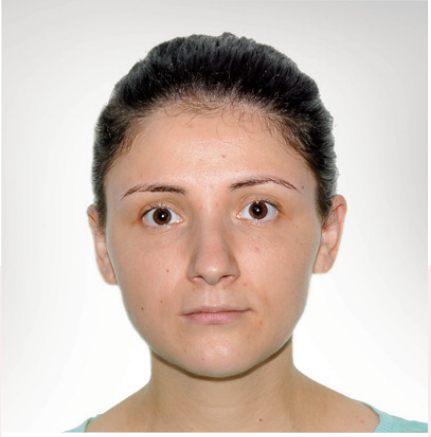
UNIVERSITY OF LEICESTER

Speaker 1

Improving cold spray additive manufacturing with a nozzle designed by the method of characteristics



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ABSTRACT:
Cold spraying is increasingly attractive as an additive manufacturing technique as it retains the original properties of the feedstock and produces oxide-free deposits. Many cold spray facilities use conical convergent-divergent nozzles for accelerating the particles; this typically creates deposits with a triangular profile, rather than an even layer, and can decrease the deposition efficiency. In the current study, this build-up issue is addressed by an axisymmetric profiling of the nozzle walls. This redesign is achieved by application of two aerospace design codes based on the Method Of Characteristics (MOC). By using a coupled Eulerian-Lagrangian Computational Fluid Dynamics (CFD) formulation, the performance of a current commercial cold spray nozzle is compared with that of the redesigned nozzle profile. The numerical predictions show that the new nozzle shape delivers more radially uniform deposit profiles. A higher particle velocity is obtained at the same operating conditions/costs used by the industry standard nozzle.