

# **Femtosecond laser shot peening for industrial component optimization**

## Project outline





# ORGANISATION PROFILE

**Irish Manufacturing Research (IMR)** is a research technology centre in Ireland who performs research for manufacturers and engineering firms to aid and acceleration the adoption of new, cutting edge manufacturing technologies and processes. IMR has 4 thematic pillars:



## Digitisation

Help Industry to gain value and competitive advantage from data through extraction and transformation to action

IOT, Data Analytics, Human Factors, AR/VR, Software Development + Domain expertise

- Inline analytics (QA/QC, image analytics, bin picking)
- Machine health monitoring (vibration analysis, predictive maintenance)
- Scheduling
- Supply-chain data



## Automation and Control

Help Industry to develop and deploy automation and control technologies and strategies

Robotics and Automation, Process Automation, Simulation, Controls Engineering

- Labour Optimisation
- Quality and repeatability
- Lights-out manufacturing



## Design for Manufacturing

Help Industry to design and manufacture complex products and processes on emerging technologies

AM, Machining, Automation, Mech Eng., Materials Scientist

- Traditional to Additive
- Lightweighting and product customisation
- Simulation based part qualification
- New Material and Process Development



## Sustainable Manufacturing

Help Industry maximise energy efficiency, minimise environmental impact and create value

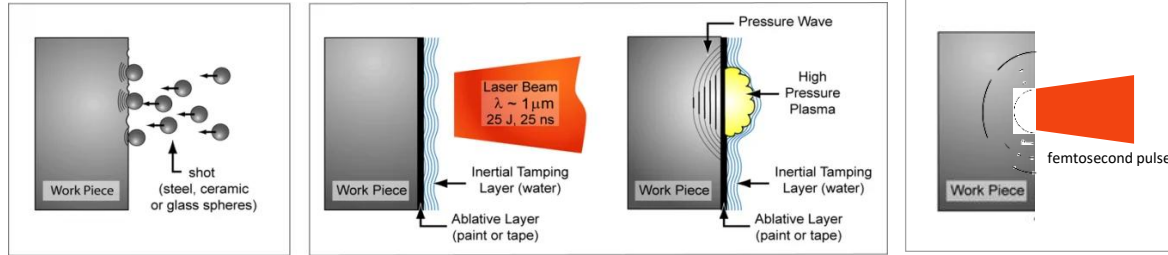
IOT, Data Analytics, SW dev, Domain Expertise, Materials Eng.

- Circular supply chains
- Energy Efficient Design
- Energy Efficient Operations
- Demand Side Management
- Plant Optimisation

# PROPOSAL INTRODUCTION (I)

## Vision:

Replace conventional mechanical / conventional laser shot peening with femtosecond laser shot peening. Shot peening is typically used to impart a compressive residual stress layer for improved mechanical performance of components – reduce the formation of **microcracks**.



## Motivation:

Remove the need for an abrasive media (mechanical peening) or ablative and tamping layers (convention laser peening). Increased control (no stochastic variance in abrasive size) and reduced cycle time (no taping and water). Increased sustainability – no shot material, waste water or tape waste.

## Content:

Process parameters on a 5 axis femtosecond integrated CNC machine for peening of an industrially relevant component i.e. medical device, aerospace or automotive.

## PROPOSAL INTRODUCTION (II)

### **Expected outcome:**

A manufacturing process for femtosecond CNC shot peening on an industrially relevant component  
Process parameters for the above, with industrially competitive cycle times  
Evaluation and benchmarking against conventional shot peening method(s)

### **Impacts:**

Reduced waste in a waste intensive process (no media or tapping / water)  
Reduced number of processing steps  
Increased repeatability (no variance in abrasive size, impact of water flow)

**Schedule:** 2 year programme, submission in February 2026 for the SMART Eureka Call

## PARTNERS

### **Current Consortium: Irish Manufacturing Research (IMR)**

IMR capabilities

1. Laser machining (Continuous and pulsed wave etching, femtosecond CNC machining)
2. Conventional CNC machining (3 axis, 5 axis, 7 axis micromachining, 9 axis mill turning)
3. Metal powder Additive Manufacturing
4. Polymer Additive Manufacturing
5. Mechanical testing (tensile, yield strength, elongation, hardness)

### **Partner search:**

Companies who currently use shot peening (conventional mechanical or conventional laser shot peening) in medical device, aerospace, automotive or other relevant industries

RTOs with simulation expertise (laser matter interaction, mechanical simulation)

Companies



## CONTACT INFO

**Contact info:** of the person coordinating the project proposal

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