INTRAPID - Innovative inspection techniques for laser powder deposition quality control

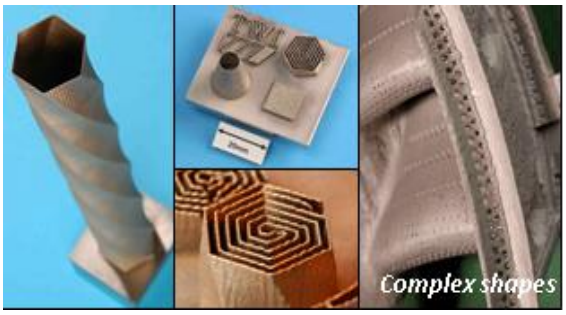
The INTRAPID project developed three non-destructive testing (NDT) techniques for inspection of parts and components manufactured by an additive manufacturing process, in particular laser metal deposition (LMD). LMD is a technology that has been maturing over the last 20 years and has found application in rapid prototyping and repair and manufacture of small intricate parts that can be used in aero and automobile engines to improve efficiency.

This technology has significant potential advantages over conventional casting methods in that small parts with internal features can be built, enabling special processes and light structures to be constructed. Currently this technology cannot be used to supply some of these parts because absence of flaws that might be left in the component during manufacture cannot be guaranteed.

Today, quality is assessed by sample destructive testing, which gives slow feedback and is expensive. Non-destructive testing (NDT) would be the desired solution so that parts can be made right first time and with reduced cost. However, conventional NDT is generally used for much simpler and larger structures and cannot be adapted easily for these components.

Project objective

The powder deposition process works by melting a layer of powder in a pattern determined by the path of a laser. To take full advantage of the intricacy of form enabled by these additive technology approaches in these applications, commensurate NDT inspection capability is needed which can support the cycle times needed in rapid agile manufacture of high performance, high loading efficiency structures. This requires an inspection process capable of handling the complex evolving forms, in cycle with a processing environment with a feature resolution on a scale relevant to the component structural elements.



Three NDT techniques (laser ultrasonics, Eddy current and laser thermography) were chosen in INTRAPID as it was expected that each would have limitations or find a niche in the variety of shapes and materials that will eventually be used for the components. They were chosen because they each operate with a different physical principle, which enhanced the chances of overall success, and they each had the capability to test very small areas of a component, which is essential for this application.

The specific project objective was to develop the three inspection methods to a stage where prototype systems were integrated into a production process and to complete a demonstration of this. These objectives were achieved and detection curves related to target sensitivities of size and depth were produced.

For further information, please visit the project website at **www.intrapid.eu**.

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