3D Printing Service Providers AM Research

Il Sentiero International Campus targets key AM adoption segments

The new research hub in Northern Italy has established a major AM and DfAM research center

Edward Wakefield · April 17, 2022

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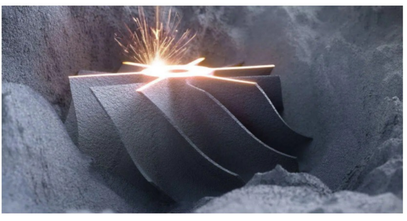
Il Sentiero International Campus is an industrial research center in the field of surface and reliability engineering, additive manufacturing and joining technologies. Its services target advanced mechanics markets such as, for example, the sector of automatic machines for processing and packaging of food and medicines, automotive and aeronautics.

One of the flagships of the Il Sentiero International Campus research and development center is the expertise acquired in additive manufacturing processes: the study of processes and technologies, the development of additive solutions, and the production of prototypes or limited series of components are just some of the activities that are carried out by Il Sentiero.

The industrial research center Il Sentiero International Campus is engaged in several areas in the field of additive manufacturing. A key focus area is the development of solutions for AM, designing for additive manufacturing (DfAM), topological optimization, prototype realization, and reliability engineering. As well as the study of materials and processes, involving the study, the choice, and the analysis of the materials suitable for the application and the future working environment. The analysis of the characteristics of the materials and their behavior is possible thanks to the instruments present in the laboratories. The instruments enable the qualification of components in terms of mechanical and physical performance and corrosion resistance, the study of the performances and applications of new materials, and the investigation of new post-processing technologies and related mechanical and electrochemical properties. Thanks to its network, Il Sentiero International Campus, can also organize training courses for its customers, related both to designing for additive manufacturing and to the implementation of the technology in different companies. These training courses involve the application of the concepts proposed during the course to case studies chosen by the customer.

Essentially, in the field of additive manufacturing, Il Sentiero is committed to carrying out industrial research by identifying the best solutions to the case study.



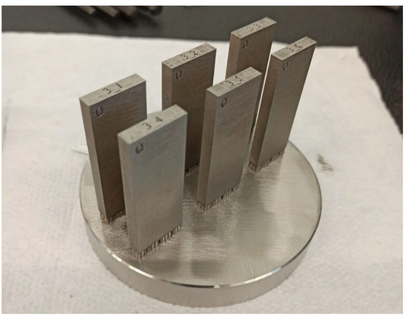
Il Sentiero's strengths in the field of AM

Il Sentiero International Campus has specific know-how of materials and the choice of materials, as well as having the ability to follow in-person investigations and laboratory tests.

Both in the experimentation phase, and the realization of prototypes, the researchers have the ability to conduct all the necessary tests to completely characterize the material. This is also essential when developing process parameters, particularly when studying innovative materials.

According to Il Sentiero, many service providers simply make the components and, when deemed strictly necessary, outsource such analyses.

The synergy of specific competencies in technology, materials, and processes, together with the ability to operate in laboratories with qualified personnel, is the ideal combination for a deep understanding of the processes and the results obtainable from the processes.



The additive manufacturing laboratory of Il Sentiero

The additive manufacturing laboratory of Il Sentiero International Campus is spread over 120 square meters in the Magreta (MO) headquarters. There are four printers installed inside the laboratory: two for metal alloys and two for polymeric materials.

There are two Trumpf Sisma Laser-PBF machines for metal printing: the MySint100 and the MySint300. The printers are qualified to print with AlSi 316L stainless steel, Ti6Al4V titanium, AlSi10Mg aluminum, and Böhler AMPO M789. The machines differ only in volume and printing capacity, but the principle of operation is the same.

The printers for polymeric materials, on the other hand, use two technologies that are similar, but different from each other. For printing the most common thermoplastic materials, such as PLA, TPU, and ABS, the center uses the Kentstrapper Mavis printer, which uses FDM technology. Its constructive simplicity and its large printing volume guarantee an easy change of material and the ability to print very large components (40x40x70 cm). It can also print using Biopolymers. It is mainly used for the creation of supports for the laboratory and templates for the positioning of tools.

The second polymeric printer is the Markforged X7, which uses a variant of FDM technology, continuous filament fabrication. Through this technology, it is possible to directly 3D print real composites (plastic material with reinforcing fibers). The print head is equipped with two nozzles: the polymer (polyamide) comes out the one, and the filament for the reinforcing fiber comes out the other. The fiber, which can either be carbon fiber, glass fiber, Kevlar fiber, or high-temperature glass fiber, allows components to have a tensile strength that is only slightly lower than an aluminum alloy but with a much lower weight.

Case study 1 – Böhler

As mentioned the study of material properties and process characteristics is one of the strengths of Il Sentiero.

For this reason, the Böhler steel mill collaborated with Il Sentiero between 2019 and 2020. In 2019, the company was proposing a new hybrid steel alloy, called AMPO M789, specifically for additive manufacturing. The alloy in question promised hybrid characteristics of 17-4PH steel and AISI 316L. Through a master's thesis at the Faculty of Materials Engineering of the University of Modena and Reggio Emilia, the material was thoroughly studied, with a focus on its corrosive behavior.

The results were then presented at some scientific conferences.

Case study 2 – AM roughness study

Among the disadvantages related to using AM with metal is the surface finish challenge. Many components require a finish that cannot be achieved by the AM process alone. This also affects various properties, such as corrosive resistance. Therefore, it is necessary to have one or more post additive steps to achieve the required surface roughness, in order to comply with the application requirements.

There are many available post-processing techniques to reduce surface roughness: from simple sandblasting to immersion in electrochemical baths.

At the request of a customer, Il Sentiero undertook an industrial project that required the study of the main technologies currently available in the European market, evaluating the performance and in terms of achievable roughness. The wide-ranging project took about a year and a half to complete and included several activities such as technology scouting, identification of suppliers, design, and implementation of samples, tests, measurements, data analysis, and reports. The materials examined were AISI316 and Ti6Al4V.

The laboratory tests (roughness analysis, optical and electron microscope analysis, tomographic analysis) that have been developed have allowed Il Sentiero to evaluate the effectiveness of the individual post-processing techniques, taking into consideration – roughness, surface 'pollution' and material removal.

Today, the company has a good picture of the performance of the different technologies that allow for choosing the optimal process to adopt in each case study – depending on the application and cost.

Tags insights

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Edward is a freelance writer and additive manufacturing enthusiast looking to make AM more accessible and understandable.