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Cold spray on Complex Geometry Utilizing Digital Twin of Robot

Cold spray deposition on complex geometries remains challenging due to the need for intricate tool paths and repeated optimization of robot trajectories. This study demonstrates the feasibility of depositing coatings onto a complex semi-spherical geometry using a robot digital twin developed in commercially available Siemens NX software. To evaluate the feasibility of this approach, high-pressure VRC GEN III cold spray was used to deposit material onto 3D-printed polyetherimide (PEI) substrates. Process parameters were first developed and optimized on flat substrates to achieve coating thicknesses exceeding 0.25 in. The study shows that cold spray depositions on 3D-printed polymer components are feasible in producing a thick, uniform coating. Additionally, the advantages and limitations of using a commercially available robot digital twin for tool path development and process planning are discussed.