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14. ABSTRACT <b>McNally Industries, Inc. of Grantsburg, WI, a worldclass leading manufacturer of defense related products, is one of the world's leading consumers of cobalt-strengthened maraging steel. An increase in production requires them to reduce the machining time of certain operations producing parts for land combat weapon systems. The National Center for Defense Manufacturing and Machining (NCDMM) was requested to evaluate the identified operations for overall improvements in processes, tooling, and part quality. This will be accomplished by applying state-of-the-art tooling and programming technologies.</b>					
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## PROBLEM / OBJECTIVE

McNally Industries, Inc. of Grantsburg, WI, a world-class leading manufacturer of defense related products, is one of the world's leading consumers of cobalt-strengthened maraging steel. An increase in production requires them to reduce the machining time of certain operations producing parts for land combat weapon systems.

Machining of three (3) pockets and four (4) grooves of a cannon breech were identified by McNally engineers to evaluate and optimize. See Figure #1.

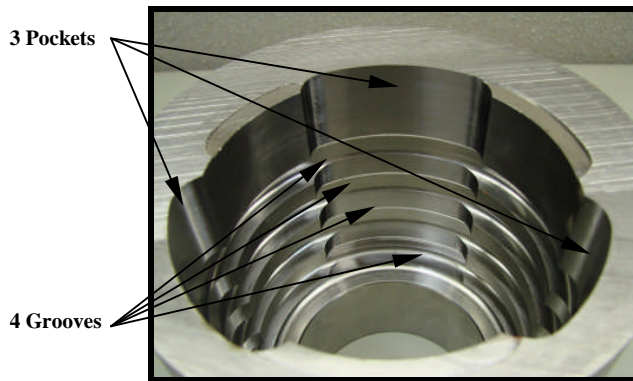


Figure #1: Proof-of-Concept Part with Grooves and Pockets Produced at the NCDMM

The National Center for Defense Manufacturing and Machining (NCDMM) was requested to evaluate the identified operations for overall improvements in processes, tooling, and part quality. This will be accomplished by applying state-of-the-art tooling and programming technologies.

## ACCOMPLISHMENTS / PAYOFF

### Process Improvement

Utilizing state-of-the-art tooling and programming technologies, the total time of the three (3) processes was reduced from 2 hours, 50 minutes to 23 minutes. Reducing the length of the current tooling presented the biggest problem. The tooling needed to be as rigid and robust as possible to overcome the disadvantages of using a 40 taper machining center.

To rough the pockets, plunge milling was chosen. This technique allows the cutting forces to be pushed back up into the spindle. This operation reduced the current time by 50 minutes. To finish

the pockets, a TiAlN coated, four (4) fluted offset flute endmill was chosen using more aggressive parameters to achieve a reduction in time of 17 minutes.

To machine the four (4) grooves, shrink fit tooling was utilized due to its robust nature. A specially designed AlTiN coated solid carbide slot cutter (Figure #2) with alternating 30° helix angles was used for the operation. This combination resulted in a reduction in machining time by 1 hour, 20 minutes.

### Implementation and Technology Transfer

By utilizing these advanced technologies and methodologies developed and implemented by the NCDMM engineers and its alliance partners, successful machining of the pockets and grooves has been accomplished. Transitioning of this technology reduces machining time as well as significantly increasing part quality.



Figure #2: Slot Cutter in Shrink Fit holder

### Expected Benefits

The efforts of the NCDMM have reduced the machining time of the three (3) operations by 87%. This results in an annual cost savings of \$36,750 when producing 300 parts per year. Additional cost savings will be recognized by implementation of the solutions herein to other maraging steel products.

## TIME LINE / MILESTONE

Start Date.....December 06  
End Date ..... April 07

## PROJECT FUNDING

NCDMM Funding.....\$40K

## PARTICIPANTS

Kennametal Inc.	NCDMM
Mastercam	SECO/Carbology
McNally Industries, Inc.	SIEM Tool

For additional information about the NCDMM visit our website at [www.ncdmm.org](http://www.ncdmm.org)