Wireless Diagnostic System Successfully Tested

In July of last year, the Center for Naval Shipbuilding Technology (CNST) awarded a $435,000 wireless technology project to Northrop Grumman Newport News. The Newport News-led team includes Northrop Grumman Ship Systems Ingalls Operations and RLW, Inc. The project is developing a wireless automated diagnostic and prognostic system for monitoring shipyard facility diesel engines with the potential to save the shipbuilding industry millions of dollars in repair and maintenance costs.

The primary goal of the project is to develop a system that uses existing wireless technology to locally monitor and evaluate the condition of mobile, high-value shipbuilding equipment such as cranes, transporters, tugboats and locomotives. Significant costs are associated with failures of these equipment types, and at present only a small amount of diagnostics and prognostics are performed. The operating maintenance industry standard cost-to-repair is 15:1, where it costs 15 times the amount to repair after complete failure than to conduct the repair at first indication of equipment malfunction. An increase in the level of diagnostic and prognostic evaluation and improving connectivity for key parameter sensors should provide the indications needed to prevent catastrophic equipment failure, thus reducing operating and repair costs. The wireless automated diagnostic and prognostic system will send indication and details of potential failure to a network that will allow time for the responsible technician and supervisor to analyze data and make maintenance decisions that consider the construction schedule.

The Newport News-led team selected four mobile diesel engines for evaluation, determined the parameters for monitoring and developed the required software algorithms and hardware components. The specific types of mobile diesel engines selected by each of the shipyards were evaluated to determine the types of problems/failures that have or could occur on the equipment. At Northrop Grumman Ship Systems in Pascagoula, Miss., the project team discussed with the Ship Systems Facilities Department the different types of mobile diesel equipment that are being used and which ones are most problematic. The team determined that one specific type of crane presented itself as a problem; in the past five years, this type crane experienced three failures that required engine replacement due to failed bearings. Based on the review of maintenance and failure data, a few of the selected parameters to be monitored include vibration, oil temperature, oil pressure and air intake pressure. All four diesel engines have been retro-fitted with the required wireless automated diagnostic and prognostic sensor suite.

As part of the project, Newport News engineers developed the required diagnostics and prognostics algorithms to support the software application. In addition to the wireless automated prognostics capability, another key feature that makes the system potentially more valuable is the capability to simultaneously transmit the sensor suite parameters to both the local on-site server for use and to a remote server for monitoring and review. The team has successfully transmitted and received the test engine parameters at both the Newport News test site and at the RLW, Inc site at the Penn State University Applied Research Laboratory, both accomplished using a wireless feature via a common cellular telephone modem. This feature permits an authorized user to receive and evaluate operating equipment information real-time, thus fully utilizing the prognostics capability worldwide. In addition to a wireless transmission capacity, the wireless automated diagnostic and prognostic system can be utilized with a common personal computer, with the technician accessing the individual machine's information and displaying the data on the computer's screen with access provided from a common Internet service provider. The quantity of machines being monitored simultaneously is limited only by the capacity of the host server/local area network.

The system is scheduled to be operational by November 2005 and will be on display in the CNST booth during the 2005 Defense Manufacturing Conference in Orlando, Fla.

About CNST

CNST is a Navy ManTech Center of Excellence, chartered by the Office of Naval Research (ONR) to identify, develop and deploy, in U.S. shipyards, advanced manufacturing technologies that will reduce the cost and time to build and repair Navy ships. For additional information on this and other CNST projects, please visit www.cnst.us.