Case Study

Bayesian Optimisation of a Blown-Powder Additive Laser Process for Pressure Vessel Cladding

CHALLENGE

Blown-powder laser cladding holds the potential to greatly benefit the nuclear sector by significantly reducing the time, cost and energy for manufacturing. It is a single pass technique, removing the need for inter-stage NDE. It is a low heat-input process that creates negligible component distortion and can be applied to relatively complex geometries such as dome ends, amongst other benefits. Previous development on the technique for nuclear applications reached Manufacturing Readiness Level (MRL) 4. Despite its benefits, further development was viewed as hampered by the lengthy and costly route of finding appropriate combinations of process parameters.
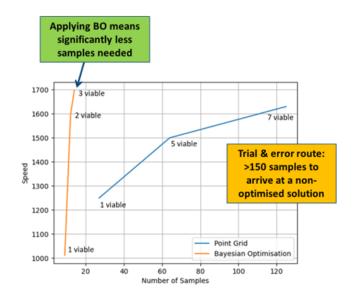
OUR SOLUTION

Frazer-Nash Consultancy consider Bayesian Optimisation as a solution to drastically reduce development time and cost. Bayesian Optimisation builds a probability model that can more efficiently and accurately identify process parameters of interest during develop to quickly reach an optimised set. This would help overcome the development hurdles to quickly raise the MRL of blown-powder laser cladding. The process was able to suggest similar optimised parameters after a greatly reduced number of iterations compared to the original project that used a methodical trial and error approach.

The outcome of this was presented at ASME PVP in Atlanta in July 23, showing the potential to significantly improve efficiencies when maturing a manufacturing process through the adoption of the Bayesian Optimisation technique and created a high level of interest from the audience.

BENEFIT

Frazer Nash Consultancy are able to bring together manufacturing challenges and our in house computation specialist to enable novel application of modelling. The use of Bayesian Optimisation on this example demonstrates an efficient way to arrive at a viable process point which could reduce time and cost to get to a viable solution.

Find out more
To find out more about our work and how we can add value to your business visit our website.

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