

# **Infrared thermography as an alternative to penetrant testing and magnetic particle inspection: from laboratory proof-of-concept to industrial use cases**

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Dye Penetrant Testing (PT) and Magnetic Particle Inspection (MPI) are two NDT techniques widely used by Safran Group companies. They benefit from their excellent sensitivity to surface discontinuities and their adaptability to a wide range of parts with different geometries and material properties. However, they both have a number of drawbacks, including their reliance on chemicals, their dependence on the human factor, and the difficulty of automating both the inspection and interpretation phases. In this context, finding an alternative that can address these limitations is a key objective for Safran Group. In this presentation, we propose to present the results of our work in active thermography, with the aim of offering a digital alternative to these inspection methods. After outlining the underlying physical principles, we will describe the main stages involved in developing various industrial use cases that correspond to different types of parts produced by Safran Group companies. The first example focuses on the use of active induction thermography as an alternative to dye penetrant inspection for helicopter turbine blades. We will then discuss how this technique can be applied to inspect sliding landing gear rods, serving as an alternative to magnetic particle inspection and Nital etching. Lastly, we will highlight the application of active thermography using laser heating as an alternative to penetrant testing on low-pressure turbine discs. By exploring these case studies, we hope to demonstrate the potential of active thermography as a viable alternative to current inspection methods, addressing their limitations and providing a more efficient and reliable solution for Safran Group.