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14. ABSTRACT Dresser-Rand Corporation located in Wellsville, NY, is responsible for power generation for the new CVN-21 Carrier for the U.S.NAVY. Development of newer power generation systems has lead to the use of advanced materials with characteristics that allow the turbine blade (bucket) to withstand increased condensation levels. The new material characteristics, with higher than normal Rockwell hardness, created many manufacturing challenges. Shorter tool life, longer processing times and longer hand finishing perations all contributed to extended lead times and additional cost. Faced with these challenges, Dresser-Rand requested the help of the National Center for Defense Manufacturing & Machining (NCDMM) to review and provide solutions that would reduce their cost and turn around times.					
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CVN-21 Carrier

Power Generation / Turbine Blade

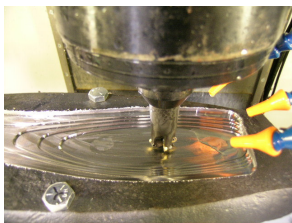
NCDMM Project No. 04-0053-12



Technical
Report

PROBLEM / OBJECTIVE

Dresser-Rand Corporation located in Wellsville, NY, is responsible for power generation for the new CVN-21 Carrier for the U.S. NAVY. Development of newer power generation systems has led to the use of advanced materials with characteristics that allow the turbine blade (bucket) to withstand increased condensation levels. The new material characteristics, with higher than normal Rockwell hardness, created many manufacturing challenges. Shorter tool life, longer processing times and longer hand finishing operations all contributed to extended lead times and additional cost. Faced with these challenges, Dresser-Rand requested the help of the National Center for Defense Manufacturing & Machining (NCDMM) to review and provide solutions that would reduce their cost and turn around times.



Advanced programming and cutting techniques are being tested (left). "Proof-of-concept" part (right) that NCDMM created to demonstrate new tooling and manufacturing processes to Dresser-Rand

ACCOMPLISHMENTS / PAYOFF

Process Improvement

NCDMM engineers conducted testing on the new material with state-of-the-market tooling to establish optimal cutting parameters. Advanced programming techniques were developed to allow the tooling to perform to their optimum potential and within the existing machine parameters. These programming techniques utilized the ball nosed style tooling with optimized approach angles that permit the tool to cut the material effectively, thus reducing smearing to the material and less generation of heat going into the workpiece.

Implementation and Technology Transfer

New advanced machining techniques and cutting parameters reduced existing operation time on the larger of two size buckets from 5.5 hours to 2.5 hours per bucket. The finish produced from these new techniques is significantly better, reducing hand-finishing time from 2 hours to an estimated .75 hour per bucket. These new processes, when applied to the smaller buckets (original material), will achieve a 10-15% reduction in manufacturing cost.

The following are the advanced manufacturing techniques that have been implemented or are in the process of being implemented:

- Advanced contour programming techniques implemented
- Optimum cutting parameters implemented
- Increased metal removal rate (MRR) by 200%
- Reduced tool usage by 30%
- Improved surface finish by approx. 50%
- Reduction in hand finishing time by >75%

Expected Benefits

With the implementation of these advanced manufacturing techniques, the new process will significantly improve the machine time per bucket. With an average 2000 buckets (both large and small sizes), per turbine based on an average machine shop cost of \$100/hour, this equates to savings of \$470K per turbine. This will equate to \$2.5M over a five-year period.

Additional savings will be recognized with the implementation of the advanced programming techniques. These techniques provide longer tool life thus reducing tool usage.

TIME LINE / MILESTONE

Start Date November 05
End Date February 05

PROJECT FUNDING

NCDMM / Dresser-Rand (Cost Share)... <\$30K

PARTICIPANTS

HAAS
Com1 Information Technologies, Inc.
Kennametal Inc.

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