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14. ABSTRACT
Hamill Manufacturing Company, Trafford Pa., won a contract to complete eight pump casings destined for use on aircraft carriers. The 4'-long, 4'-diameter casings were made of Inconel 600 alloy. The casing flange featured 24 threaded holes, 2.375"-8 by 5.75" deep. Drilling and tapping Inconel, a tough nickelbase material with high tensile strength, is time consuming and requires high torque. Hamill determined the need to optimize the process to control manufacturing cost, and asked the National Center for Defense Manufacturing & Machining (NCDMM) for assistance.

15. SUBJECT TERMS
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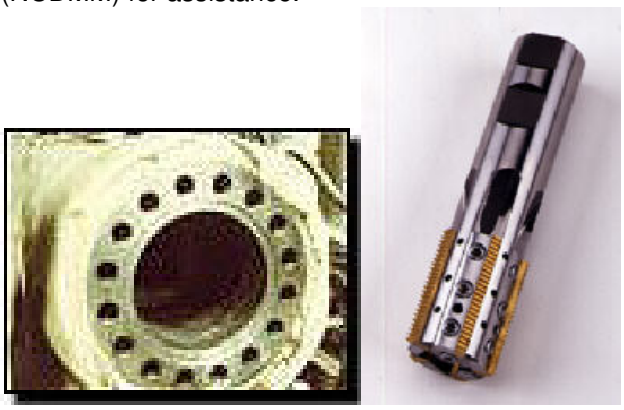
Inconel Pump Casing

NCDMM Project No. 03-0015-12

Technical Report

PROBLEM / OBJECTIVE

Hamill Manufacturing Company, Trafford Pa., won a contract to complete eight pump casings destined for use on aircraft carriers. The 4'-long, 4'-diameter casings were made of Inconel 600 alloy. The casing flange featured 24 threaded holes, 2.375"-8 by 5.75" deep. Drilling and tapping Inconel, a tough nickel-base material with high tensile strength, is time consuming and requires high torque. Hamill determined the need to optimize the process to control manufacturing cost, and asked the National Center for Defense Manufacturing & Machining (NCDMM) for assistance.



Similar casing (left) and the Advent Threadmill Tool (right)

ACCOMPLISHMENTS/PAYOFF

Process Improvement

Hamill had been drilling the holes in the casing with two spade drills run at 90 surface feet per minute (sfm) cutting speed. The first drill created a 2.15" hole, and the second established the thread minor diameter of 2.25". The NCDMM recommended the use of an indexable insert drill from alliance partner Kennametal Inc. The new drill eliminated the need to change drills in mid-process, and permitted an increase of cutting speed to 310 sfm. Drilling time dropped from 22 minutes to just 7 minutes per hole. To thread the holes, Hamill had been using a single-toothed threading tool lacking through-tool coolant capability. The NCDMM recommended the use of a 1.5"-diameter thread mill from Advent Tool and Manufacturing Company. Featuring five effective cutting teeth and through-tool coolant, the threadmill permitted higher feed rates. Threading cycle time per hole fell from 50 minutes to just 10 minutes.

Implementation and Technology Transfer

Hamill implemented the NCDMM recommendations on the CNC horizontal machining center already used for the process, so the productivity improvements required no capital expenditure. Reducing drilling time by 60 percent and threading time by 80 percent produced machine time savings of 55 minutes for each hole. Total time saved per casing was 22 hours. The resulting increase in machine availability enabled Hamill to take on additional work. In addition, use of a single indexable drill versus two spade drills simplified tooling inventory.

Expected Benefits

In summary, implementation produced:

- Greater than 75 percent reduction in machining time for drilling and threading
- Simplification of tool selection and inventory
- Increased machining capability for contractor through increased machine availability.

At current burden rates, savings in machining time alone amounted to $1,540.00 per casing. Over the entire intended production run of eight casings, machine time savings totaled $12,320.00. Savings will escalate substantially as technology is implemented elsewhere within Hamill Manufacturing Company.

TIME LINE / MILESTONE

Start Date ..... Dec 03
End Date ..... April 04

PROJECT FUNDING

NCDMM funding $5K

PARTICIPANTS

Hamill Manufacturing Company
NCDMM
Kennametal Inc.

For additional information concerning this project, contact the NCDMM at www.ncdmm.org