

Utilizing Simulation to Drive Rotating Band Welding Strategy to Keep Our Warfighters Farther from Active Combat

A LIFT Project / Department of Defense Manufacturing Innovation Institutes



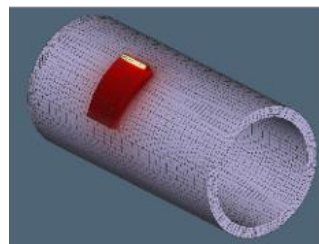
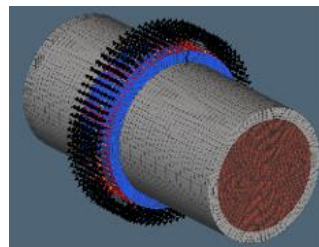
Technology: Integrated Computational Materials Engineering (ICME) and Wire-Arc Additive Manufacturing (WAAM)

Project Participants: LIFT, Hexagon Manufacturing Intelligence, Flow3D, ThermoCalc

Institutes' Role: LIFT is developing its Integrated Computational Materials Engineering (ICME) workflow to simulate and predict parameters that will prevent defect formation such as porosity and cracking in the deposition of rotating bands. To date, this workflow has identified alternate toolpaths and strategies that maximize deposition rate while mitigating cracking. LIFT is now physically validating those simulations in its Detroit facility.

Technology Description: Rotating bands, the band of material encircling a large-caliber projectile that helps provide spin during firing, must survive higher accelerations as required by the Long-Range Fires Program (LRPF). In place of gilding metal, harder, stronger materials such as nickel are of interest, however, these materials must also minimize damage to the gun barrel liner. During deposition, cracking and unacceptable levels of porosity have been observed, both of which render the structures un-fit for purpose. LIFT's ICME workflow, in combination with its physical capabilities, are working in tandem to develop and prove-out strategies that identify the correct manufacturing parameters in the virtual space to mitigate the need for extensive physical prototyping.

Impact: The physical validation of these simulations is currently underway at LIFT. These efforts will build and validate a band deposition process model, advising on optimal manufacturing parameters that minimizing porosity and cracking. This predictive framework, abstractable to other alloy systems, will also be able to model barrel-band interactions. Ultimately aiding the LRPF, this work will help keep the warfighter farther away from active combat.



Rotating Bands
Material Deposition
via WAAM
Simulation