PUNCH | Torino

A service provider to GENERAL MOTORS

**Andrea Boscolo**

AD&M Application Engineer

# **Additive Manufacturing as a game changer for the Automotive Industry**: strategy and successful cases within the product development

24/09/2020

# From General Motors Global Propulsion Systems to Punch Torino

GM | CORPORATE NEWSROOM

Home | News | Company | Plants & Facilities | Images | Videos

## Punch Group Acquires General Motors Propulsion Engineering Center in Turin, Italy

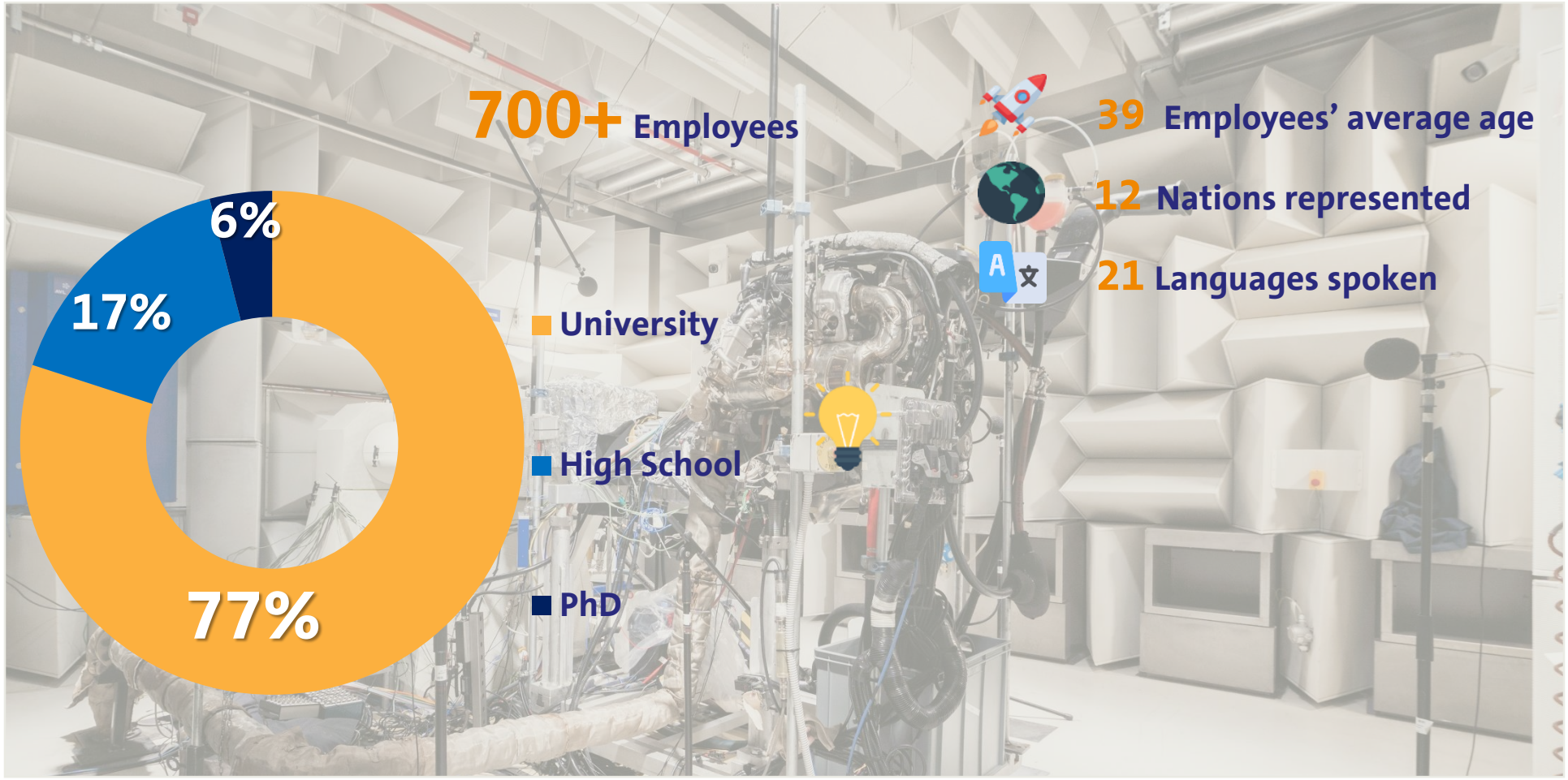
**TURIN, Italy —** Punch Group and General Motors announced today that Punch Group has acquired GM's propulsion engineering center in Turin. The transaction between the two companies includes an engineering services agreement to support GM's global product programs through the end of 2021.

The agreement ensures the ongoing viability of the engineering center and employment of its workforce. Punch Group plans to reposition the company with developments for new market segments while continuing to provide engineering services to GM.

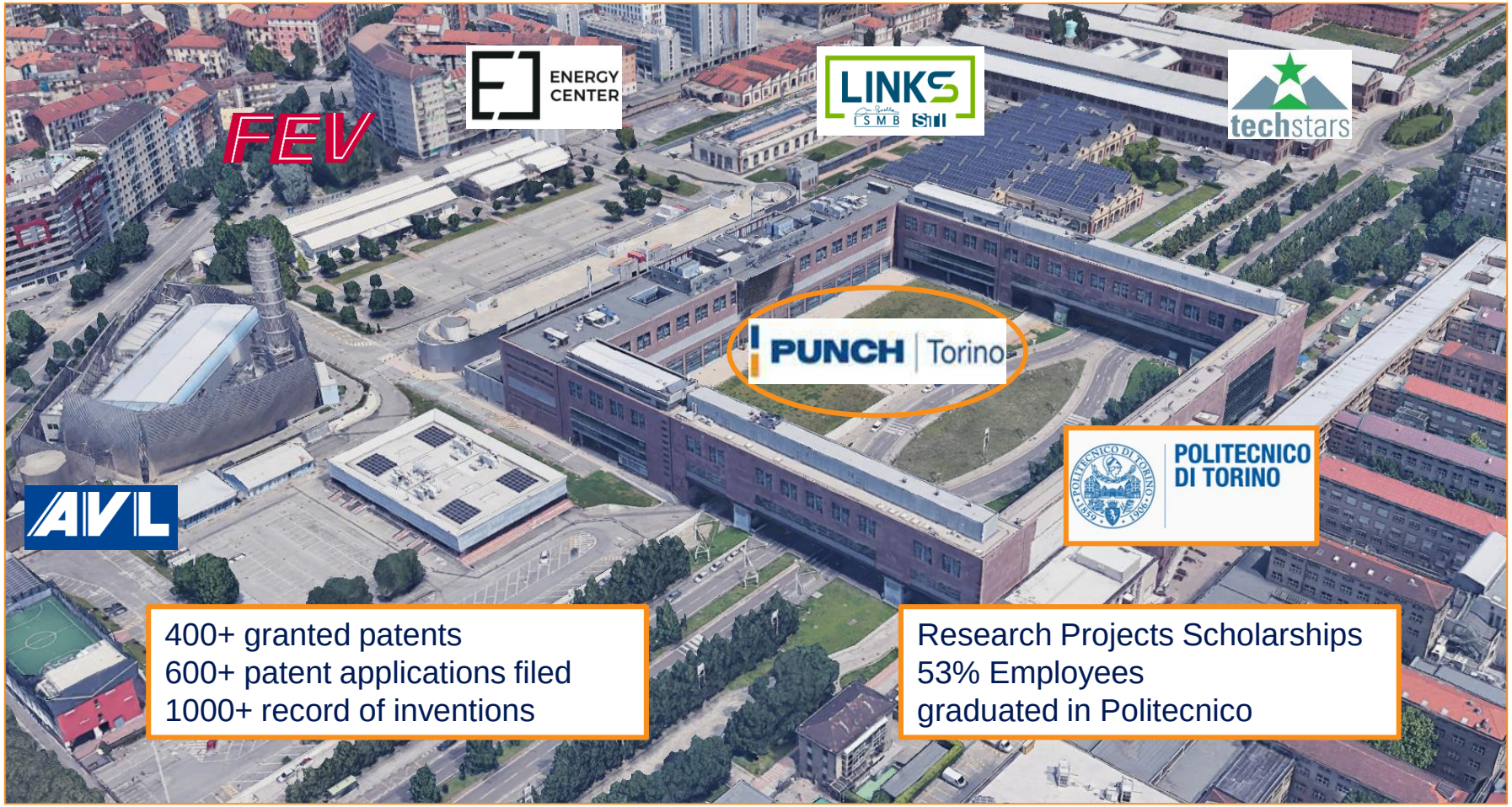
Since 2005, Turin served as a global center of excellence for diesel propulsion systems and electronics for GM.

"This addition to our global portfolio will help the Punch Group execute our vision to be the leading integrator and manufacturer of driveline solutions," said Punch Group Founder and CEO Guido Dumarey. "The focus of this business will be to deliver world-class engineering services to GM and new clients. This includes developing engine applications for new segments, supporting the manufacturing of engines, and providing both engine and transmission solutions in markets worldwide."

# PUNCH | Torino - Our people



# PUNCH | Torino - Environment for Innovation



# Additive Manufacturing Key steps

**Jurney to Serial Production**, 2018 – today*

**AM Innovation Event**, Torino, September 2018

**AD&M Global Team**, November 2017

**Network**, 2016

**Pre-Production**, 2015

# Product development: benefits

**Reduced development time**

- ✓ No tooling
- ✓ Flexibility
- ✓ Multiple design loops
- ✓ Several design concepts

**Design Freedom**

- ✓ Functional design
- ✓ Light weighting
- ✓ Impossible design
- ✓ Customization

**Part Consolidation**

- ✓ Quality Improvement
- ✓ Functions integration

**Smart 4.0 eco-system**

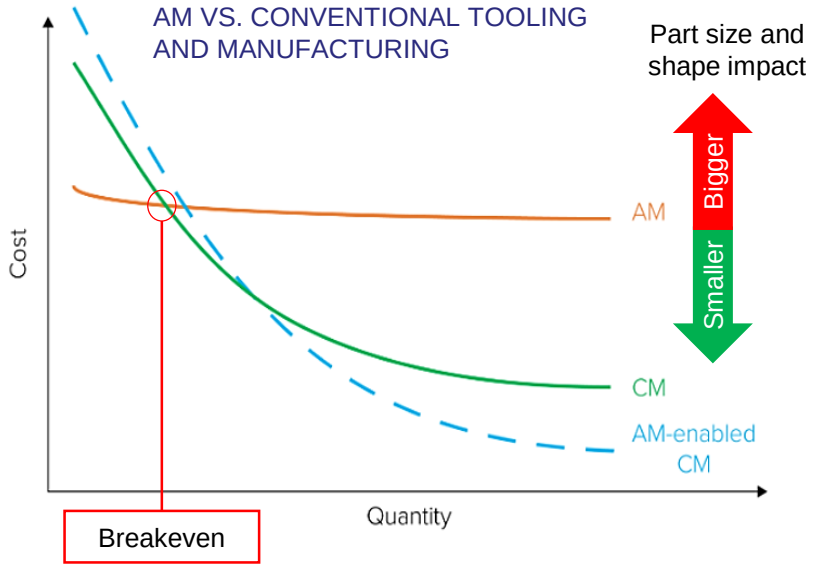
- ✓ Number of suppliers
- ✓ Shipping & logistics
- ✓ Reduced inventory costs & risk
- ✓ Smart procurement and quality monitoring

**Environmental Impact**

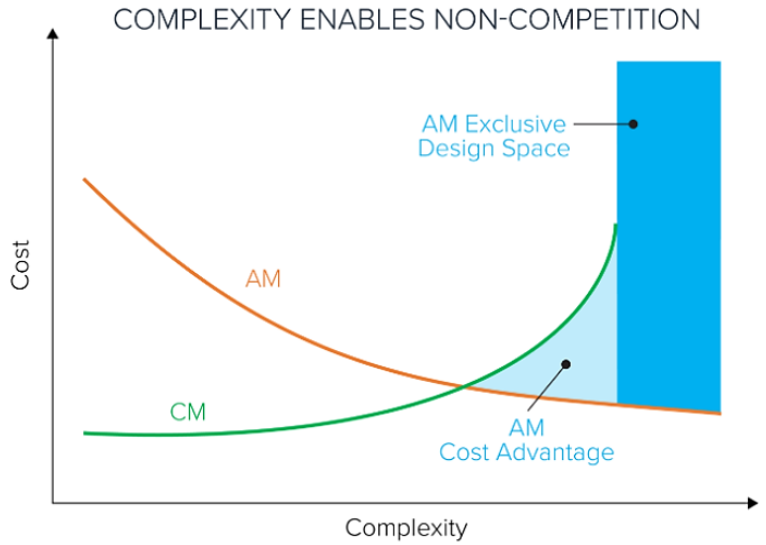
- ✓ Lower energy consumption
- ✓ Less material waste

# Product development: business case

**Cost vs Quantity**




**Cost vs Complexity**




# Key factors for Additive high volume production

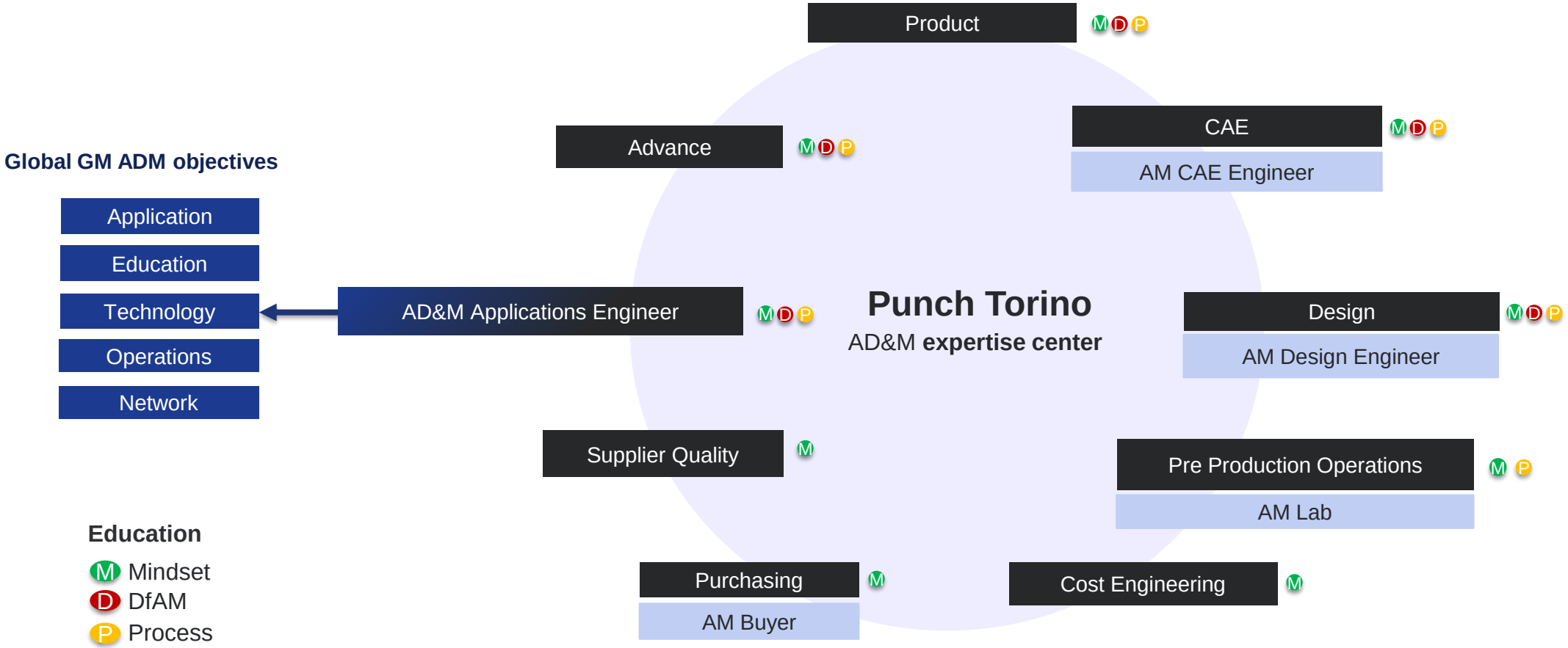
- ✓ Business model and tailored strategy
- ✓ Functional optimization and design for Additive
- ✓ Materials development
- ✓ Process efficiency and throughput
- ✓ Post-processing reduction and automation
- ✓ Quality improvement and control

**Interdisciplinary cooperation**
*(Cross-functional team)*

**Qualified supply base**
*(4.0 eco-system)*

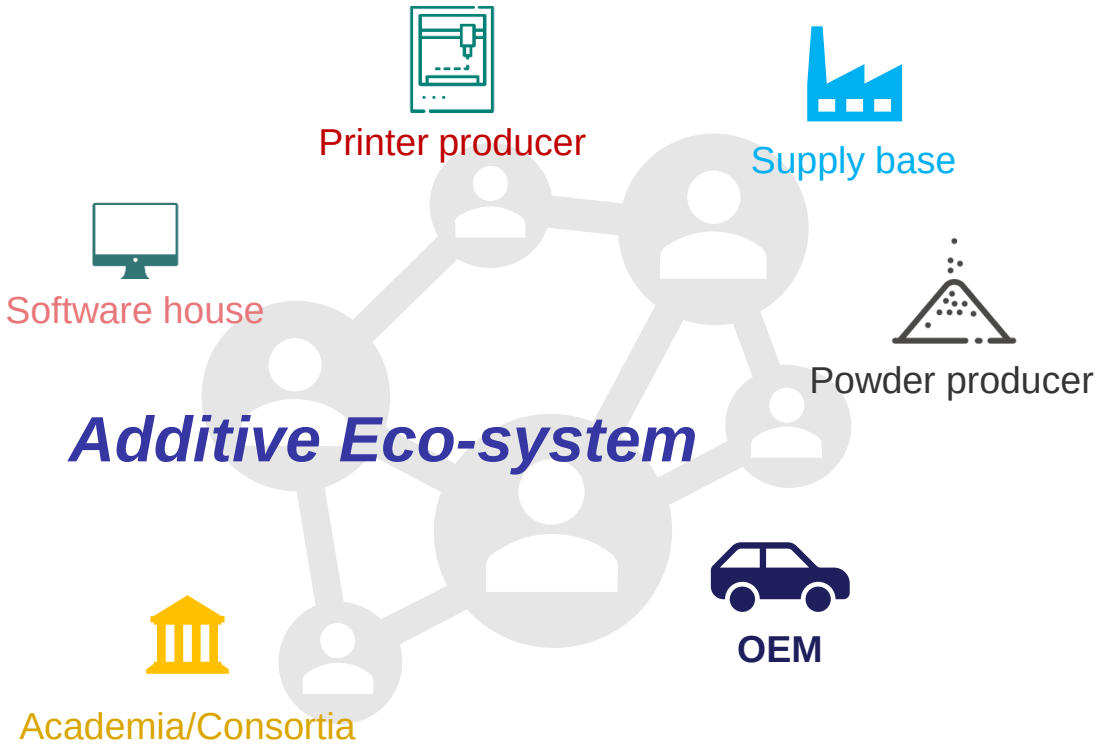
**Prouct development**
*(Additive BOM row strategy )*

# Cross-functional team



# 4.0 Eco-system

How could we get to **higher performances** , **more quality** , **more efficiency** and a **good business case**?




**Product development**

- ✓ Technical gaps vs. conventional process
- ✓ DfAM methods and mindset for automotive products
- ✓ Product development process efficiency
- ✓ Product business model

**Supply base**

- ✓ AM Tier 1 qualification and development (IATF)
- ✓ Additive adoption for conventional Tier 1

**Process**

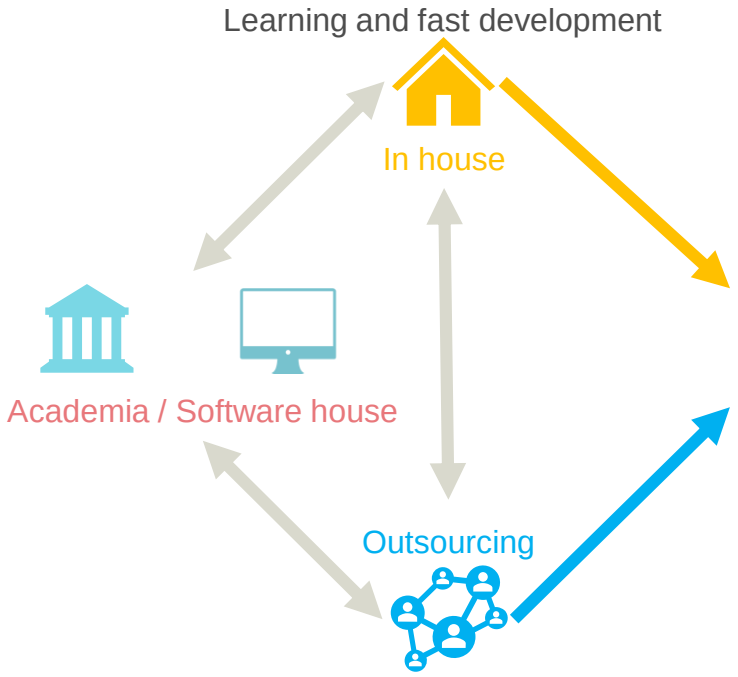
- ✓ Cost drivers analysis
- ✓ Process industrialization (TRL 6-9)
- ✓ Digitalized procurement

# Additive BOM row strategy

*start* | *categories* | *commercial and technical evaluation* | *best scenario*

**BOM screening**

- **Complex brackets**
- **Manifolds**
- **Housings**
- **Pipes ..**

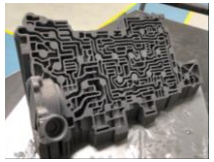



Qualified AM Tier 1 and 2

***Procurement*** & ***BOM-row*** strategy

- Cost/time reduction
- Performance increase
- Know-how increase
- Technical gaps decrease
- Cost drivers analysis
- Serial production candidates

# Pre-production experience

| | Metals | | Polymers | | |
|---|---|---|---|---|---|
| *AM* | **DMLS**  | | **MJF**  | **SLS**  | |
| *Material* | 316 L | AlSi10Mg | PA12 GB | PA12 GF | PA6 GB |
| *Part* | Aftertreatment Converters, housings | Housings, Brackets, Covers, Valve Bodies | Intake Manifolds | Intake Manifold, Camshaft Cover, Ducts | Cooling tubes, Intake Manifolds |
| |   |   |  |    |  |

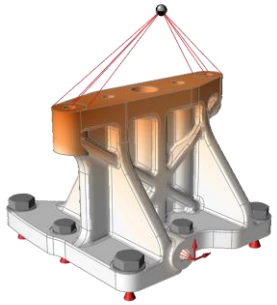
| | |
|---|---|
| Cost reduction* | - 18% tot |
| Time reduction | - 63% avg |
| Product development | Flexibility |

# Pre-production example: optimized turbo charger bracket

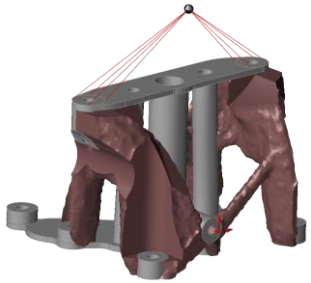
***Need:*** higher stiffness, lightweighting, two different variants for ICE T/C proto validation

***Solution:*** Additive design and manufacturing (DMLS – AlSi10Mg)

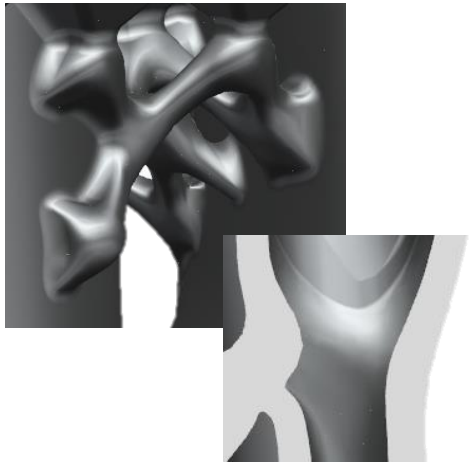
**Conventional bracket**

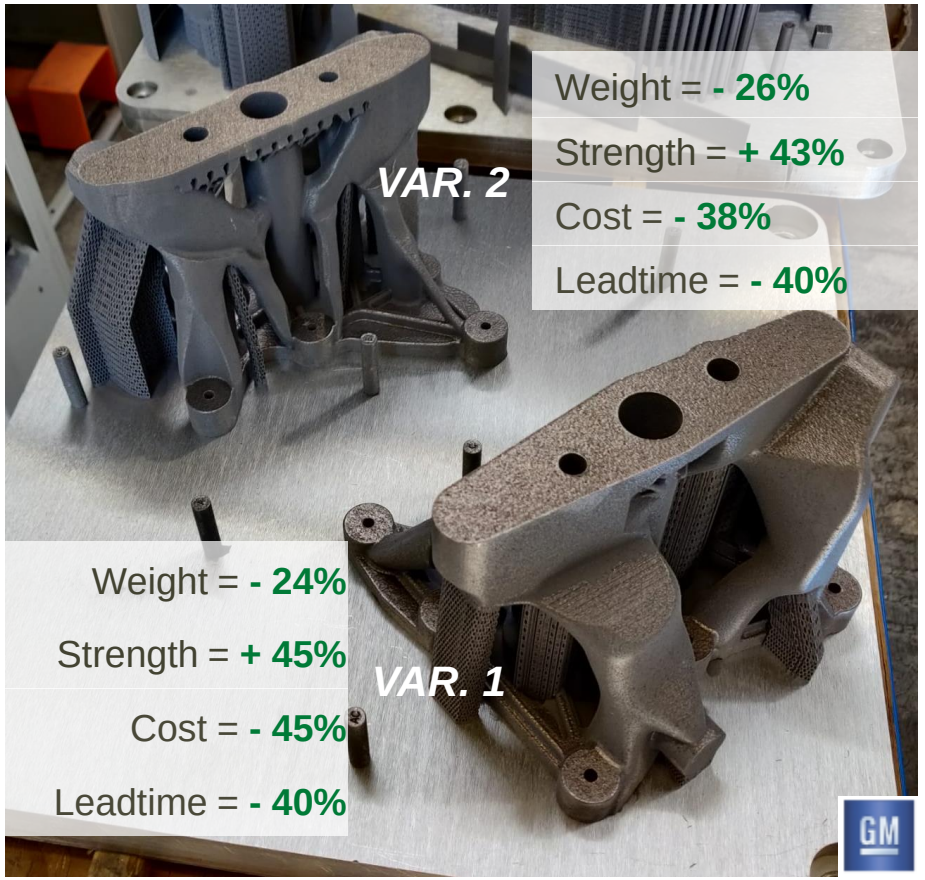


**Topological optimization**



**Lattice structures and complex cavities**





# Pre-production example: Optimized assembly tool

***Need: cost decrease and lightweithing***

***Solution:*** Additive manufacturing insourcing (FDM – C-reinf. PA6)

Conventional manufacturing - Metal → FDM – C reinf. PA6

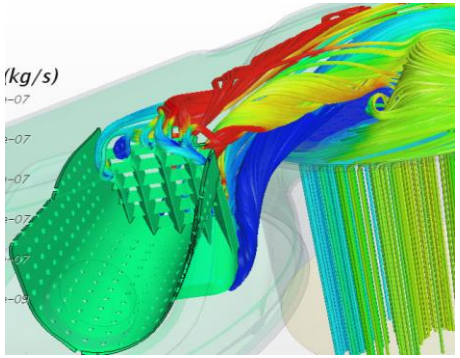
# Serial production intent example: Aftertreatment DEF mixer

***Need:*** *solve the issue w/ the conventional DEF mixer not able to meet the CO2 emissions targets and delta pressure.*

***Unit/year:*** 30k – 90k

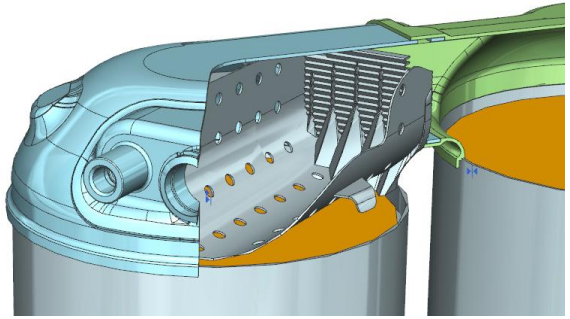
***Solution:*** CFD optimization + Additive design and manufacturing (DMLS – Stainless Steel)

CFD optimization

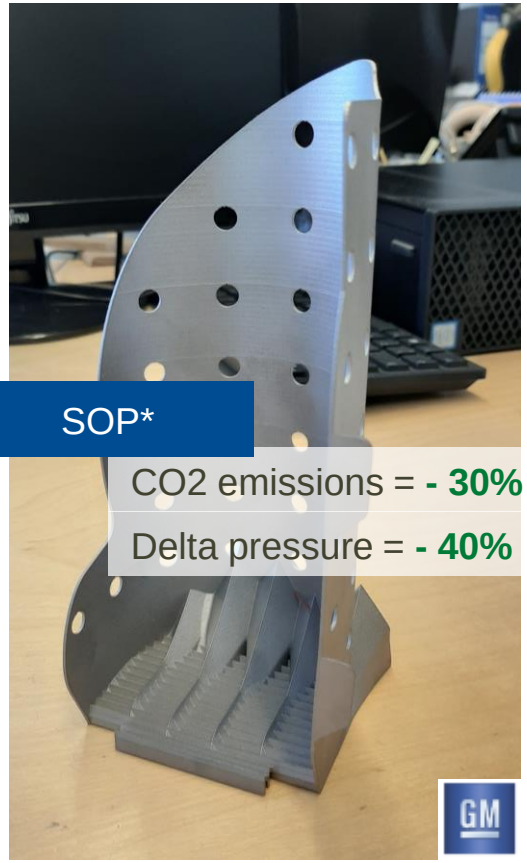



DfAM

Validation



SOP*



CO2 emissions = **- 30%**

Delta pressure = **- 40%**


PUNCH | Torino

Corso Castelfidardo 36
10129 Torino

+39 011 4248010

andrea.boscolo@punchtorino.com

+39 011 4382747

www.punch-group.com