

# rade2XL

the next big thing

## Application of Functionally Graded Materials to Extra Large Structures

### PROJECT DATA

- **Objective:** to demonstrate the potential of multi-material Wire Arc Additive Manufacturing (WAAM) for large structures (~1 to > 10 meter length).
- **Budget:** 10M€, including 8M€ EU funding
- **Duration:** 48 months of R&D
- **Programme:** H2020 project Innovation Action | Call NMBP-19-2019 Advanced materials for AM
- **Project coordinator:** Materials Innovation Institute M2i
- **Consortium:** 21 partners from 8 EU countries

### INDUSTRIAL NEED

Large engineering structures such as turbines, bridges and industrial machineries are still manufactured by traditional processes such as forging, casting or by machining from solid blocks. These processes do not allow local control of material properties to achieve specific function such as anti-corrosion or anti-wear.

To meet the functional specifications, engineers must operate within a limited range of design options, with high “buy-to-fly” ratios and long lead times.

### INNOVATION

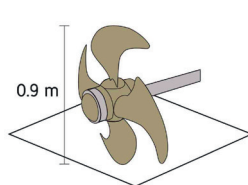
Current technologies (casting, forging and machining) only allow single materials, forcing compromise on the properties and functions of the product. With Wire Arc Additive Manufacturing (WAAM), multi materials can be used to create the desired blend of properties in a product: no compromise needed.

The **high printing rate** of WAAM, combined with the ability to **control material properties down to the nanoscale**, enables the manufacturing of strong and durable engineering structures.

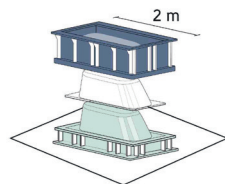
## IMPACT

- Superior **quality and performance**, with **wide range of design** and **multimaterial possibilities**.
- **Lead times cut by up to 96%**
- **Massive cost savings** for the maritime and energy industry, as well as for industrial machinery.
- **Rapid roll out** to other sectors.
- Attractive **investment opportunity for SMEs**.
- Strengthen **Europe's capacity to drive manufacturing innovation** globally.
- **Withstand growing competition** from Asia.

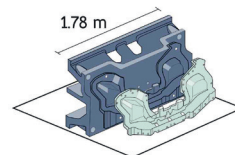
## INDUSTRIAL APPLICATIONS



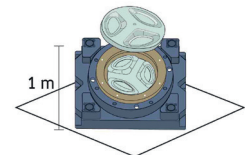
**A-1 Propeller**  
MAN-ES / RAMLAB



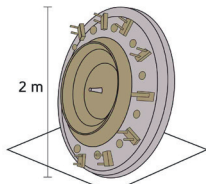
**B-1 Mould for Bathtub Showface**  
Villeroy&Boch / RAMLAB



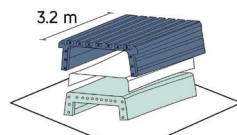
**B-3 Injection Mould for Plastic Parts**  
ARRK Shapers' / Naval Group



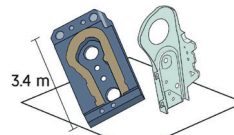
**B-5 Forming die for Stainless Steel Parts**  
Gorenje / RAMLAB



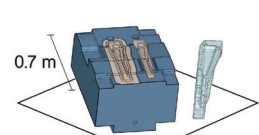
**A-2 Mobile Ring for Hydroelectric Plant**  
EDF / Naval Group



**B-2 Mould for Composites**  
GKN / RAMLAB



**B-4 Forming die for steel parts**  
Gorenje / RAMLAB



**B-6 Hot Forging die (repair)**  
Kuznia Jawor / RAMLAB

Air Products | Bureau Veritas | Commissariat à l'énergie atomique et aux énergies alternatives | Danmarks Tekniske Universitet | Electricité de France | GKN Aerospace Services Ltd | Gorenje Orodjarna | Kuznia Jawor SA | Lincoln Smitweld BV | MAN Energy Solutions | Naval Group | Pôle EMC2 | Politechnika Wrocławska | RAMLAB | ARRK Shapers' | M2I | Technische Universiteit Delft | Ucosan (Villeroy&Boch) | Universiteit Gent | Valk Welding | voestalpine Böhler Welding



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862017.

[www.grade2xl.eu](http://www.grade2xl.eu)  
[@Grade2XL](https://twitter.com/Grade2XL)

