

Improving Shipboard Maintenance Practices Using Non-Intrusive Load Monitoring

by
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Abstract

The Non-Intrusive Load Monitor (NILM) is a device that utilizes voltage and current measurements to determine the operating profile and individual loads on a system from a single aggregate measurement. The NILM can also be used to actively monitor and quickly diagnose system failures or improper operation. Current NILM research conducted at Massachusetts Institute of Technology's Laboratory for Electromagnetic and Electronic Systems (LEES) is exploring the application and expansion of NILM technology for the use of monitoring shipboard systems.

This thesis presents the implementation of the NILM on a vacuum aided sewage collection system, a ship's service low pressure compressed air system, and a vane axial ventilation supply fan. The NILM's ability to monitor the power usage profile of these systems could be used to immediately diagnose system casualties and unusual operation parameters. Measurements and experimentation were conducted onboard the *USCGC ESCANABA (WMEC-907)* and the *USCGC SENECA (WMEC-906)*, 270-foot Coast Guard Cutters home ported out of Boston Harbor.

New casualty parameters were recorded and analyzed in an attempt to verify and expand on diagnostic software currently being developed for the vacuum aided sewage collection system. The analysis of the ship's service compressed air system provides an example of what immediate diagnostics such software would be able to provide for the user. Additional analysis of a misaligned ventilation fan provides evidence of the NILM's ability to constantly monitor steady state systems. The expansion of testing onto the *ESCANABA* provides valuable verification of previous data collected onboard the *SENECA* during past research.

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