
Master project, 2021-2022

— Topology Optimization toward Additive Manufacturing —
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Key word

Topology Optimization, Additive Manufacturing, Design by optimisation, Electric component

Context

Topology optimization (TO) is an alternative method to find the optimal shape of a device for a specific purpose without any layout a priori. Highly inspired from the structural/mechanical community which has been actively working on this method since the late 60s, it represents a growing interest in the electromagnetic community for the design of electrical machines [1,2]. The methods used are essentially based on and further evolved from existing TO ones: Homogenization Method, Density Method [3,4], ON-OFF Method, or Level-Set Method. The latter are principally used to model the design space /domain to be optimized. Associated with the chosen method, a modeling tool must be used. Additionally, an optimization algorithm is used to achieve the best shape for the formulated problem; this can be chosen more freely amongst the wide range of existing algorithms.

Additive manufacturing (AM), also known as 3D printing, has experienced a tremendous development over the past twenty years as it has spread over a wide range of industrial sectors. Beyond the fact that this process allows for rapid prototyping, it offers the ability to create complex geometries that would otherwise be difficult to produce using classical techniques. Electromagnetic systems and power electronic applications can take a great advantage to used AM [5]

Objective

The overall objective is to design by optimization electrical engineering components. The way to achieve this is through topological optimization methods. Some tools are available to model and optimize in our laboratory. The work will focus on the development of test cases and their resolution by different techniques. Finally, the obtained shapes and structures will be printed and tested.

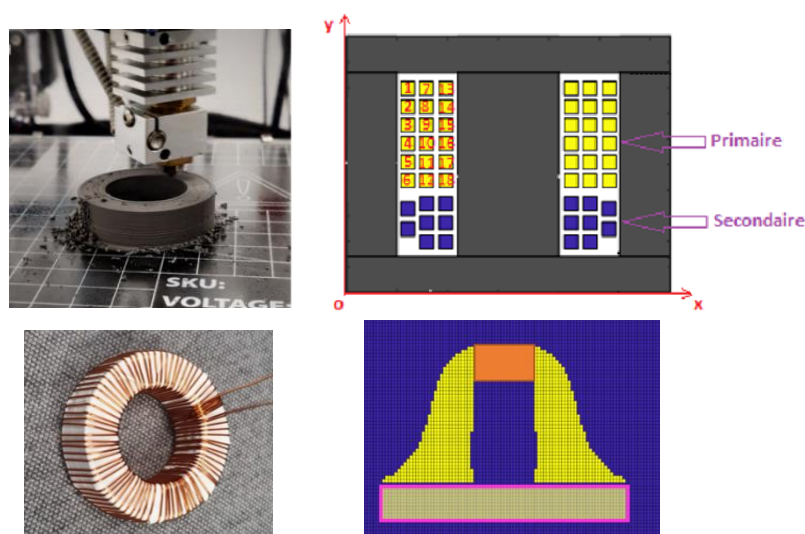


Figure 1. Printing with pellet and magnetic characterization in left, optimized structures in right

References

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