High Performance Production Through 3D-Printing Pilot

3DP HYSUS

VANGUARD INITIATIVE

Challenges

- Reducing weight of a vehicle's suspension control arm
- Increasing durability of multi-material structural automotive components

Project duration: **9 months**
Industrial sectors: **Automotive**
Consortium coverage: **Italy, Sweden**

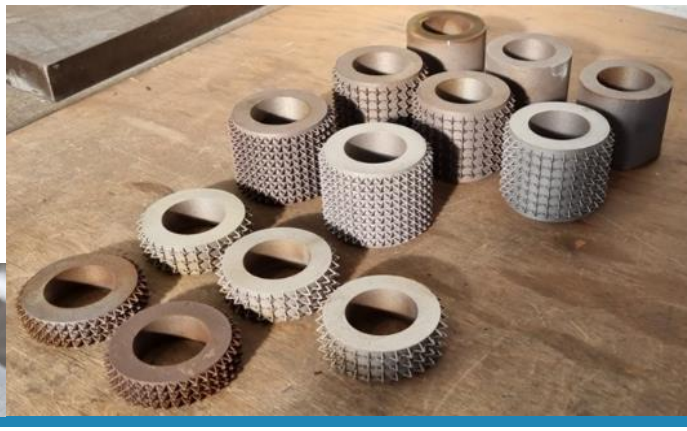
MIND was founded in 2006 with the desire to become highly specialised in the engineering and manufacturing of composite components. The company is located in the centre of the Italian Motor Valley, Emilia Romagna, in an area that, for over a century, had been driven by motors, guaranteeing professionalism, vision and competence for the industry. The skills of MIND range from process engineering to quality control, from industrial design to the manufacturing of composite material components. Both traditional and innovative manufacturing processes are used on a daily basis to supply several OEM and Tier 1 suppliers of supercars, racing cars and motorbikes.

The Challenge

Hybrid material suspension components are slowly being integrated within the automotive sector. However, this is only done within and by the most high-end manufacturers in the world. Previous examples of hybrid material suspension components were manufactured using more traditional techniques which resulted in poor durability because of the more simple bonding surface between the materials. To overcome this problem, MIND turned to additive manufacturing due to its capability to create complex structures at lower manufacturing costs. Capitalising on additive manufacturing, MIND had the ambition to produce new hybrid suspension control arms with a weight reduction of between 10-50% and increase safety by being able to locally tune crash behaviour of structural components of the car.

The Project

Over the course of 9 months, the project aimed to demonstrate and validate the mechanical properties of a hybrid material component (the control arm of the suspension of a sports car), in which a metal insert, produced using additive manufacturing is bonded to a Thermoset Carbon Fibre. This metal insert would have a complex lattice structure surface to guarantee a strong integration and bonding between the metal and composite materials, thus overcoming bonding issues faced when using more traditional technologies and production methods. This would be a crucial step in enabling industrial uptake and investment in a new production line.



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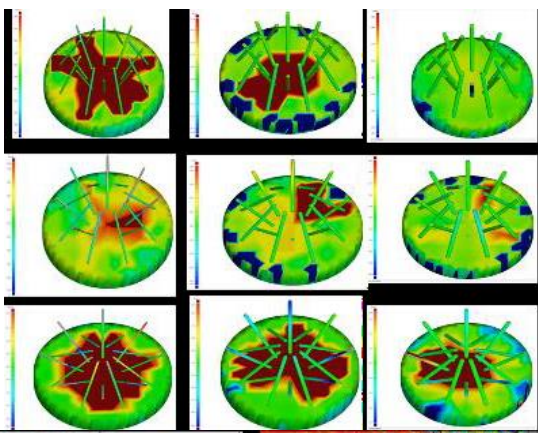
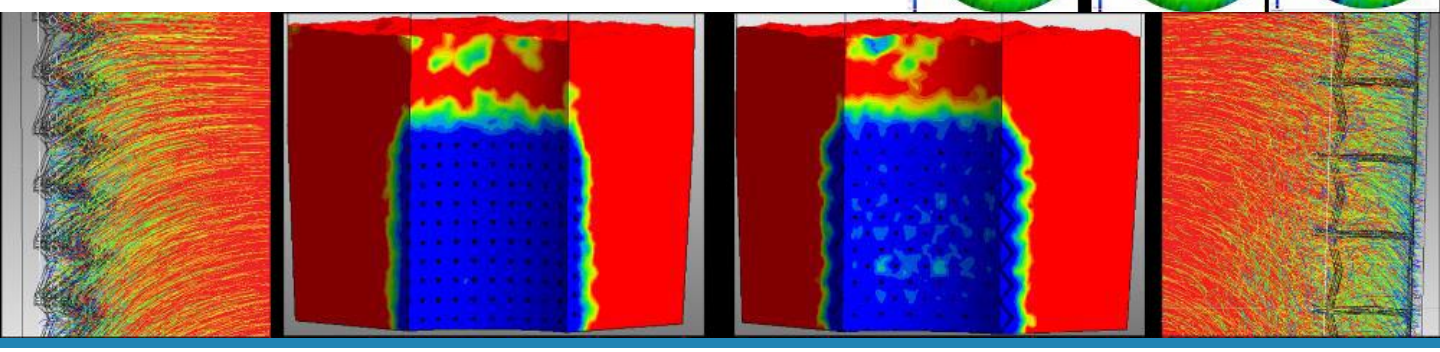
Role of the Facility Centres

For the implementation of the 3DP HYSUS project, MIND partnered up with the University of Bologna based in Italy, and the Örebro University in Sweden. Within this partnership, the University of Bologna was tasked with the creation of the design of both the metal insert, which was manufactured using 3D printing technologies, as well as the lattice structure to be printed on the insert. During the design process, the optimisation of the shape of the joint for strength and ease of manufacturing & testing was kept as the main focus. This process resulted in two different geometries to be used for final validation. Following the design phase, the University of Bologna proceeded with the manufacturing of 20 hybrid material samples to be used for mechanical testing – this testing was also conducted by the University of Bologna. Following the validation of the hybrid material components, Örebro University was involved by making available their CT scanning equipment and were responsible for the preparation of the samples prior to CT scanning. The CT scanning was a critical final step in analysing the structural integrity and strength of the suspension components. After the testing phase, it became possible to finalise the design of the suspension arm for the automotive application for further homologation.

Results achieved

Through testing, it became apparent that the new component had increased mechanical performance and was far better suited to absorb energy, thus improving stability and safety of vehicles. 3DP HYSUS has directly contributed to the development of expertise associated with the manufacturing of hybrid components and to further capitalise on the increased structural performance which this solution offers. This technique can be applied in other automotive (and non-automotive) application areas and the results of the project can have strong spill-over effects to other industrial domains.





VANGUARD INITIATIVE
New growth through smart specialisation

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

ÖREBRO UNIVERSITET