Topic: N141-072

MATSYS, Inc.

Processing of Metal Powders for Enhanced Combustion Efficiencies

MATSYS has developed new, highly-reactive composites with high density and strength that enhance the performance of munitions by delivering kinetic energy as well as chemical energy to the target. MATSYS is a small business specializing in prototype manufacturing. This proprietary processing technology has been successfully tested at subscale by the Navy, shown to be the best performer by DTRA, and is now ready for field testing. Funds are sought to demonstrate/transition this technology to support Navy FNC as well as Air Force and Army programs. The company seeks ONR, Program Office and prime contractor support to transition these reactive materials for specific DoD applications.

Technology Category Alignment:

Energy storage

Ordnance

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SYSCOM: ONR

Contract: N00014-15-C-0159

Department of the Navy SBIR/STTR Transition Program

STATEMENT A. Approved for public release; distribution is unlimited.
ONR Approval # 43-2203-16

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Processing of Metal Powders for Enhanced Combustion Efficiencies
MATSYS, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: Integrated Warfare Systems (IWS-3)

Transition Target: The target transition is for warheads with reactive fragments for low collateral damage applications.

TPOC:
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Other transition opportunities: The transition opportunities include gun rounds, bombs and missile warheads.



US Navy BLU-129/B; 041113-N-3799S-002 Pacific Ocean (Nov. 13, 2004). U.S. Navy photo by Lt. Perry Solomon (RELEASED)

WHAT

Operational Need and Improvement: There is a need to reduce the size of munitions while maintaining their lethality. The use of reactive materials enables the delivery of additional energy on target to make up for the effect of size reduction. In addition, the reactive materials will provide additional damage mechanisms through the chemical energy released on target and facilitates damage bomb assessment. The development of high density structural reactive materials makes it possible to improve performance of existing munitions with no major design modifications.

Specifications Required: The structural reactive materials must have a density equivalent to that of steel or 7.8 g/cc to enable direct substitution, have good mechanical properties, and release energy upon target impact. Additional requirements will be application-specific.

Technology Developed: MATSYS has developed a new generation of highly-reactive composites with high density and strength that enhance the performance of munitions by delivering kinetic energy as well as chemical energy to the target. Reactive powder formulations have been processed into fully dense materials with high energy density and good mechanical properties. This proprietary processing technology has been successfully tested at subscale by the Navy, shown to be the best performer to date by DTRA, and is now ready for field testing. These materials can be processed into different shapes and sizes to meet specific munitions requirements in gun rounds, bombs and missile warheads.

Warfighter Value: Replacing inert materials with high energy reactive materials increases the on-target explosive impact and munitions lethality of ship gun rounds, air-to-air, air-to ground and surface-to-air missiles, missile defense as well as anti-ship and cruise missiles. Improved battle damage indicators will eliminate the need for multiple hits on the same target, saving ordnance and reducing warfighter risk. Munitions with reactive materials can be designed for controlled fragmentation to control the size of the hit area and minimize collateral damage. In addition, the fragments are self-consuming, which further minimizes collateral damage.

WHEN

Contract Number: N00014-15-C-0159 **Ending on:** April 30, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate reliable and predictable explosive launch	Med	Demonstrate fragment launch survivability	5	September 2016
Optimize formulation and reduce material cost	Low	Demonstrate good mechanical properties and high energy release	5	January 2017
Net-shape forming technology	Med	Fabrication of fragmenting warheads	5	October 2017
Develop cost-effective manufacturing process	Med	Building a device with predictable fragmentation	5	July 2018
Scale-up of the manufacturing process	Med	Manufacture prototype warheads	5	April 2019

HOW

Projected Business Model: MATSYS seeks to team with prime contractors and munitions subcontractors to produce and transition a product line of reactive materials to the Navy and the DoD. MATSYS will consider production of the warheads as well as licensing of the technology. MATSYS can begin low rate production within six months. High volume production will take twelve to 18 months. MATSYS is willing to license the technology and support the licensee in further design, development and production, as needed.

Company Objectives: MATSYS is seeking Program Office and prime contractor assistance to transition our capabilities for specific applications. MATSYS would like support to identify requirements, support applications development and demonstration, and product integration.

Potential Commercial Applications: Reactive materials can be used as a heat source on an extremely short time scales for the purpose of rapid bonding of ceramics and dissimilar materials that would otherwise be impossible to bond as a result of differences in thermal expansion. The applications include miniature scale bonding applications as well as larger scale composite armor brazing applications. Reactive materials as shaped-charge liners or explosively formed projectiles can also be used to create more effective well-drilling charges for the petro-chemical industry.

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