

Sniffing

for Fuel

NELP Identifies Shipboard Tool for Fuel Dilution Analysis

In support of their mission, the Navy Environmental Leadership Program (NELP) has identified the “Fuel Sniffer” as an innovative way for Shore Intermediate Maintenance Activity (SIMA) Mayport, FL to improve daily operations and minimize the impacts on the environment in fuel dilution analysis of used oil samples.

In 1990, the Navy Ship System Engineering Station (NAVSSSES) initiated a program to develop a portable surface acoustic wave (SAW) based instrument to measure the fuel dilution in shipboard diesel engine lubricants. The Navy and Microsensor Systems Inc. worked together to design and build a small and reliable instrument, based on the SAW microsensor. After an extensive evaluation and testing period, the Navy began using the original fuel dilution meters aboard ships. This instrument was the first generation of the current Fuel Sniffer that uses the exact same technology.

SIMA Mayport is now using this portable fuel dilution meter to provide rapid and accurate measurements of fuel concentrations in used lubricating oil samples. The meter can be used in the Oil Laboratory at SIMA Mayport or be transported to a ship. Like the first generation equipment, the Fuel Sniffer employs an advanced solid state SAW chemical microsensor to measure the concentration of contaminating fuel vapor present in the air “headspace” over the sample of lubricating oil, with a measurement range of 0 to 10 percent fuel contamination. The equipment assumes that the fuel vapor concentration in the headspace of the sample bottle is directly proportional to the fuel present in the oil. This testing methodology is based on Henry’s Law, which states “the weight of a gas dissolved by a given amount of liquid is directly proportional to the pressure exerted by the gas when in equilibrium with the solution.” This means that as fuel contamination builds up, a vapor concentration will be established in the headspace that is directly proportional to the concentration dissolved in the oil.

The Fuel Sniffer works by placing an oil sample bottle (125 milliliters, 3/4 full) on the sample platform and then lowering the clamp to form a tight seal around the bottle opening. A pump inside the instrument then draws headspace vapors across the SAW sensor, which detects absorbed hydrocarbons by changing the frequency of a SAW. The percentage fuel dilution is



ABF2 AW Hawa P. Jenkins uses the Fuel Sniffer to test a fuel oil sample at SIMA Mayport.

“Through NELP, we were able to find the Fuel Sniffer, and it has proven to be a fast and accurate tool.”



then displayed on a backlit LCD display and can also be sent to a printer or external computer.

For the SIMA Mayport Oil Laboratory, the Fuel Sniffer is an improvement over the previously used flashpoint method of testing. In the past, fuel samples were tested with butane to determine flashpoint, and a correlation table was used to obtain the known percentage of fuel. This testing method proved to be slower, less accurate, and not as safe to use in the Oil Laboratory. Changing to the new Fuel Sniffer has reduced sample measurement time from about 45 minutes/sample to approximately 1 minute/sample. And at the same time, it reduces exposure to fire and inhalation hazards from heating fuel samples. The Oil Laboratory is now better equipped to process the quantity of diesel oil samples (up to 15 percent of the shop's workload) received from the entire Navy Region Southeast.

“This is the best piece of testing equipment provided to the Oil Laboratory at

—LT Tim Jirus,
SIMA Mayport

SIMA,” said ABF2 AW Hawa Jenkins, SIMA Oil Laboratory. “It is much safer than the old equipment for testing fuel contamination in engine oils.”

In conclusion, SIMA Mayport is very pleased with the addition the Fuel Sniffer (Model FDM-1A). It is easy to use with operating instructions displayed on a LCD screen and functions are selected from the menu by pressing a single key to start testing operations. The equipment can measure 40 or more samples per hour, which translates to a cost savings by reducing man-hours for sample analysis. It has also provided the Oil Laboratory with an improved safety factor over the previously used flashpoint method of used oil sample analysis. ⚓

Photos by Mark Faircloth.

CONTACT

Diane Lancaster
Naval Station Mayport
904-270-6730, x-208
DSN: 960-6730, x-208
diane.lancaster@navy.mil

ABOUT NELP

The Chief of Naval Operations chartered NELP at Naval Station Mayport in 1993. The mission of NELP is to support Navy warfighter operational readiness through the identification, demonstration and communication of innovative ways to perform daily operations while minimizing the impacts on our environment and promoting environmental stewardship. The program serves as a test bed for new and innovative technology and focused management that addresses the full spectrum of environmental issues. NELP exports its successes and lessons learned throughout the Navy and Marine Corps family.

