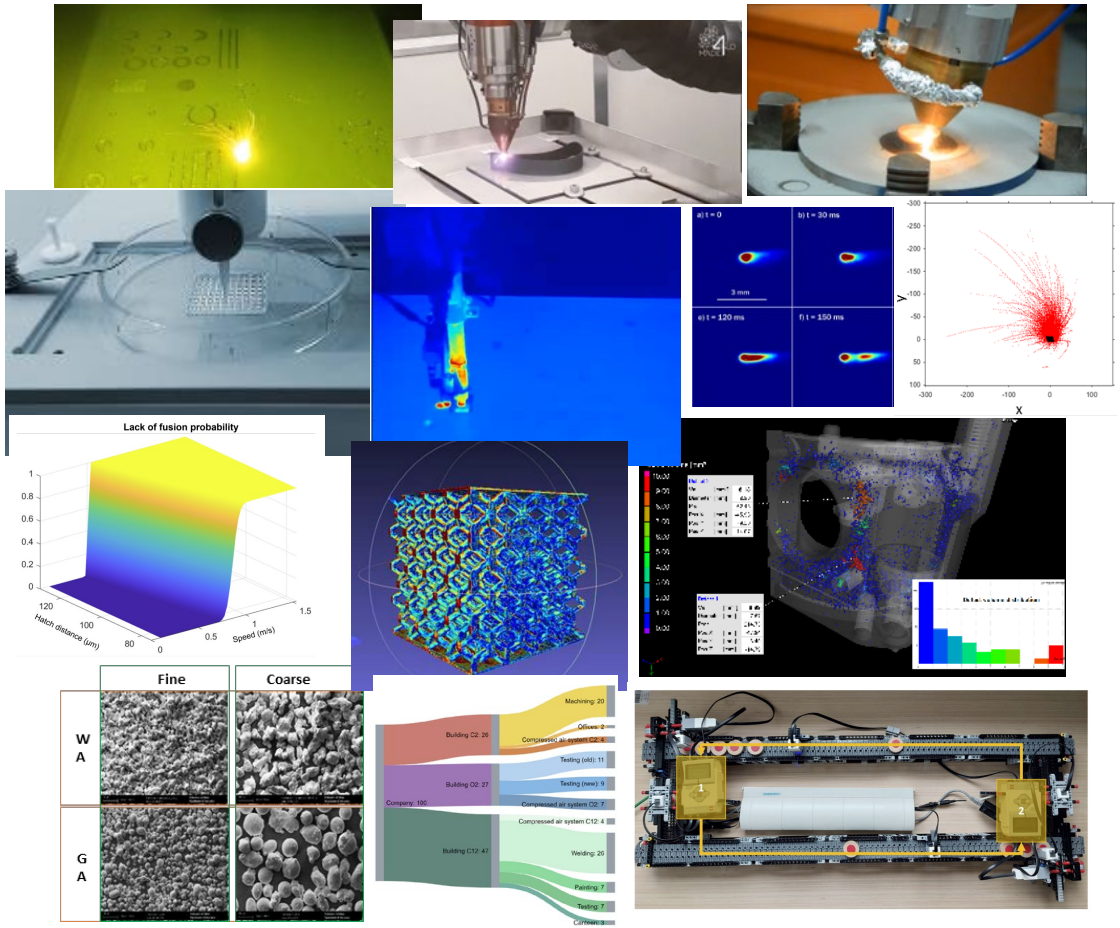
ADVANCED, SMART, AND SUSTAINABLE MANUFACTURING



Advanced manufacturing processes

Additive manufacturing for metals, ceramics, and polymers, laser processing and digital/green I4.0 manufacturing - new process development, innovative solutions conception.

Smart process monitoring, inspection, and control

Smart solutions for sensing and inspection and innovative strategies for intelligent data fusion, big data analysis, quality process monitoring, control and inspection are key factors to achieve sustainable zero-defect manufacturing.

Advanced manufacturing systems

Innovative solutions for configuring and managing manufacturing systems are eventually needed to drive the whole production system toward smart, high-performance, and sustainable solutions.

Period abroad in partner Universities/Agencies

- MIT, TUM, Georgia Tech, ESA, Shianghai Jiao Tong,…

Research group:

- Prof B.M. Colosimo, A. Matta, G. Moroni, B. Previtali

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MANUFACTURING AND DEMANUFACTURING PROCESSES AND SYSTEMS

Description of the subject

Circular economy is changing the way companies conceive, produce, de-produce, and reproduce their products. Not only circular economy is supporting the preservation of the environment and reducing energy consumption but it can become profitable for companies that can recover the function and/or materials of their products. New processes and new systems are required to make the described change operational together with new business models. Moreover, processes should be designed to allow strict cooperation between humans and automation. Therefore research and innovation are at the cornerstone of the circular revolution.

Goals

The goal is to create an expert in the circular economy who is able on the one side to understand processes and on the other side to cope with manufacturing systems design and analysis

Research group:
Prof Tullio Tolio, Marcello Colledani, Marcello Urgo

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CFD SIMULATIONS OF ADDITIVE PROCESSES FOR RECYCLED CFRP

Description of the subject

In this research project, the main objectives would be to develop CFD simulation modelling for predicting the temperature distribution, pressure, velocity, and viscosity of the molten material as it is deposited layer by layer. This information can be used to optimize the process parameters such as the print speed, temperature, and nozzle diameter to ensure the final part meets the required specifications in terms of mechanical properties, dimensional accuracy, and surface quality.In this specific research the focus would be on the 3D printing of recycled CFRPs.

Research group:
Prof Paolo Albertelli, Tommaso Lucchini

Goals

Methods and techniques that will be developed and used to carry out the research will be CFD simulations tools (e.g., Open Foam, ANSYS, etc.), development of specific material modelling of recycled CFRPs. Proper model updating strategies need to be developed. Since the model validation is essential, experimental activities on a test bench would be required. Sensorization of the test bench and data acquisition/processing skills would be required.

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