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RESEARCH
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National Science Foundation's
Hybrid Autonomous Manufacturing – Moving from Evolution to Revolution
Engineering Research Center

WAAM-BAM: Improving Process Physics of WAAM by A HAMMER

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WAAM-BAM: Improving Process Physics of WAAM by A HAMMER

Proposed Solution: Improve Process Physics by A HAMMER

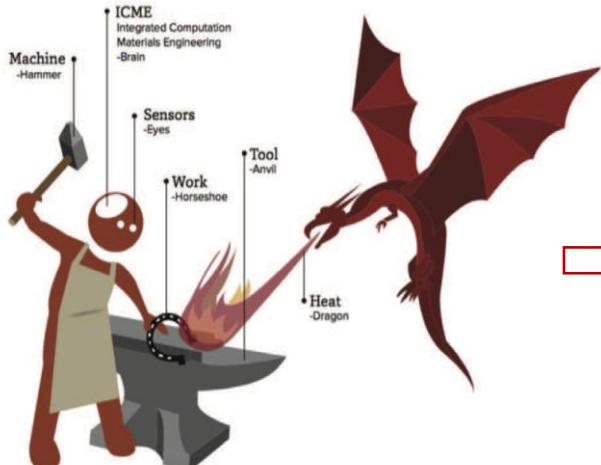
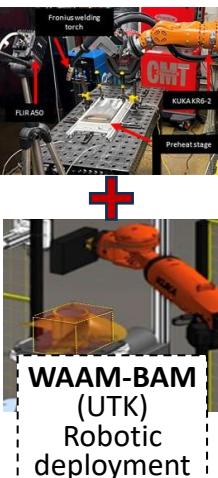
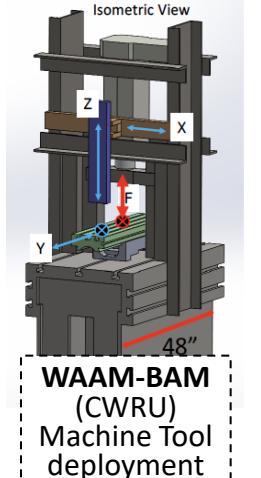


Image from Daehn and Taub, 2018.

Blacksmith → Heat + Force

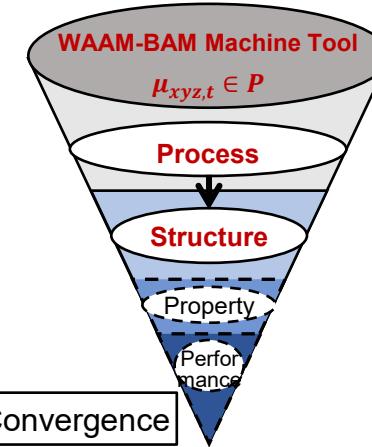
Hardware Development



Software Development (Model-based CAM/CAE)

Process Parameters + Tool Path

Causality

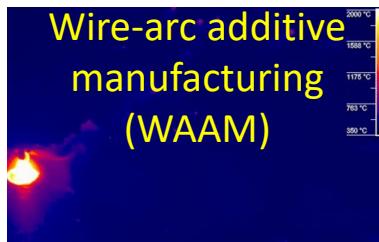


- Simulate and generate the best process parameters and path planning in G-code
- Part production with assured structures and properties

WAAM-BAM: Process and System Development



Problem Statement



Single WAAM process (ONLY HEAT) has almost reached its physical limits

Quality Issues: Large grain size, columnar grains, large residual stress, distortion

Broader Impact

- WAAM-BAM: A new hybrid manufacturing technology as HAMMER ERC's flagship engineering system
- Advance U.S. manufacturing capabilities and leadership
- Address supply chain challenges of casting and forging parts