Additive Manufacturing and Quick Tooling for Injection Molding

PROBLEM / OBJECTIVE

Colorimetric Reconnaissance Explosive Squad Screening (CRESS) kits allow warfighters to accurately detect homemade explosive components. The Edgewood Chemical Biological Center (Prototype Integration Facility) used traditional injection molding tools to prototyping the detector kits. However, tool complexity and long fabrication lead times made prototyping and design iterations for testing purposes lengthy and cost-prohibitive.

The objective of this project was to replace the traditional approach to producing full molds for each component with a modular tool approach.

ACCOMPLISHMENTS / PAYOFF

Process Improvement: A common mold frame was utilized that accepts different insert modules, each insert unique to the component it produces. The inserts are smaller than the whole mold and thus require less material, less fabrication time and fewer tool components. The unique tool modules were fabricated using additive manufacturing, a process that was demonstrated superior to traditional machining techniques. Specific process improvements included:

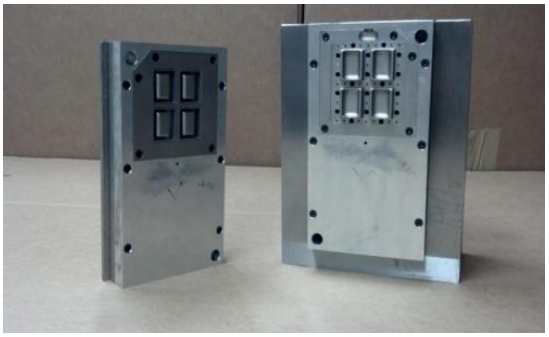
- Use of additive manufacturing and rapid prototyping technology to build mold inserts from plastic (Krypton Green), ceramic (Nanotool), and metal (Maraging Steel).
- Demonstrating modular fit of the additive manufactured mold inserts into Master Unit Die (MUD) Frames.
- The ability to make production-representative parts using MUD Frame in an injection molding machine.

Implementation and Technology Transfer:

Prototypes were tested and delivered for the CRESS kits. The technology demonstrated in this project can be applied to many systems. Application of modular tooling techniques using a variety of proprietary modular tooling processes is possible. Additional implementations are expected for any part requiring reduced fabrication time using the insert modules.

The technology was transitioned to the Joint Program Manager for Contamination Avoidance.

Assembled CRESS Kit in Use



Metal Inserts shown inside modular frame

Expected Benefits and Warfighter Impact:

The impact of this project is reduced cost and time to prototype new products for the Soldier, allowing for rapid scale up to production. Specific benefits from this effort include:

- Reduced cost of producing a single, test CRESS cover insert from $7400 to $575
- Reduced time to build new inserts from 72 hours to 8 hours
- Reduced Mean Time to Repair (MTTR) by 89%
- Cost Benefit of $3.3M with Return On Investment (ROI) of 7.7:1

TIME LINE / MILESTONE

Start Date	March 2012
End Date	September 2013

FUNDING

U.S. Army ManTech	$500K

PARTICIPANTS

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