



# NAVAL Submarine and Carrier Propulsion Shaft Machining Cycle Reduction

Success Story

NCDMM Project No. 07-0144-07

## PROBLEM / OBJECTIVE

During the 2007 program year the National Center for Defense Manufacturing and Machining (NCDMM) accepted a comprehensive project proposed by FARO Technologies, Inc. of Lake Mary, FL. The project involved the improvement of current Navy shipyard methods for manufacturing the shaft tapers on aircraft carrier and submarine drive shafts. The recommended improvement would involve the implementation of an advanced measurement system for in-process and final inspection of the shaft taper. This project would provide proof-of-concept for the measurement system as well as lay the foundation for future extended utilization.

The current accepted method for performing a shaft taper inspection utilizes a bluing fit. This bluing fit in conjunction with a standoff measurement is the process Navy shipyards use to ensure interchangeability of all shafts and couplings. This process has been used for over fifty years and although proven effective, it is susceptible to operator interpretation as well as the need for highly skilled fitters. Another area for concern is that there are only 5 known gages throughout the U.S. shipyard community. Each of these gages has their own imperfections. It has been stated that this process requires the shaft taper to be hand worked to fit the gage's imperfections.

that all shipyards would easily understand the relationship with the current bluing fit. As a result of several meetings involving representatives from all the shipyards, a proof-of-concept was developed and performed at Norfolk Naval Shipyard.

### Expected Benefits

The resulting process was voted a "GO" at the final shipyard meeting in Norfolk, VA. It has proven that the process shows promise in eliminating the use of costly hard gauging for final inspection as well as reducing the in-process machining time. The current inspection process results in an estimated 72 man-hours while the proposed Laser Tracker method would take 24 man-hours, saving a total of 48 man-hours per shaft taper. Based on an average shipyard quantity of 3 shafts per year at each of the 6 shipyards, the projected ten-year savings equates to \$1,962,000.

Benefits were calculated based on one shaft taper and one class ship. Should the developed process be deployed throughout all ship classes, a savings of four fold could easily be seen.

## TIME LINE / MILESTONE

Start Date.....September 07  
End Date.....March 08

## PROJECT FUNDING

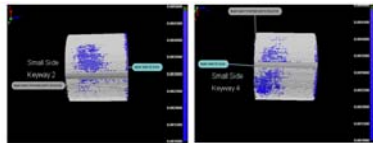
NCDMM Effort.....\$220K  
FARO Inc. Effort .....\$93K  
Penn State ARL Effort.....\$10K

## PARTICIPANTS

- Erie Forge and Steel
- FARO Technologies, Inc\*
- Penn State, Applied Research Laboratories\*
- Naval Sea Systems Command
- Naval Sea Warfare Center
- Norfolk Navy Shipyard
- Puget Sound Navy Shipyard
- Pearl Harbor Navy Shipyard
- Portsmouth Navy Shipyard



FARO Laser Tracker.



Acquired Data.

## ACCOMPLISHMENTS / PAYOFF

### Process Improvements

The team determined through process development and testing that the FARO Laser Tracker system would achieve the desired results. FARO personnel then developed a process using several software methodologies. These methodologies allowed for the collection and presentation of data in such a way

\*NCDMM Alliance Partner

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