



# MULTI-FUN

ENABLING MULTI-FUNCTIONAL PERFORMANCE  
THROUGH MULTI-MATERIAL ADDITIVE MANUFACTURING

## OBJECTIVES



Development of more than 5 new materials customized for Additive Manufacturing (AM) – 3 of them using nanotechnology

- Use of nanotechnology to maximize thermal conductivity, minimize electrical conductivity and improve wear resistance
- Coating of optical fibres (OF) to maintain their sensing capabilities
- In-situ alloying to improve flexibility in composition and adjust material properties



Development of AM equipment and AM software being able to realize 10 different multi-material designs by 5 new technologies

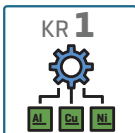
- Atmospheric Plasma Powder Deposition (APPD) – produce requested material compositions during the layer build up
- Wire + OF will allow sensing capabilities – APPD will generate electrically conductive layers in between insulating layers
- Development of advanced offline planning and process control tools for multi-material AM



Supervising the significant reduction of environmental impact and costs by LCA

- LCA, LCC, safety and Eco-efficiency will ensure:
  - More than 40% rise in efficiency, quality and reliability
  - More than 35% reduction of resources and costs

## KEY-RESULTS



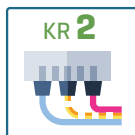
### ADVANCED METALLIC MATERIALS

Advanced structural metals & corresponding active material solutions for innovative multiple functionalities



### MULTI-MATERIAL DESIGN-KNOWLEDGE

New knowledge on increased efficiency of parts & moulds due to integrated, multi-material-based functions



### NOVEL AM EQUIPMENT

Hard- & software for multi-material processing & in-situ alloying, toolpath planning & process control for several AM technologies working in parallel



### STANDARDISATION KNOWLEDGE

Enhanced knowledge to contribute to standards and support regulatory bodies adapting to multi-material AM



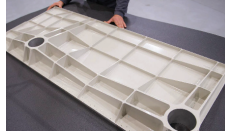


# Manufacturing and evaluation of 7 physical demonstrators with multi-material design and integrated multi-functionalities

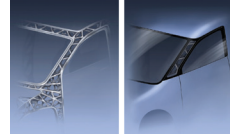
**KR1 (≥ 5 MATERIALS)** and **KR2 (≥ 5 TECHNOLOGIES)** will be applied in 10 different combinations in 7 demonstrators, belonging to 3 use cases (structural parts, moulds, test equipment), addressing 4 different markets (automotive, aviation, space and production industry)



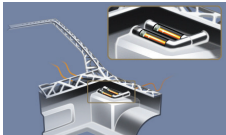
Actuator Housing



Bulkhead Panel



See-through A-Pillar



Dashboard Carrier



Mould for Alu Casting



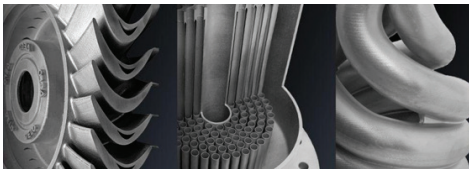
Mould for CFRP Parts



Automotive Testing

## IMPACT

- Improvement of the efficiency, quality and reliability of the product by at least 40%
- Better use of raw materials and resources with reduced environmental impact and to lower cost by 35% as demonstrated by Life Cycle Assessment
- New opportunities & business for SMEs across Europe (key players in adv. materials research for AM)



## BENEFITS

Large benefits are expected from incorporating nano-technologies due to outstanding material properties. Three of the several novel features are:

- Integration of heat sink material with highest thermal conductivity, resulting in up to 100% increase in local heat transfer rates
- High degree of integral design
- Adding sensing and data transfer capabilities into metal parts for condition and structural health monitoring purposes as well as process control techniques (Digital Twin)

## PARTNERS



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[www.multi-fun.eu](http://www.multi-fun.eu)