

The U. S. Coast Guard Marine Safety Laboratory



Our history and missions.

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The Marine Safety Laboratory (MSL) (Figure 1) is the U.S. Coast Guard's forensic laboratory for oil spill source identification or "fingerprinting," a term adopted in the mid-1970s when the Coast Guard Research and Development Center developed the oil spill identification methodology. MSL supports field investigators and various federal, state, and local agencies by providing forensic analysis of spilled oil samples and suspected source samples (Figure 2). MSL then works closely with the National Pollution Fund Center (NFPC) and the Department of Justice (DOJ) in the prosecution of responsible parties. The analytical results produced by the Marine Safety Laboratory provide support for both law enforcement and cost-recovery benefits. MSL chemists provide expert witness testimony for hearings and court proceedings as needed.

MSL is currently a subunit of the National Maritime Center, but planning is underway to move the laboratory under the Coast Guard's Office of

Investigations and Analysis (G-MOA). MSL serves as a powerful tool to aid Coast Guard pollution investigators in determining the source of oil spills as mandated by federal law. The laboratory provides the means to fix oil pollution responsibility, assess penalties, and help recover federal pollution cleanup funds expended during an incident. MSL also serves as a deterrent to deliberate oil pollution discharges and encourages the reporting of and acceptance of responsibility for accidental spills.



Figure 1: Front row, from left: MSTC Steve Natale, MST3 David Martinez, MST3 Logan Brien, MST1 Duane Wilson, MST2 Chris Horn, Ms. Kristy Juaire. Back row, from left: MSTC Rusty Harbuck, SK1 Roger Matros, YN2 Seth Puskarenko, MST3 Bernie Grosso, Dr. Wayne Gronlund.

As part of an effort to improve the visibility, enhance the quality, and broaden the utility of the Marine Safety Lab, we are in the initial stages of seeking accreditation by the American Society of Crime Laboratory Directors Lab Accreditation Board. Ten Coast Guard personnel staff the laboratory: two civilians and eight military members. Their backgrounds provide a unique blend of scientific and academic expertise, operational and pollution investigation experience, as well as technical and administrative competence.

the wise forensic investigator will always remember that he must bring all of his life experiences and logic to find the truth. This means common sense, informed intuition, and the courage to see things as they are. Then he must speak honestly about what it all adds up to.”¹

Having performed both navigation and forensics in the Coast Guard, I find this philosophy particularly applicable to the responsibilities and challenges I face in my role as manager of the Marine Safety Lab.



Figure 2: MSTC Rusty Harbuck in the walk-in cooler where the Marine Safety Laboratory maintains secure stowage of oil samples that are preserved as evidence for future legal proceedings. Dr. Wayne Gronlund, USCG.

In the prologue of his popular book, *Cracking Cases, The Science of Solving Crimes*, Dr. Henry C. Lee describes an interesting similarity between forensics and seagoing navigation:

“At the outset, permit me to define the term *forensics* as the direct application of scientific knowledge and techniques to matters of law. The study of modern forensic investigations is similar to navigating the high seas, in that this subject is both an art and a science. The seafarer may have taken his sun line correctly and fine-tuned his position on his chart for the effects of tide and current, but if his senses are telling him his vessel is in another spot on the sea, then he must combine his findings with his intuition and common sense to adjust for a proper course. This is especially important to remember today, since, just like navigation, technology is making great strides in providing the forensic scientist with ever-improving data. Still, even with all of this precise information,

Overview of Oil Spill Identification Methodology

The Oil Identification System (OIS) uses several complementary chemical tests that exploit the unique, intrinsic properties of petroleum oil that make it possible to match spilled oil to the correct chemical source. The system is based on multiple analytical methods: Infrared Spectroscopy (IR), Gas Chromatography (GC), and Gas Chromatography-Mass Spectrometry (GC-MS). These analytical methods profile different chemical properties of an oil sample (Figures 3 and 4). If two oils are chemically similar, they are said to derive from a common source. In many of our cases, oils from other suspected sources will be simultaneously eliminated from consideration as the pollutant source, because they are chemically different as determined by the test methods. It is important to note that the chemical source of a spill is not necessarily the same as the physical source of the spill.

Lab results must be corroborated with a physical investigation to be substantiated.

Interpretation of the analytical test results is often not straightforward, because of the increased analytical complexity brought about by “weathering” or contamination of the spilled oil. Weathering includes: evaporation, dissolution, biodegradation, oxidation, and other chemical, physical, and biological environmental changes that alter the makeup of the spilled oil. The degree of weathering will vary with each particular case; advanced weathering significantly complicates the analyst’s job.

MSL prepares a written analysis report for each case. This report is a self-contained record that includes all of the legal documentation, quality control information, analytical results, and chemical data interpretation, including the expert opinion of a trained

chemist with extensive experience in oil identification. These results are available to authorized users through the Marine Information for Safety and Law Enforcement network.

In addition to its primary mission, the Marine Safety Lab is tasked to:

- provide consultation to Coast Guard field investigators, district offices, hearing officers, as well as to the National Pollution Fund Center, Department of Justice, and other federal agencies concerning the Oil Identification System (OIS) and MSL analysis reports;
- provide expert opinions and testimony at legal proceedings as required;
- maintain a system of adequate quality controls to assure the integrity of the Oil Identification System;
- evaluate new methods and advancements in technology that may increase the accuracy, reliability, and efficiency of the Oil Identification System;
- participate in activities that enhance the credibility and legal acceptance of MSL analyses, including membership in the American Society for Testing and Materials;
- provide long-term secure storage of oil samples (i.e., evidence) that MSL has received from field units in support of oil pollution cases.

How Can MSL Help You?

MSL personnel are available to provide on-call assistance to Coast Guard field investigators; district personnel; hearing officers; and NPFC, DOJ, and other government officials on all aspects of the Oil Identification System. This assistance includes but is not limited to:

- planning sampling strategies in complex cases,
- answering questions and explaining the sig-



Figure 3: MST2 Duane Wilson preps an oil sample for Gas Chromatography (GC) analysis. Dr. Wayne Gronlund, USCG.

nificance of test results,

- evaluating test data from other laboratories,
- providing expert witness support.

An efficient and effective Oil Identification System depends upon good communication and understanding between the various users and Marine Safety Lab personnel. Please give us a call; we're eager to help!

Additional information is available at the Marine Safety Laboratory Web site at www.rdc.uscg.gov/msl/.

Endnotes

¹Lee, Henry C. Dr. with O'Neil, Thomas O. (2002) *Cracking Cases, The Science of Solving Crimes*. Amherst, NY: Prometheus Books.



Figure 4: MSL chemist Kristy Juaire compares two oil chromatograms. Dr. Wayne Gronlund, USCG.