talk about requirements!



EOS NickelAlloy IN939



General description

Material: √ **Process:** √

High strength Nickel-based superalloy for high temperature applications.

Typical property values (as-built): **$Rp_{0.2}$**: 750 Mpa **Rm**: 1000 Mpa **A**: 30%

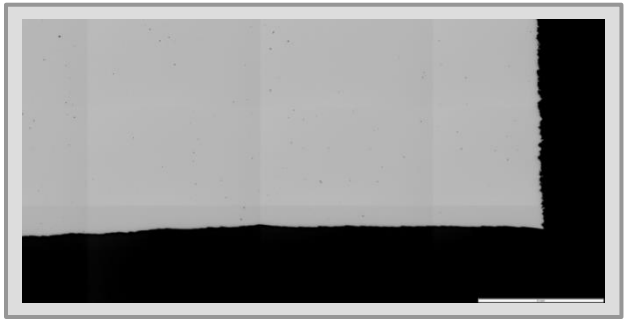
Typical mechanical values (HT): **$Rp_{0.2}$**: 1000 MPa, **Rm**: 1500 Mpa **A**: 10 %

Main Characteristics

+ High mechanical stability at elevated temperatures
+ Oxidation resistance
+ Good ductility

Target Applications

- Aerospace applications
- Energy sector, e.g. turbine components
- Toolmaking



Key parameters	
Current TRL	4
Target TRL	8
System type	M290
Material	IN939
Process	To be defined

Potential applications for gamma primes

Vanes/Clusters (SGT/AGT)

Source: Präwest

Blades (HPT SGT/ LPT AGT)

Source: Siemens

Transitions SGT

Source: Dawopu

TCF Components (AGT)

Source: MTU

Housing/Shroud/Sealing components AGT/SGT

Source: Siemens

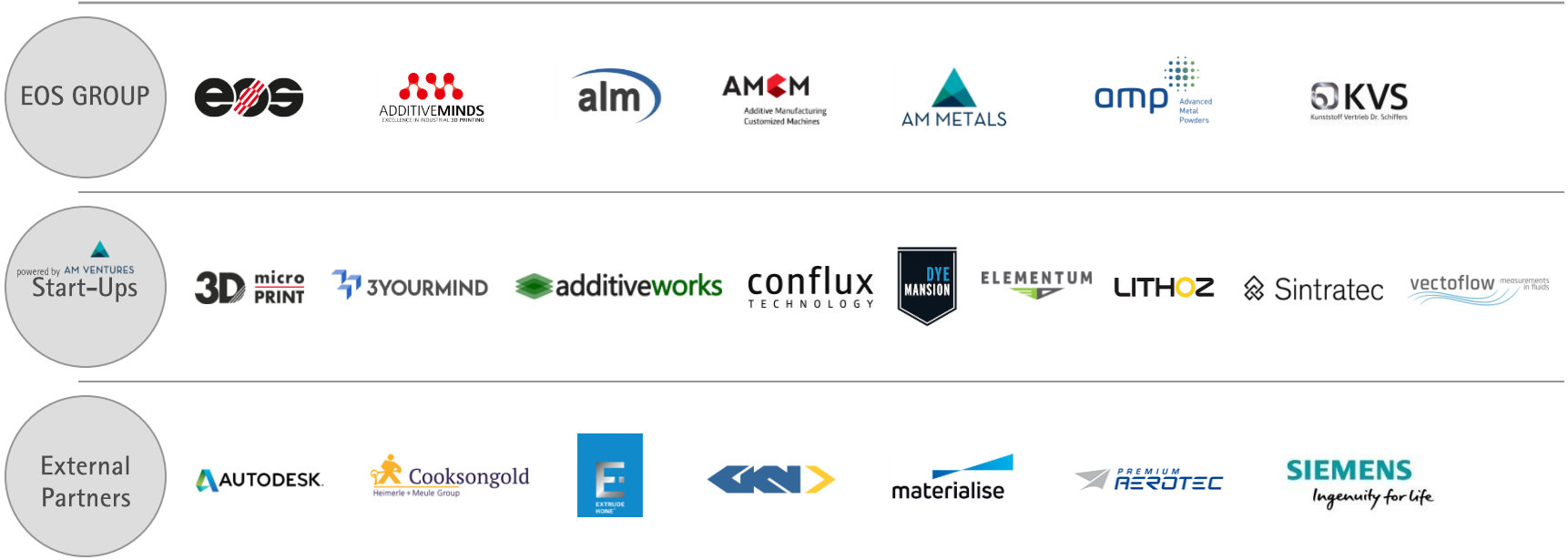
Your application?

?

EOS is constantly innovating in our core competency: Laser – Material interaction

No support structures
up to 10° needed

EOS Ecosystem – Realize 3D printing with partners along the entire process chain



EOS Ecosystem – Reali
with partners along th

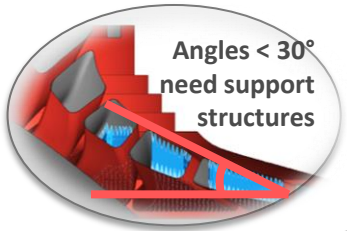
EOS GROUP

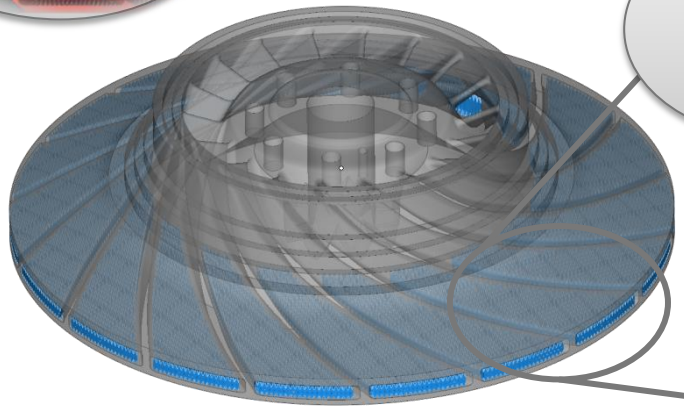
powered by AM VENTURES
Start-Ups

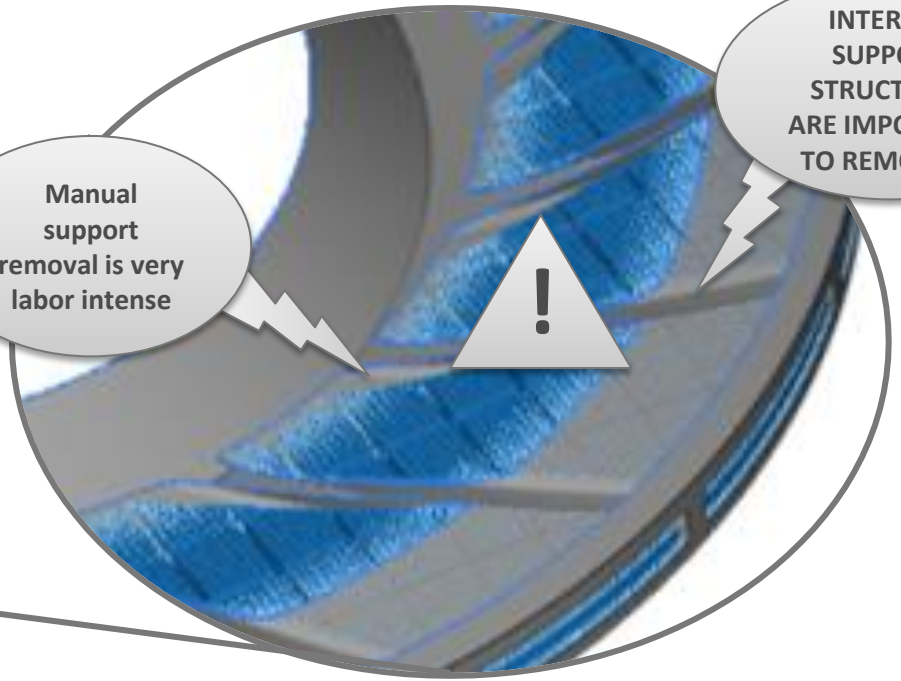
External Partners

Application example closed Impellers: Automatic Support Removal with TEM

The challenge of manual support removal







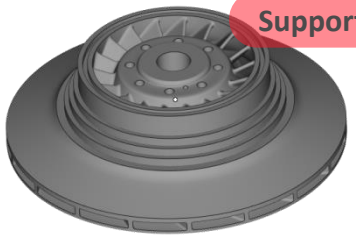
Internal supports like in this impeller are impossible to remove as they are not accessible with tools!

Automatic Support Removal with TEM

Process chain

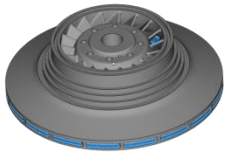
Generation of specialized TEM support by EOS

Support generation 01



Process parameters 02

Specialized TEM exposure settings by EOS



Part production 03

Part production on EOS M290 or M400-1/M400-4

Support removal 04

Automatic support removal by advanced T.E.M. Process by Extrude Hone (patent pending)

Surface finish 05

Post processing to achieve desired surface quality e.g. AFM by ExtrudeHone

Joint project with PAG and Daimler

NEXT GENERATION AM

THE FUTURE OF ADDITIVE MANUFACTURING

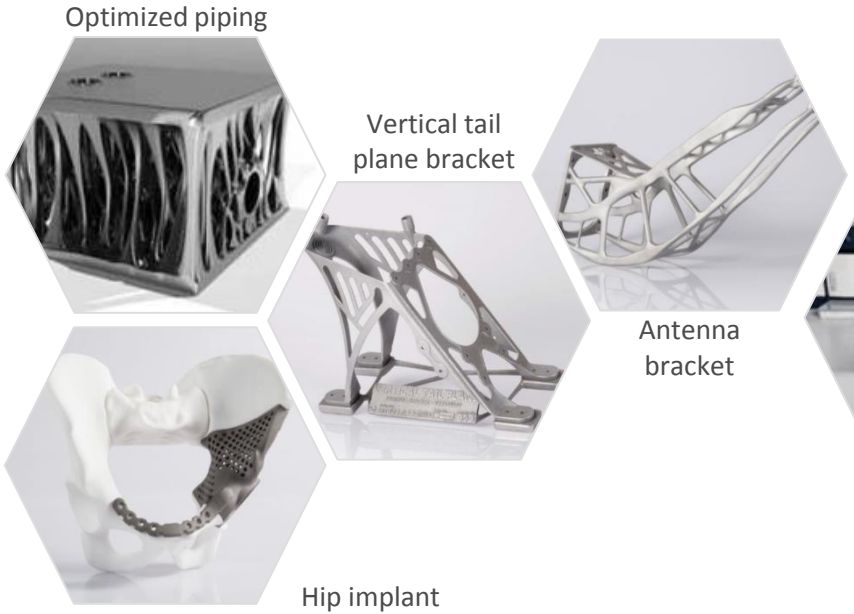
https://www.eos.info/industrial-3d-printing-the-new-era-has-begun-e3164758fc8a805e

Thank you for your attention!

Disruptive power lies in combination of innovative parts with digital manufacturing

Innovative Parts

Key characteristics: complex structures, functional & part integration, mass customization



Digital Manufacturing Cells

Key characteristics: on demand production, small series, localized cells

Image sources: EOS GmbH, Kuhn-Stoff, Alphaform Instrumentaria

With Additive Minds we support you to further accelerate your AM transformation