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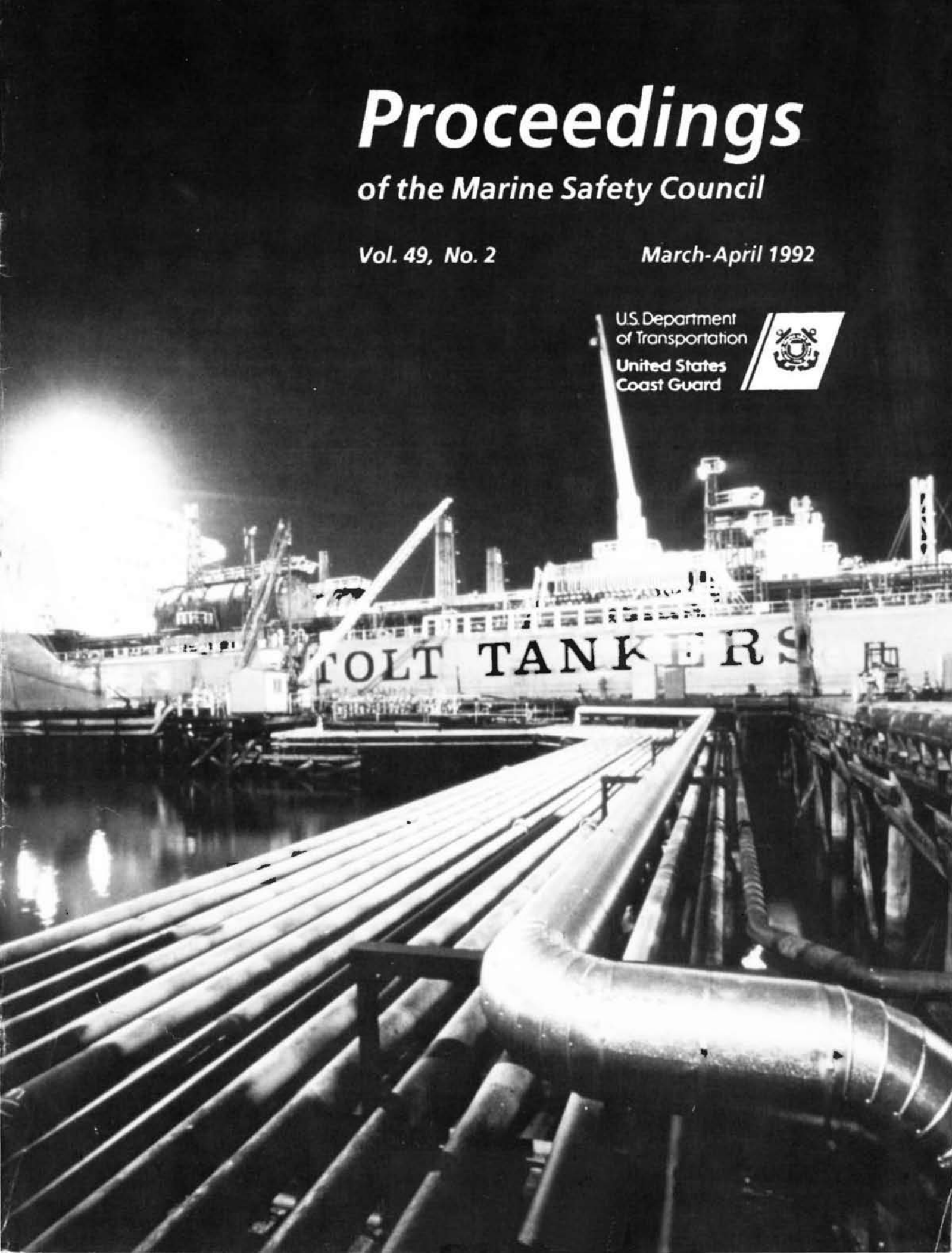

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Proceedings

of the Marine Safety Council
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Front cover: Parcel tanker loads bulk liquid chemicals at a tank storage terminal in the United States Gulf.
Photo courtesy of Stolt-Nielsen, Inc.

The May-June 1992 issue of *Proceedings* will be devoted to the efforts of the Coast Guard and other agencies in carrying out the mandate of the Oil Pollution Act of 1990 - - OPA-90. The special issue will feature photographs in color.

Marine chemists *provide safer workplace*

By CDR Kevin J. Eldridge and LT John C. Edgar

Who is the marine chemist?

A marine chemist is the primary professional responsible for maintaining a safe environment for "hot work" and the entry into confined spaces on vessels and vessel sections in shipyards, which had contained toxic materials.

The Occupational Safety and Health Administration (OSHA) has issued regulations requiring the inspection by marine chemists certified by the National Fire Protection Association (NFPA) prior to many shipyard activities. By protecting people from shipyard hazards, the chemists are the cornerstone of the Coast Guard's confined space entry program.

How are they used?

The services of marine chemists are required by government regulations and, in some cases, by Coast Guard policy as follows:

1) It is mandatory that a marine chemist test and certify a space safe for hot work and safe for workers in shipyards under Title 29 of the Code of Federal Regulations 1915.14 (29 CFR 1915.14), when either of these two conditions are met:
   a) When hot work (any construction, alteration, repair or shipbreaking involving riveting, welding, burning or similar fire-producing operations) is to be performed in a space. Grinding, drilling, sand or shot blasting, or similar spark-producing operations are also considered hot work under most circumstances. Many shipyard operations fall under the definition of hot work, and must be certified by a marine chemist before commencing.

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M/T Stolt Aspiration, 12,009 dwt medium-size parcel tanker, carries a variety of bulk liquids, including chemicals. Marine chemists must keep its spaces safe for shipyard "hot work" and inspections. Photo courtesy of Stolt-Nielsen, Inc.

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b) When the space to be entered by workers had contained toxic materials and could have a toxic atmosphere. This would include most cargo or fuel tanks on board vessels in shipyards, and any preservative coated spaces which had been closed and secured without ventilation.

2) Before non-emergency entry into cargo space that had been fumigated, a marine chemist or qualified person under 46 CFR 147A.25 must test the space.

3) Before hot work is performed on Coast Guard-certified vessels in waterfront facilities in the United States or its territories or possessions, the operator must have the vessel inspected by a NFPA-certified marine chemist. (Sources of this requirement are in 46 CFR 35.01-1, 76.1-1, 91.50-1, 109.573 and 169.236.) The inspection must be completed and a certificate issued before any alterations, repairs or other such operations involving riveting, welding, burning or similar fire-producing actions.

4) Coast Guard policy requires a marine chemist to evaluate work to be conducted at waterfront facilities approved for the handling and storage of flammable or combustible liquids in bulk. The chemist must issue a certificate authorizing hot work before a hot work permit is issued under 33 CFR 126.

There are many other situations when the use of a marine chemist is not mandatory, but, nevertheless, desirable. For example, the Coast Guard has approved testing by a marine chemist prior to entry into pumprooms on tank vessels, as a way of complying with OSHA's benzene exposure limits for Coast Guard personnel. Also, a marine chemist could be used during response operations involving confined spaces.

History

A large increase in explosions on vessels under repair during World War I provided the impetus for establishing a national certification program for hot work. This increase was attributed to changes in construction and repair methods, combined with the shipment of more flammable materials, such as fuels. Insurance underwriters, shipyard operators, vessel owners and government officials agreed that an effective method of reducing the number of explosions and fires should be developed.

The NFPA formed a marine committee in 1916 to draft an initial standard for shipyard fire safety. Appendix A of NFPA Marine Regulations was published by the committee in 1922. It was the predecessor of the present NFPA 306, "Control of gas hazards on vessels."

Also in 1922, the American Bureau of Shipping (ABS) certified the first 25 marine chemists. This initial certification was relatively informal compared to today's process, and the early chemists used Appendix A as their guidelines to issue certificates for hot work.

This system of shipyard fire safety continued until the early 1960s, when the Department of Labor and the Coast Guard expressed concern over the lack of a formal standard for certifying and monitoring marine chemists. In April 1963, the Marine Chemist Qualification Board was established by NFPA to certify and recertify marine chemists according to clearly defined parameters.

In 1970, OSHA was established by the Occupational Safety and Health Act to set and administer worker health and safety standards. Their jurisdiction included shipyard workers.

By the end of 1971, OSHA declared many industry voluntary standards mandatory, including the certification by marine chemists of spaces before hot work can be performed. This requirement, in essence, made the NFPA 306 standard mandatory for shipyards. Amendments to this standard are now being finalized and are scheduled to be published early in 1993.

Following a 1975 explosion, which claimed four lives, aboard the barge B-924 in Greenville, Mississippi, the Coast Guard joined the Marine Chemist Qualification Board, actively participating in certification procedures.

Marine chemist tests cargo tank for toxic atmosphere with an MSA photon gas detector.

Shortly thereafter, the board was granted the authority to investigate potential acts of noncompliance with NFPA 306 provisions, and suspend or revoke certification of marine chemists based upon findings of formal proceedings.

The qualification board also developed a comprehensive training curriculum for prospective marine chemists, which was first published in 1982. A complete revision of the curriculum is scheduled to be published in 1992.

Marine chemists association

In 1938, a marine chemists association was formed by NFPA-certified marine chemists. Ten years later, the Marine Chemists Association, Inc. became an independent professional organization with the following aims:

A) to promote the science of and improve methods of evaluating and eliminating health, fire and explosion hazards;

B) to obtain and circulate information concerning these hazards; and

C) to enhance the general welfare of its members by promoting a closer relationship with all concerned industry and regulatory bodies.

In the mid-1950's, the association established the Marine Chemist Education Committee to keep members current with relevant scientific developments. This committee reviews pertinent literature, maintains a library, and conducts regional workshops and annual training sessions. The Marine Chemist Qualification Board requires all certified marine chemists to attend a certain number of regional and/or annual training sessions for recertification.

Qualification board

The Marine Chemist Qualification Board was organized to administer rules for certification, including training, certification and recertification of marine chemists, and to provide oversight of marine chemists' compliance with the provisions of NFPA 306. The board, which meets about four times annually, consists of a practicing marine chemist and representatives of:

A) tank ship operations,

B) shipyards,

C) the Marine Chemist Association, Inc., and

D) the marine insurance industry.

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Voluntary membership includes representatives from the Coast Guard, Navy and OSHA.

During the past ten years, the board has had an active role in addressing and preventing occupational exposures to hazardous chemicals, and reducing potential hazardous conditions on board vessels and vessel sections in shipyards. Here are some of the board's accomplishments.

A) The board found the certificate issued by a marine chemist in compliance with NFPA 306 following a barge explosion in a Louisiana shipyard in 1989. (See "Casualty lessons" in the January-February 1991 issue of *Proceedings* .) However, it determined that there was extra "boiler plate" language on the certificate, which might have been misunderstood by shipyard workers. In order to determine whether the use of such language was a common practice among marine chemists, the board required that all certificates issued during the month of August 1990 be forwarded for review. Consequently, direct feedback was provided for all marine chemists on how to avoid language, which, though in compliance with NFPA 306, might confuse shipyard personnel.

A complete review of all marine chemist certificates has been conducted twice during the past five years, and observations from the reviews have been discussed at the annual Marine Chemist Association training workshop. The board feels that, as a result, marine chemist certificates have become clearer and more concise.

B) A Coast Guard marine inspector in Louisiana requested the board clarify what is meant by "local shifting" or vessel movement permitted by NFPA 306. The board forwarded the request along with its recommendations to the NFPA Technical Committee on Gas Hazards, which develops all revisions to the NFPA 306 standard. Subsequently, this committee clarified the term, which will be published in the new edition of NFPA in 1993.

C) In 1989, Coast Guard marine inspectors in Louisiana lodged two complaints on methods used by a marine chemist in testing confined spaces on board offshore drilling rigs in the Gulf of Mexico. One complaint concerned improper testing of the oxygen content, and the other involved testing for hydrogen sulfide in spud cans (confined spaces normally under water which provide the basis of stability for certain offshore drilling rigs). After a thorough study of the complaints, the board required the marine chemist to review several modules of the Marine Chemist Training Curriculum and be examined on each one. It was believed that this technical refresher could avoid possible injuries in the future. The chemist successfully completed the review and subsequent examinations.

D) Two other incidents of alleged nonperformance by a marine chemist were filed with the board during 1991. A Coast Guard marine inspector on the East Coast lodged the first complaint, which alleged that the chemist did not enter the cargo tanks he certified as safe for hot work. The same marine chemist was the subject of the second complaint by a Navy safety supervisor alleging that a certificate was issued allowing hot work in a Navy vessel's engine room with diesel fuel in the bilges directly below.

The board conducted formal hearings on the complaints and subsequently suspended the marine chemist's certification for six months. In addition, the board required the individual to satisfactorily complete two weeks of on-the-job-training with marine chemists outside his geographical location as a condition for recertification.

E) During 1991, the board denied recertification to one marine chemist based on his failure to attend the required number of training courses for continuing education. The board considers this to be a critical condition for maintaining certification.

F) During board meetings, reviews of accidents involving marine chemists are routinely conducted to obtain valuable information to pass on to all marine chemists, hopefully preventing similar mishaps. During 1990, the board reviewed 16 accidents.

As demonstrated by these examples, the Marine Chemist Qualification Board is making every effort to provide a safe workplace in shipyards. Anyone can assist in this process by informing the Coast Guard Hazardous Materials Branch [(202) 267-1217] about incidents which may possibly involve the activities of marine chemists in shipyards. This information will be forwarded to the board, which not only polices the activities of marine chemists, but also tries to improve marine chemical services to the maritime industry.

Conclusion

Marine chemists, the Marine Chemist Qualification Board, the Marine Chemist Association, Inc., the NFPA Technical Committee on Gas Hazards, the NFPA Marine Field Service, OSHA, the Coast Guard, the Navy, American shipyards, tankship operators, marine insurance underwriters, and others associated with maritime and shipbuilding industries have worked closely together for more than 70 years to provide safer workplaces in shipyards, at waterfront facilities and on board vessels. Individuals involved with any of these groups are encouraged to participate in these efforts by contacting the NFPA Marine Field Service at (617) 984-7435 and the Coast Guard's Hazardous Materials Branch with any pertinent information.

Marine chemist supervises checking of ventilation of cargo tank prior to testing and entry.

Field services

The NFPA Marine Field Service was established in 1963 to provide administrative support and legal assistance to the Technical Committee on Gas Hazards and the Marine Chemist Qualification Board, and to maintain all records of activities by both groups. The field service also helps the Marine Chemist Association, Inc., to achieve its first basic goal, "to promote the science of, and improve methods of evaluating and eliminating health, fire and explosion hazards in marine and associated industries." It also conducts "competent person" training for shipyard employees, and Coast Guard marine inspection and Navy personnel. The same training program is used for Coast Guard personnel on vessels or shore facilities.

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This parcel tanker carries bulk liquids, including chemicals like benzene. *Photo courtesy of A.B.S.*

Benzene hazards . . . and their control

By Dr. Alan L. Schneider

Introduction

Modern chemistry has made major contributions to the advancement of life. Sometimes, however, the very chemicals that enable progress have drawbacks themselves. Asbestos, lead alkyls in gasoline and certain of the halogenated hydrocarbons (Freons) are three examples. Benzene is another.

Benzene is a very important chemical intermediate, an excellent solvent, and an octane enhancer, making cars run smoother. (See Vol. 49, No. 1 of Proceedings of the Marine Safety Council - January-February 1992 - for a complete description of benzene and a synopsis of the final rule, 46 CFR parts 30, 151, 153, 197, published in the Federal Register on October 17, 1991.)

Appearing naturally in some crude oils, benzene was treated in years past as if it presented no danger to human beings. Individuals even used it to clean oil off their hands. Unfortunately, as with mercury and asbestos, benzene has been linked to cancer.

There are many chemicals carried by ship and barge that are hazardous to health. Benzene is very dangerous, and is shipped in large quantities by itself and in mixtures. The Coast Guard selected benzene as a pilot regulatory project, and may regulate other chemicals similarly.

In the United States, the Occupational Safety and Health Administration (OSHA) is charged with protecting workers on land from exposure to dangerous materials, while the Coast Guard is responsible for protecting marine workers on inspected vessels. Both agencies regulate benzene.

Hazards

Cancer, primarily leukemia, is the most serious risk of benzene exposure. While considerable progress has been made in combatting this serious blood disease, it is still very dangerous, especially the forms of leukemia linked to benzene exposures.

Benzene inhalation can also cause serious blood and liver problems, while swallowing even small amounts of liquid benzene can cause serious lung damage. A lesser threat, but nevertheless serious, is the damage to the skin and underlying fat layer when the liquid is spilled. Finally, high vapor concentrations irritate eyes and the mucous membranes of the nose and respiratory tract.

Fortunately, the human body usually exhibits warning signs of preliminary damage from exposure to benzene, such as changes in blood chemistry. Removing the worker from further exposure to benzene immediately after the warning signs are discovered usually reverses the initial damage.

OSHA requirements are based on continuous eight-hour exposures at constant concentrations, which are representative of land-based working conditions. The exposure experienced by the marine worker, on the other hand, is intermittent, varying in length and concentration. Would the risk be less with intermittent, as opposed to concentrated exposure?

Evidence from four animal studies suggests that intermittent exposure causes chromosomal damage and might cause more cases of leukemia than constant exposure. Also, a study of death rates among refinery, petrochemical and research workers found normal levels of leukemia, but pipefitters and utility workers exposed to benzene intermittently had the highest rates of the disease. This is convincing evidence that the marine worker's intermittent exposures are at least as dangerous as the land worker's constant exposure.

Regulatory process

The Chemical Transportation Advisory Committee and the Towing Safety Advisory Committee provided valuable input to the development of the new benzene regulations. Both are long-standing committees that have given advice on a wide range of topics for many years. Their meetings are open to the public, and are attended by representatives of management, labor and environmental interests.

The Coast Guard published an advanced notice of proposed rulemaking in the *Federal Register* on June 4, 1984. Since OSHA was then in the process of complex litigation on their proposed benzene rules, the Coast Guard placed its rulemaking on hold. OSHA published its final rule on September 11, 1987, covering all mixtures with a benzene concentration of 0.5 percent and reducing the permissible exposure level from ten to one parts per million. The agency estimated that this would reduce leukemia deaths from benzene exposure by 90 percent.

Based on OSHA's rulemaking, the Coast Guard published a notice of proposed rulemaking in the *Federal Register* on January 29, 1990, reducing the existing permissible exposure level from ten to one parts per million. The public made numerous comments during a three-month period which were all evaluated by the Coast Guard. In general, the public was satisfied with the draft regulations. The final rule was published on October 17, 1991, with corrections issued on December 13, 1991.

Regulation summary

Based on the OSHA regulations, the Coast Guard rules apply to all cargoes containing at least 0.5 percent benzene. Since there is no established health data on the intermittent exposures common to the marine industry, the Coast Guard adopted OSHA's land-based concentration exposure limits. Marine workers cannot be exposed over these limits without respiratory protection. The operator or person in charge of the vessel is responsible for ensuring that workers are protected from harmful benzene exposure.

Workers not employed by the vessel often board vessels to perform transfer operations, make repairs and deliver supplies. The regulations require that such workers certify to the person in charge of the vessel that they have satisfied the same requirements as vessel employees.

Not all vessels carrying benzene present hazards. To determine whether there is a problem, the vessel owner must measure benzene exposure levels before operations begin. There must be benzene measurements annually to ensure that exposure levels have not increased, and whenever conditions or operations change that could increase the levels.

If monitoring shows benzene exposures above the permissible limits, the employer must develop a written program to reduce exposures.

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This can consist of (a) engineering controls, (b) revised work practices, or (c) the use of respirators, and personal protective clothing and equipment. Whenever the exposure level increases, the program must be modified to protect workers.

The regulations describe in detail the respiratory protection equipment, specifying types, the need for testing and approval, fit-testing, inspection, maintenance and storage.

Unfortunately, despite the prevention methods, some workers will inhale benzene, thus the rules require medical surveillance. Some workers will get cancer, others, possibly with even greater exposure, will not. Benzene exposure usually causes noncancerous changes in the body before leukemia develops. These changes normally will be reversed if discovered in time and the worker is removed from benzene vapors. However, if exposure continues, leukemia is likely.

Since examinations for benzene exposure are so critical, workers are required to take them and employers must pay for them. The rules state that a physician can report only benzene-related problems revealed by such examinations to an employer. This is intended to preserve the privacy of the employees and encourage their cooperation in submitting to the exam.

An initial medical examination is required to identify workers with problems that prevent them from working with benzene. This exam serves as a "base line" for later tests, and must include an occupational history, a medical history, a list of drugs routinely taken, a history of exposure to ionizing radiation, a complete physical workup, a blood count and additional tests as necessary, plus a pulmonary function test for workers who wear respirators for at least 30 days a year.

A required annual medical exam includes a history of new exposures, changes in medicinal drugs, physical signs of blood disorders, a blood count and additional tests as necessary, plus the pulmonary function test for those who wear respirators for at least 30 days a year and a cardiopulmonary system evaluation at least every three years.

No matter how effective the use of engineering controls, revised work practices and respirators, accidental releases of benzene liquid or vapor can take place and workers can become exposed to high concentrations for short times.

The rules require emergency medical exams with urine samples and follow-up treatment if there are medical problems. The employer must give the employee a written opinion with the benzene-related results of the exam and the physician's job-related recommendations.

Once a worker has developed medical problems, he or she cannot enter any area where the benzene vapor concentration exceeds 0.5 parts per million by volume until a physician determines that it is safe to do so.

Informed consent (the employer must tell workers what they are going to be exposed to) and education are important features of modern industrial hygiene. The employer must provide a benzene material safety data sheet for employees, plus initial training and annual retraining. The topics to be covered are contained in the regulations.

Recordkeeping is important because it enables test results to be compared to determine changes. Also, it facilitates Coast Guard verification of employer compliance with the regulations. The rules contain the requirements for recordkeeping and disposition.

Enforcement

The Coast Guard drafted the regulations to maximize the benefits to worker health at the lowest possible cost to the industry while minimizing the burden on itself. Simply stated, the Coast Guard does not have the resources to have personnel at each cargo transfer and vapor monitoring operation. To a great extent, the regulations were designed to be self-enforcing with the Coast Guard spot checking records to determine compliance.

Coast Guard personnel inspect vessels and marine facilities periodically. When there is reason to believe that a vessel or facility is not in compliance, Coast Guard personnel will investigate further. There are civil as well as criminal penalties for noncompliance with Coast Guard regulations.

The Coast Guard worked closely with marine advisory groups to devise rules which would be reasonable and easy to implement. Industry has a major incentive to comply with the regulations. Employers recognize their responsibility to their employees' health, financially as well as morally. Workers too have reasons to comply with the rules - their own health for one. The rules require training in benzene dangers, which should motivate workers to comply.

Future

Benzene is only one of many chemicals with toxic dangers for workers. Nevertheless, the benzene regulations are quite important, projecting an estimated savings of 323 lives over a 45-year period. In a larger sense, however, these rules are but a first step toward protecting workers from a large array of chemical cargoes.

Initially, it is vital to determine how effective the regulations are. Do they work? Are they protecting workers? Are they cost effective? Are they enforceable? If problems occur, the Coast Guard will strive to correct them.

OSHA has stated its intention to apply its regulations to all mixtures with at least 0.1 percent benzene, reduced from 0.5 percent. The Coast Guard will review the initial exposure monitoring results to determine whether such a lowering of the threshold is necessary, and will modify its regulations as needed.

Benzene is the first chemical treated in this detail. The Coast Guard will consider whether regulations for other chemicals are needed. Other chemicals may be selected after consulting with public advisory groups.

The Coast Guard faces a major challenge in protecting the marine worker from chemical cargo hazards. This challenge will continue for the foreseeable future.

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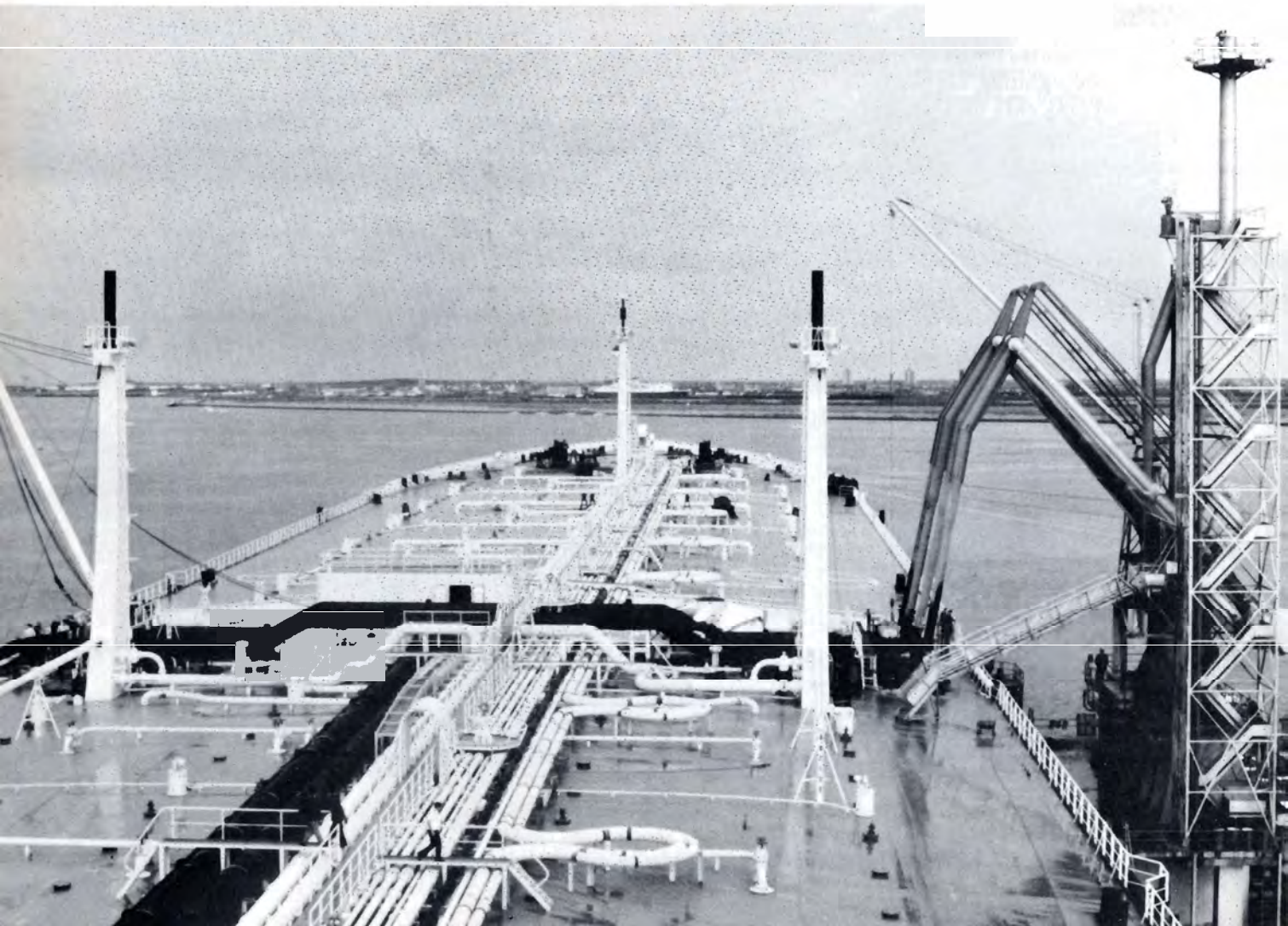
Top deck of a large chemical tank ship during cargo transfer.



Newly installed vapor recovery system on a dock in Texas. Note the detonation arrester (lower right corner), which prevents a flame front from spreading through the piping system in the event of an accident.

Benzene vapor control

Introduction

The Environmental Protection Agency (EPA) mandates limits of benzene emissions while loading ships, barges, tank trucks and railroad tank cars throughout the United States. EPA does not specifically state that its rules apply to vessels, but rather to a facility which loads a minimum of 1,300 cubic meters per year of a cargo which is at least 70 percent benzene.

In practice, every marine facility which loads a ship will load at least that much cargo, and it must be loaded into a tank which is sufficiently vapor tight. To verify tightness, the facility must have either a certificate from a vessel or conduct a tightness test on the vessel. Tightness testing can be accomplished by any of the following:

1. Loading while pulling a vacuum on the vessel's tanks. This is really an operational requirement, not a test.

2. Testing of the tightness during loading using "test method 21," which uses a hand-held gas detector calibrated to compensate for background concentrations of vapors. Described in 40 CFR part 60, this test for leakage must be conducted either during the last 20 percent of the loading, or have been conducted during the last 20 percent of a loading within the preceding 12 months.

3. Testing the tightness of tanks with air or inert gas at 1.0 psi (gauge).

By requiring that all vessels be tight, EPA hopes to achieve a 98 percent reduction in the emissions from tank vessel loadings. These rules were enforceable as of July 23, 1991, however, a number of interpretations will be needed to clarify their intentions before they can be fully carried out. Since the facilities enforce the rules, a ship operator or agent should address any questions to the loading facility.

EPA anticipated one difficulty in the implementation of its rules. According to test method 21, when a vessel is tested for benzene leaks at the 80 percent (or more) full level and does not meet the test standards, it either must be repaired before its next loading or must provide documentation that it cannot feasibly be repaired without dry-docking. In the latter case, the vessel may continue to load benzene until that dry-docking.

Safety regulations

Although it is EPA and not the Coast Guard which requires vapor recovery for benzene, the recovery arrangements might be fraught with safety hazards without a vapor emission control system. To achieve safe operating conditions with a new technology, the Coast Guard strives for a ten-fold increase in safety.

However compliance is achieved, a vessel must contain benzene vapors in order to return them to shore. In doing so, there are three areas of concern.

1. Keeping cargo tank pressure within allowable limits.

2. Preventing overfill of the tank.

3. Protecting the vessel from a fire or explosion at the facility, or on the vessel itself.

To maintain a tank within its limits for pressure requires improved cargo vapor venting. Care must be taken not only to exclude air, but to prevent structural failure as well.

The rules conform to existing basic regulations for sizing tank vents. One example is the requirement that venting accommodate one and one-quarter times the loading rate, which is also a requirement of the International Convention for the Safety of Life at Sea (SOLAS). However, unlike SOLAS, when a vapor emission control system is used, pressure vacuum valves cannot be bypassed during loading and must be able to provide sufficient capacity at the loading rate.

Moreover, specific requirements for valve venting have been added. For example, a valve must open between the tanks allowable working pressure and about 1.0 psi. The valve must also open between the allowable tank vacuum and approximately 0.5 psi.

Another new requirement is that pressure vacuum valves be constructed so that they can be inspected for free operation and proper closing.

Tank pressure and vacuum limits must also be maintained by alarms, which are intended to prevent unnecessary opening of the vent system. Back-up alarms are not necessary with this system.

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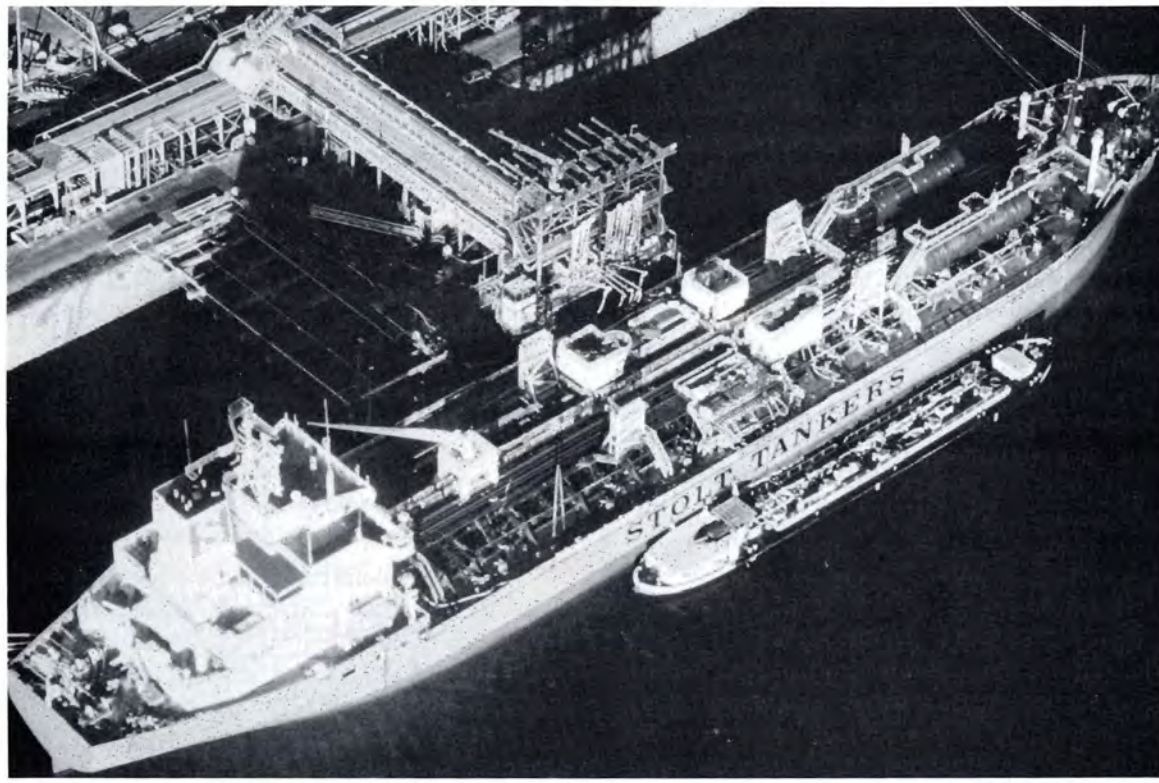
Inland tanker helps unload liquid cargo from large parcel tanker at a European port. Like all chemical carriers, these vessels must carry out vapor control measures as required. *Photo by Aerocamera Hoffmeester.*



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A fire on board a vessel is addressed by protecting vents with flame screens and by shutting off and isolating the inert gas system during loading.

To protect a tank's structure from an overflow of benzene, a high-level alarm and an overfill alarm, along with closed gauging, which may be portable, are required. The high-level alarm need not be independent of the gauging.

Implementation of these rules has already introduced some problems. Alarms which are not "tank-specific" have been installed on vessels. When loading is controlled on deck by manual valves, a general, or "summary" alarm on deck is of limited value. A summary alarm on deck is only appropriate where loading is controlled remotely from a control room with tank specific indications of high-level and overfill conditions.

Certain requirements common to handling of all flammable fluids is necessary. Hoses and loading arms connecting to the vessel's vapor emission control system must be electrically continuous, and there should be an insulating flange at the shore connection. Furthermore, vapor lines should be designed so that condensate is returned to tanks.

The vapor emission control system connection from shore to ship must have a lug on the fitting to prevent accidental loading of liquid through a vapor control manifold, which would produce a severe static hazard. (A lug is a piece of metal on one-half of the connection that fits into a corresponding part on the other half.) In addition to the lug, clear marking of the vapor connection is also required.

Training

A ship's crew must be thoroughly familiar with the vapor emission control system and operate it properly. The American Petroleum Institute is developing training standards, which will address the following points for individuals in charge of cargo transfers:

1. purpose of the system,
2. principles of the system,
3. components in the system,
4. hazards associated with the system,
5. Coast Guard regulations,
6. operating procedures, and
7. emergency procedures.

There are still areas that are not specifically addressed. For instance, there is no requirement for length of training. There are no international standards for certification of training, which may be provided by vessel operators. The Coast Guard hopes that the International Maritime Organization (IMO) will develop such standards. Although there is no independent review program set up for the training, a drill program must be in place which covers both normal and emergency operating procedures.

International regulations

The Coast Guard's work on the vapor emission control system has been considered by the IMO's Subcommittee on Bulk Chemicals, which forwarded a draft of guidelines for marine vapor control systems to the IMO's Maritime Safety Committee for adoption.

There are two major differences between the bulk chemicals subcommittee's guidelines and the Coast Guard safety rules. The subcommittee recommends two separate devices -- one for tank level gauging and one for an overfill, but only the overfill device has an alarm. The Coast Guard requires that the two separate devices each have an alarm. Also, unlike the subcommittee, the Coast Guard requires pressure sensors on all vapor return lines. Other than these differences, the IMO guidelines and the more detailed Coast Guard rules agree in principle on all major areas of vessel vapor emission control systems.

Conclusion

The safety features of vapor emission control systems should ensure that the loading of benzene will not endanger a vessel's crew or the general population residing or working in the vicinity of marine terminal operations. The rules should also serve as a model for future regulation of collecting vapors from other cargoes.

The previous two articles on benzene hazards and vapor control are reproduced in an edited form from MariChem 91, the ninth conference on transportation, storage,handling and distribution of bulk chemicals, with the permission of Gastech Rai LTD, 200 Tottenham Court Road,London W1P 9LA.

Coast Guard faces workplace risks

By LCDR Bob Acker

A highly effective safety and occupational health program is now in place for Coast Guard personnel. It is based on a comprehensive network of technically trained individuals who strive to accomplish goals that meet or exceed recognized standards. The objective of the program is to give field personnel the practical ability to recognize, evaluate and control workplace risks.

The Coast Guard's Hazardous Materials and Environmental Health Branches work closely together in spearheading the commandant's active approach to worker health and safety. A post-graduate school-trained officer with marine safety experience helps manage the program, ensuring that worker safety and health concerns are covered in all policy decisions.

Coast Guard industrial hygienist sampling equipment includes colormetric tube, pump, barometer and a device to measure relative humidity.

Program management

A strong commitment to the safety and health of every employee is evident at the Coast Guard's highest levels. In May 1991, the commandant ordered that Coast Guard commands conduct an all-hands "safety standdown" (one-day safety self-examinations) by June 30, 1991.

The initial need for a comprehensive Coast Guard industrial hygiene program was highlighted by a study conducted in the early 1980s by the National Cancer Institute on the incidence of occupational disease in Coast Guard marine inspectors. This study concluded that there was a significant increase in the incidence of certain diseases among these inspectors.

Several topics of concern are now being addressed. As a result of a ten-year industrial hygiene study of chemical exposures to workers in the maritime industry, and with the recommendations of the Chemical Transportation Advisory Committee, the Coast Guard is issuing a Navigation and Vessel Inspection Circular (NVIC) scheduled for publication in 1992, which outlines a recommended industrial hygiene program for merchant mariners. Many facets of the Coast Guard in-house safety and occupational health program discussed in this article are similar to the type program recommended for the maritime industry.

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MSO personnel are monitored for exposure to benzene during routine tank barge boarding.

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A revision to the Safety and Health Standards section of the Coast Guard Marine Safety Manual will refocus attention on better internal risk management. Safety and occupational health concerns will be included in revisions to NFPA 306 (Control of gas hazards on vessels - See page 2), and will benefit both Coast Guard and industry personnel. Participation in a long-term Shipyard Employment Standards Advisory Committee project to rewrite 29 CFR 1915 (See page 1) into a single source standard for safety and occupational health in shipyards will indirectly improve the safety of Coast Guard marine inspectors.

Training

The success of the safety and occupational health network greatly depends on the effectiveness of training conducted at the Marine Safety School in Yorktown, Virginia. Every marine safety course includes some aspect of safety and occupational health training. For example, port safety and environmental response personnel are taught to use basic toxic vapor sampling equipment, and marine inspectors learn to recognize confined space entry hazards.

This training also prepares the students to assume the collateral duties of unit safety and occupational health coordinators. They provide an essential link with district coordinators.

A marine safety and occupational health coordinator is assigned to each Coast Guard district office. These professionally trained individuals provide technical support to the Marine Safety Office (MSO) commanding officers, who are responsible for marine safety personnel assigned to their units. The district coordinator visits the field units regularly to perform measurements of recognized chemical, noise and heat stress hazards. The data is analyzed and compared to accepted health standards to evaluate degrees of hazard.

Field support model

The Second Coast Guard district, headquartered in St. Louis, Missouri, has what is considered a model safety and occupational health program begun in 1989. Three levels of commitment are responsible for the success of this program.

1) **Executive level commitment**
Funding provided by Coast Guard headquarters and policy provided by the second district commander was an essential combination.

2) **Field command acceptance**
Each commanding officer in the second district was already strongly committed to worker health and safety, and many of them were anxious to prove that carrying out the program would improve their job performances. Establishing written policy reflecting a risk management strategy instead of the more traditional specification standards checklist increased support among commanding officers.

3) **Worker acceptance**
Spending money and writing standards does not alone guarantee an effective safety program. Workers who recognize the personal benefits of following safe work practices, wearing protective equipment and preparing for hazards are less likely to cut corners when the boss isn't looking.

The second district's safety program has been reinforced by frequent field unit visits by the coordinator who audits programs, inventories equipment and identifies hazards. Visits targeting hazard assessment during routine

Marine inspector is monitored for benzene exposure during internal examination of cargo tank. Note passive organic vapor monitor hanging from his label.

operations yields information upon which to base preliminary safe work practices. Program elements are also addressed by video training sessions, respirator fit-testing and detection equipment practice.

Sharing initial risk assessment information between field units has been a key aspect in the program's success. Through October 1991, 51 different chemical and physical hazards were evaluated and their assessments disseminated to all second district marine safety units. Such information sharing has maximized resources and eliminated unnecessary duplication of effort.

Industrial hygienists are able to provide information to unit personnel on occupational exposures during specific Coast Guard operations. They also evaluate and recommend changes to work practices based on information obtained during sampling.

Highlights of some of the services provided by the marine occupational health coordinator to marine safety commanding officers include:

- Evaluation of personnel exposure hazards at a major petroleum naphtha spill for the Coast Guard on-scene coordinator;
- Evaluation of exposure assessment of styrenes at recreational boat building facilities;
- Measurement of hazardous noise levels during tank barge offloadings;
- Abatement of a welding fume hazard by obtaining semiportable ventilation system for a workshop;
- Identification of benzene exposure potential experienced by Coast Guard boarding personnel during bulk cargo operations of heavy aromatics;
- Provision of risk assessment information for pregnant servicewomen possibly exposed to chemicals during routine marine safety activities;
- Delivery of essential personnel protective gear to accompany prepositioned pollution response equipment mandated by the Oil Pollution Act of 1990;
- Identification of protective clothing standards for personnel monitoring bulk liquid transfers of caustic soda, sulfuric acid, oleum, butadiene, aniline, phenol and hydrochloric acid;
- Quantitative respirator fit-testing for safety unit personnel;

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Industrial hygienist monitors MSO inspector conducting a drydock examination of a tank vessel.

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- Procurement and delivery of hydrogen sulfide colorimetric badges to provide early warning during boardings or spill response involving asphalt, petroleum feedstocks etc.;

- Characterization of fugitive acrylonitrile vapor levels venting from a leaky valve stem packing gland aboard a dormant loaded tank barge; and

- Measurement of residual methylene chloride vapors in a barge cargo tank that had been certified safe for workers.

National progress

Sharing risk management information has contributed toward safety and occupational health program development throughout the Coast Guard. Written hazard communication summaries, safe work practices, instructions and standard operating procedures have been assimilated at the field level at many Coast Guard marine safety units.

Participation in local industry day panel discussions during the past two years has turned out to be a useful exchange of risk management information between the Coast Guard and inland river industries.

Conclusion

The Coast Guard safety and occupational health program still has a long way to go. All Coast Guard units must receive meaningful field support by trained professionals. Otherwise, revitalized awareness will diminish and worker complacency will return.

Program credibility must be further established by using risk management information from audits and surveys in updated Coast Guard safety and occupational health policy and safe work practices.

Most importantly, Coast Guard program managers must firmly reinforce commitment to worker safety and health by seeking every opportunity to integrate safety and occupational health program elements into mission performance expectations.

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How to obtain regulations

By ENS Barbara Rose

To order Coast Guard rules from the Code of Federal Regulations, cite the title, volume and stock number; enclose the price and send to:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
Telephone: (202) 783-3238

Following is a summary of commonly requested regulations.

TITLE: 46 - SHIPPING

VOLUME	CONTENTS	PRICE	STOCK NO.
Parts 1-40 Subchapters A, B, C, D	Organization, general course and methods governing marine safety functions; Merchant Marine officers and seamen; uninspected vessels; tank vessels.	$15.00	869-013-00169-9
Parts 41-69 Subchapters E, F, G	Load lines; marine engineering; documentation and measurement of vessels.	$14.00	869-013-00170-2
Parts 70-89 Subchapter H	Passenger vessels.	$ 7.00	869-013-00171-1
Parts 90-139 Subchapters I, I-A, J	Cargo and miscellaneous vessels; mobile offshore drilling units; electrical engineering.	$12.00	869-013-00172-9
Parts 140-155 Subchapters N, O	Dangerous cargoes; certain bulk dangerous cargoes.	$10.00	869-013-00173-7
Parts 156-165 Subchapter Q	Manning of vessels; equipment, construction, and material specifications and approval.	$14.00	869-013-00174-5
Parts 166-199 Subchapters R, S, T, U, V	Nautical schools; subdivision and stability; small passenger vessels,oceanographic research vessels, marineoccupational safety and health standards.	$14.00	869-013-00175-3

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TITLE: 33 - NAVIGATION AND NAVIGABLE WATERS

VOLUME	CONTENTS	PRICE	STOCK NO.
Parts 1-124 Subchapters A, C, D, E, G, I, J.	General; aids to navigation; international navigation; inland navigation; regattas and marine parades; anchorages; bridges and security of vessels.	$15.00	869-013-00-125-7
Parts 125-199 Subchapters L, M, N, NN, O, P, S	Waterfront facilities; marine pollution financial responsibility and compensation; outer continental shelf activities; deep-water ports; pollution; port and waterways safety; and boating safety.	$16.00	869-013-00-126-5

NOTE Overseas orders: add 25 percent (surface mail). Contact Government Printing Office for airmail delivery rates.

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Bare-boat chartering . . .
are the benefits worth the risk?

By Mr. William A. McCurdy, Jr.

In the summer of 1989, Coast Guard officers boarded a 108-foot recreational yacht at New York's historic South Street Seaport. They informed the captain that he was operating his vessel in violation of current Coast Guard safety regulations and could be endangering the lives of the approximately 80 passengers embarked for a mid-day cruise and lunch. The co-sponsors of the event elected to remain on board the vessel for lunch, but the cruise was canceled.

Later that same summer, other passengers on a similar recreational craft were not so lucky. Several lives were lost when an English charter operator overloaded its vessel and embarked on a cruise on London's famous Thames River. The vessel experienced mechanical difficulty, took on water and eventually sank. Investigators indicated that the vessel lacked sufficient life-saving equipment, which, if present and used, would have prevented the needless loss of life.

These seemingly unrelated events -- in opposite corners of the world -- had a significant impact on managers of E. I. Du Pont de Nemours and Co. Their employees were among the guests on the aborted New York cruise and had been invited to sail on the ill-fated Thames River outing.

This sequence of events caused the Du Pont corporate management to question whether or not its employees should be permitted to attend or host business-related cruises on such vessels. In addition to the safety concerns, management raised issues around legal compliance and liability. A thorough review of corporate practices and policy was ordered.

Commercial vs recreational

Du Pont safety engineers reviewed Coast Guard regulations for "commercial vessels" and contrasted them with the lesser standards imposed on the operators of "pleasure vessels." Significant differences in requirements concerning primary life-saving equipment, fire prevention, manning, training and periodic safety inspections generated a strong recommendation that "pleasure vessels" not be used for Du Pont-sponsored events and that Du Pont employees be urged not to attend any business events held on such vessels.

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This yacht is typical of bare-boat charters.

Photo by LT Richard J. Ferraro.

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A simultaneous review conducted by Du Pont lawyers revealed that many owners of large "pleasure vessels" tried to defray the high costs of owning and operating such craft by "bare-boat" chartering the vessel to businesses for the purpose of entertaining. Under current United States law, the owners of such vessels can document their boats with the Coast Guard as "pleasure vessels" and avoid meeting the more stringent and costly requirements imposed on owners and operators of "commercial vessels."

The charterer must select and hire the captain and crew of the vessel, and ensure that each is properly trained, competent and fully capable of carrying out responsibilities under the law. The charterer must also ensure that the vessel is "seaworthy," fully and properly equipped to function under all but the most unusual and extreme conditions. Under some circumstances, the charterer must also provide authorities with proof of ability to satisfy all financial contingencies that might arise during, or as a result of, the voyage.

An afternoon outing on a bare-boat chartered vessel.

Bare-boat charters

They could then lawfully "bare-boat charter" their vessels (leasing them without crew on a time basis) to unsuspecting business people who would then use them to entertain their guests. Since the guests were not charged for the entertainment or use of the vessel; and if there was no consideration, such as anticipated future financial gain, the entire operation met the letter of the law.

Further research indicated that, while lawful, bare-boat charters of pleasure vessels are beset with potential liability concerns. Under prevailing maritime law, the charterer assumes all of the responsibilities and liabilities as if he or she were the vessel owner.

The vessel will also be required to comply with all applicable marine pollution and waste disposal laws. If an accident occurs, and fuel or other marine pollutants are released into the environment, the charterer is fully liable for removal costs and for restoring the environment to its original condition.

In most instances, the charterer is responsible for maintaining and returning the vessel to its owner at the conclusion of the charter in the same condition it was in when received. In some cases, damages sustained by the vessel will be the charterer's responsibility.

The charterer may be contractually obligated to arrange and pay for a Coast Guard inspection, dry docking or other repairs or surveys, if required during the term of the charter.

More yachts that could be bare-boat chartered. *Photo by LT Richard J. Ferraro*

Finally, there is the issue of civil liability, which could arise after an injury or death of a crew member or guest during the term of the charter. Under the Jones Act (United States marine-based "worker's compensation" law), the charterer is fully responsible for the safety and maintenance of the vessel's crew. This act requires the "bare-boat charterer" to pay all of the medical bills associated with an on-the-job injury sustained by a crew member, and to provide for maintenance during recovery, regardless of whether or not the charterer caused or contributed to the injury.

The charterer's liability to a guest for an injury sustained during the cruise is based on the standard of care normally owed to passengers of vessels used for similar purposes. In such cases, the court may elect to use as a base the higher Coast Guard requirements for passengers on commercial vessels. This could make the charterer fully liable for the guest's injury, along with punitive damages.

Conclusion

Du Pont's strong commitment to safety, its concern for the health and well-being of its employees, customers and the environment, and its desire to avoid unnecessary risk and attendant liability have resulted in the prohibition of uninspected pleasure vessels for business entertainment.

Commercial vessels may be used for business entertainment at Du Pont. However, such vessels will be subject to inspection and will be required to meet all Coast Guard safety standards.

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This 38,720 dwt parcel tanker, M/T Stolt Emerald, needs room to maneuver.

Photo courtesy of Stolt-Nielsen, Inc.

Small boaters . ..
Be Wary

By Mr. Thomas J. Pettin

In recent years, the number of large commercial vessels serving the Port of Baltimore and the number of small boats sailing on the Chesapeake Bay have both increased. Everyday, large ships bearing tons of cargo pass through the major shipping channel that runs the length of the Bay.

Small boats should be aware of the constraints under which large commercial ships operate.

Rule 9 of the "Rules of the Road" specifically states that small craft "shall not impede the passage of a vessel which can safely navigate only within a narrow channel or fairway." Unlike most small boats, large vessels must often keep to a narrow channel.

Operators of small craft should avoid ship channels where possible. When unavoidable, these channels should be crossed quickly at right angles.

Speed

On open waters, large ships may travel faster than the usual "maneuvering speed" of 10 to 13 knots. In poor visibility or in congested areas, ships often travel faster than you would expect. In low visibility, ships navigate by radar. However, small boat operators must not assume they will always be detected.

Lightly loaded ships or loaded vessels that are unevenly trimmed must keep up a fair speed to stay under control when in a channel. If they slow down too much or stop, they risk being driven aground by wind, tide or current.

It doesn't take a whole lot of time for a large ship to reach you. At ten knots, a ship goes one nautical mile in six minutes. At 15 knots, this takes four minutes. Large, difficult to maneuver ships cannot always successfully avoid small craft in narrow channels, so it's up to the smaller boats to stay clear of these vessels.

A ship that is slowing down does not steer very well. It needs the propeller action on the

SMALL BOATER DOS AND DON'TS

- **Be alert - maintain watch at all times.**
- **Don't take the wheel if you have been drinking.**
- **Be seen, especially at night.**
- **Carry a radar reflector.**
- **Know whistle signals.**
- **Use binoculars.**
- **Use your radio.**
- **Observe all speed limits.**

rudder to respond. A pilot may sometimes choose to turn instead of slowing down to serve a particular situation.

Once a ship's engines are put "full astern," there is nothing more one can do to slow a ship. Reversing action will in most cases swing the bow to starboard, therefore if small boats have a choice, they should try to maneuver to the port side of the larger vessel to avoid a collision. It should be kept in mind that it takes four to six minutes and 2,000 to 4,000 feet for a large ship to stop after its engines are reversed.

Vigilance

Small commercial vessels that operate on waterways should also be watched carefully. Tugs pushing barges, especially at night when the barges may be poorly lit, have to be looked out for. A partially submerged towing cable can cut a boat in two. Commercial fishing vessels, though more maneuverable, may pose a problem when hauling in large nets which can be deceptively long.

Learn to recognize the mast lights of a tug towing one or more barges, and of commercial fishing vessels towing nets.

Keep a constant lookout, especially astern.

The safe sailor has a roving eye on the water. He or she uses binoculars, which can help determine ships' lights and directions with greater accuracy, especially at night.

Small boaters should keep out of the way of large ships. This doesn't mean that open waters "belong" to the big ships. What it does mean is that big ships must stay in deep channels, whereas small boats don't have to. Therefore, sailing or traveling in ship channels should be avoided whenever possible, especially in fog, rain or darkness.

Always maintain a watch, especially at night.

Even on a clear night, you will have difficulty seeing a big ship approach. You might see it first as a black shadow against a background of shore light, or as a shadow moving rapidly across still water. At that point, you are not far apart.

Remember that your lights will not be easily spotted from a larger ship. Focus attention on the ship's light. To determine whether you are in the path of a ship, note the vessel's sidelights as well as the masthead lights. If you see only one sidelight, or if one is much brighter than the other, you can be fairly sure you are not in the direct path of the ship. This also lets you know which way to move in order to get clear altogether. If you see both sidelights, you're dead ahead - **MOVE OUT FAST.**

Visibility

Don't underestimate the speed of a large ship. A slow boat might not be able to take effective evasive action on a collision course with

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a large ship. In visibility of a quarter of a mile or less, the speed differential is simply too great.

Be visible!

At night, make sure that your navigation lights are bright, and not obscured by sails, flags or dinghies in davits. If you see the running lights of a ship, and you're not sure whether you've been spotted, begin to get out of the way immediately. Use flashlights on sails, a spotlight, flash bulbs or a white flare to indicate your position. (Strobe lights should be reserved for distress.) Carry a radar reflector as high on the boat as you can -- a must in restricted visibility.

Whistle signals

Know whistle signals and use them only when vessels are in sight of one another. The master or pilot of a large ship will frequently not use the port or starboard whistle signals when passing small boats, lest the signals be misunderstood and cause the smaller vessel to change course erratically.

Five or more shot blasts on a whistle is a danger-signal. If you should hear this, check right away and see if it is for you. If so, make way fast.

Radios

Use your radio. If you have a VHF radio aboard, remember that channel 16 is the calling and distress frequency, and channel 13 is the working frequency used to arrange safe meeting and passing between ships and other water craft. Use channel 13 for bridge-to-bridge communication and monitor channel 16.

Anchorages & piers

Choose safe anchorages. Each year commercial ships and fishing vessels ram and sink a few boats anchored in navigation channels or tied to marker buoys. Coast Guard buoys tell ships, "here is where you must pass." It is illegal, as well as unsafe, to tie up to them.

When navigating small craft in harbors, be particularly cautious around piers. Ships may be maneuvering in the vicinity. Sudden propeller wash or wakes generated by large ships can be extremely dangerous to small boats.

Don't pass close to ships leaving piers. You don't know what is on the other side of them, and their turbulence can cause you problems.

Remember harbor speed limits -- you are responsible for your own wake.

Conclusion

Whether you are a small boat operator or the master of a large container ship, it is wise to visualize any possible situation which can result when vessels of all shapes and sizes compete for the same space. Plan for it well ahead of time.

Keep in mind that few people survive collisions with ships.

Always keep clear.

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Tank vessel dwarfs tug approaching New York Harbor. Other small boats should keep clear.

Photo by Francis Duffy, Moran Towing Corp.

Bicycles patrol harbor

By LTJG Brad F. Smith

Harbor patrols to check waterfront facilities for safety, security or pollution hazards have traditionally been carried out on foot, or by boat or car. Last summer, the Marine Safety Office (MSO) Puget Sound, Seattle, Washington, conducted what may have been the first Coast Guard harbor patrols by bicycle.

The idea for bicycle patrols arose last spring at a quality action team meeting at the MSO. "We were brainstorming for ideas to improve patrol efficiency, and thought mountain bikes would be right for the job," notes MST2 Peter T. Neumann, a pollution investigator.

"Several other law enforcement agencies in the area use them," he points out, adding, "we chose mountain bikes because of the variety of terrain our patrols cover, including dirt, gravel, grass and railroad tracks."

To test the idea, Neumann and another experienced cyclist rode their bikes around Seattle's Lake Union. They apparently generated interest, as passersby asked what they were doing and seemed to like talking with the Coast Guard personnel.

MSO officers approved the bicycle patrols when they discovered that the bikes could reach remote areas of the waterfront and patrol areas often overlooked when traveling by car. They also gave the Coast Guard higher visibility, as well as providing added benefits of physical fitness to the bikers. Last, but not least, bicycles are very cost effective.

The program proved its worth during the second bike patrol with the discovery of an oil sheen and its source. The bikers noticed the sheen on the water when they were riding down a finger pier, and were able to quickly track the source down by bicycle. They agreed that they might not even have noticed the sheen if they had been in an automobile.

"With the bikes, in one day we can cover an area that used to take three days by car," Neumann reports. "And in half an hour, we're covering what we would take three hours to do on foot.

"We're a lot closer to the water, and can ride down finger piers and right up to vessels without having to find a place to park the car.

Bicycle patrol vest and helmet is modeled.

"People on the waterfront seem to like seeing us take a proactive role in the port," Neumann adds.

Patrollers search for dangerous and/or illegal situations, including obstructions to navigation, improperly moored vessels, fires and thefts. They correct potential hazards, monitor bulk liquid transfer operations and check all "hot work," or welding operations to ensure valid permits are held.

Uniforms for the bicycle patrol were not easy to find. They needed to be practical for bicycle wear, yet be identifiable as Coast Guard uniforms. The investigators finally settled on blue and black bicycle helmets and gloves, black mountain bike shorts and steel-toed black athletic shoes with soft soles. Rain-proof jackets and pants are available when needed.

The patrol riders also wear specially-designed blue vests with pockets for equipment. The vests bear the Coast Guard ensign patch and reflective material.

Attached to the bike frame are cargo bags for carrying sampling jars, a portable radio, a cellular phone, boarding papers and other patrol gear.

Personnel at MSO Puget Sound believe that bicycle patrols would be useful in most United States ports, and hope that other MSOs follow suit.

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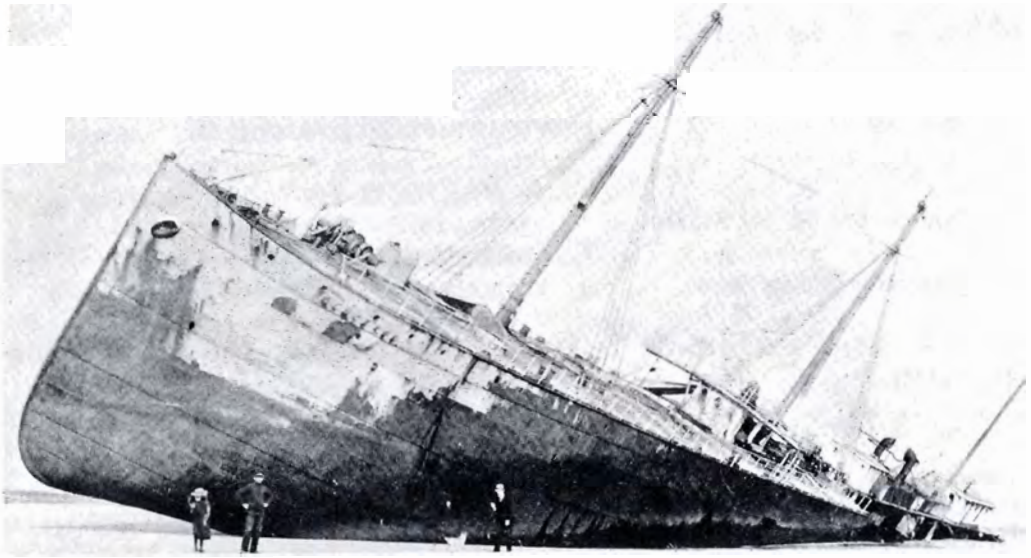

Gluckauf was wrecked in 1893. See Proceedings - July-August 1991, page 4.

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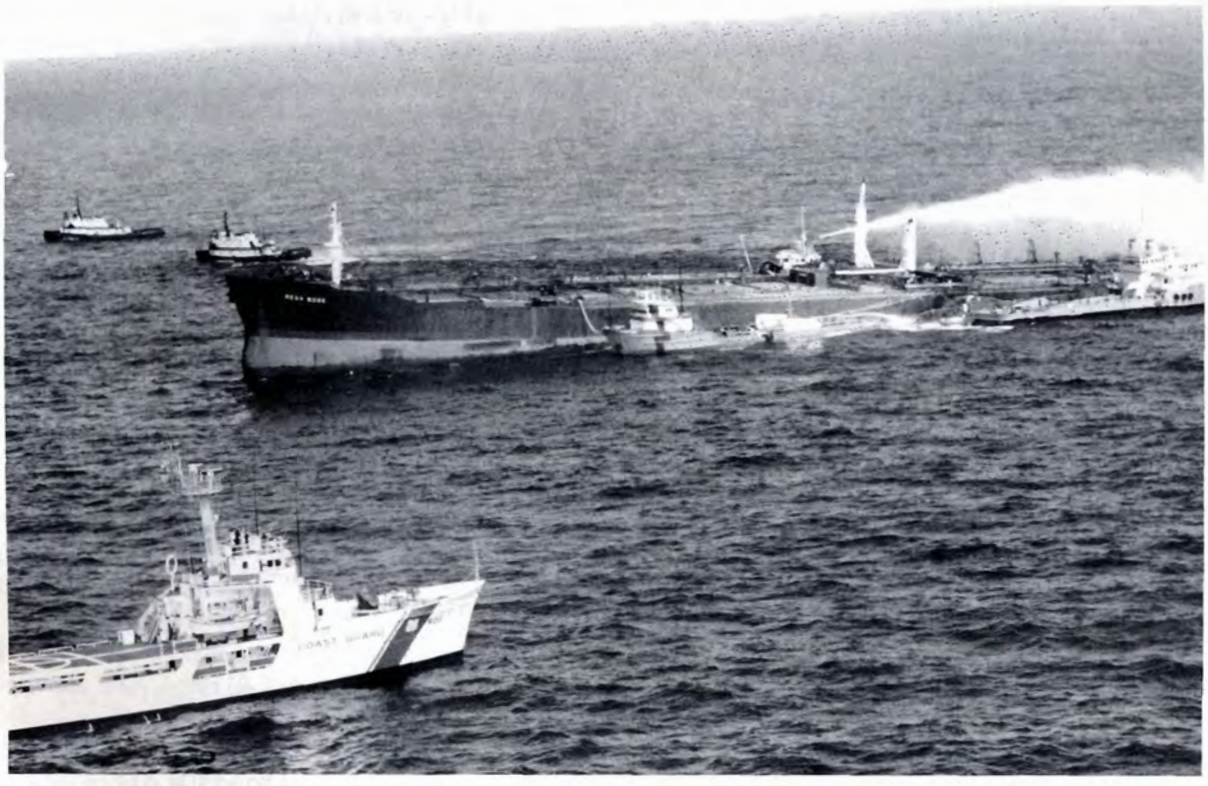

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Nautical queries — *March-April, 1992*

The following items are examples of questions included in the third assistant engineer through chief engineer examinations and the third mate through master examinations.

Engineer

1. What safeguard can be built into the control circuits of a remotely-operated fire pump to ensure that the pump is not started with the suction valve closed?

A. The fire pump starting circuit is engaged by a limit switch when the suction valve opens.
B. A contact in the suction valve open-starter coil opens and the pump starts immediately.
C. A normally open contact closes in the fire pump suction valve starter coil circuit.
D. A time delay relay is de-energized when the "ON" button is pushed, and the pump starts after a predetermined time.

2. The designation "schedule 80 extra strong" refers to _____

A. weight of steel plate
B. tensile strength of bolts
C. piping wall thickness
D. tubing bursting strength

3. A continuous fluctuation of the speed due to over control by the governor is known as?

A. Hunting.
B. Sensitivity.
C. Promptness.
D. Speed droop.

4. The MOST common cause of heat blisters on boiler generating tubes is _____.

A. waterside deposits
B. flame impingement
C. gas laning
D. insufficient water circulation

5. If a main propulsion diesel engine hunts excessively at idle speed, you should _____.

A. adjust the idle speed control
B. drain and flush the governor and replace the oil
C. adjust the compensating needle valve
D. adjust the load limit

6. An unsteady vacuum in a submerged tube evaporator can be caused by _____

A. fluctuating steam pressure to the air ejector nozzle
B. improper venting of the evaporator tube nests
C. air leaks in the evaporator tube nests
D. high water level in the evaporator shell

7. Which of the following is/are true about contact makers in general alarm systems?

A. Each must be a normally open, spring-return-to normal, enclosed, watertight switch.
B. Each must close its contacts when the operating handle is rotated counter clockwise through an arc of 90 degrees.
C. Each must have the "off" and "on" positions clearly stenciled or conspicuously posted on a nearby bulkhead.
D. All of the above.

8. To correct hunting problems in hydraulic governors for propulsion diesel engines, __.

A. increase the governor oil pressure
B. adjust the speed droop setting
C. adjust the speeder spring travel
D. adjust the compensating needle valve

9. When air compressor drive belts squeal, fix them by _____

A. spraying oil on the belts
B. tightening the belts
C. loosening the belts
D. installing wider belts

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Deck

1. BOTH INTERNATIONAL AND INLAND- Risk of collision is considered to exist if .

A. four vessels are nearby
B. a vessel has a steady bearing at a constant range
C. there is any doubt that a risk of collision exists
D. a special circumstance situation is apparent

2. INLAND ONLY - At night, a barge in a slip used primarily for mooring purposes shall _____.

A. not be required to be lighted
B. show a white light at each corner
C. show a red light at the bow and stern
D. show a flashing yellow light at each corner

3. What is the purpose of the intake/exhaust valves in a diesel engine?

A. They regulate the combustion cycle.
B. They supply cooling water.
C. They synchronize the ignition spark.
D. They supply and regulate the lubricant flow.

4. BOTH INTERNATIONAL AND INLAND - When action to avoid a close-quarters situation is taken, a course change alone may be the most effective action, provided that _____.

A. it is done in a succession of small course changes
B. it is not done too early
C. it is a large course change
D. the course change is to starboard

5. You are off the coast of South Africa when a seaman is injured. What indicator should be used in a message requesting medical advice from a South African station?

A. DH MEDICO.
B. XXX RADIOMEDICAL.
C. MEDRAD.
D. PORT HEALTH.

6. An azimuth angle for a body is measured from the .

A. observer's meridian
B. Greenwich meridian
C. body's meridian
D. zenith distance

7. Retrograde motion is the _____

A. movement of the points of intersection of the planes of the ecliptic and the equator
B. apparent westerly motion of a planet with respect to stars
C. movement of a superior planet in its orbit about the sun
D. movement of the celestial north pole in an elliptical pattern in space

8. Which of the following would give the best radar echo?

A. The beam of a three-masted sailing vessel with all sails set.
B. A 110-foot fishing vessel with a radar reflector in its rigging.
C. A 300-foot tanker, bow on.
D. A 600-foot freighter, beam on.

9. BOTH INTERNATIONAL AND INLAND - You are in restricted visibility and hear a fog signal forward of the beam. Nothing appears on your radar screen. The rules require you to .

A. stop your engines
B. sound two prolonged blasts of the whistle
C. sound the danger signal
D. slow to bare steerageway

Answers

Engineer

1-A, 2-C, 3-A, 4-A, 5-C, 6-A, 7-A, 8-D, 9-B.

Deck

1-C, 2-A, 3-A, 4-C, 5-D, 6-A, 7-B, 8-D, 9-D.

If you have any questions concerning "Nautical Queries," please contact U.S. Coast Guard (G-MVP-5), 2100 Second St., S.W., Washington, D.C. 20593-0001. Telephone: (202) 267-2705.

Chemical of the month *4/C M. D. Bush*

Isopropyl Alcohol

The chemical isopropyl alcohol (IPA) has the formula $CH_3CHOHCH_3$. It is also referred to as isopropanol, 2-propanol, di-methyl carbinol and petrohol, but is most commonly known as rubbing alcohol.

At room temperature, IPA is a clear liquid with a slight odor resembling that of an ethanol and acetone mixture. It is the 44th highest-volume chemical produced in the United States, and is commonly shipped in drums, tank trucks and railroad cars.

IPA has many uses other than for body rubbing. Like most alcohols, it is highly volatile and, therefore, used in quick-drying inks and oils, in anti-freeze compositions and as a solvent in gums and shellacs. A common denaturant for ethyl alcohol, it is found in hand lotions, after shave lotions and cosmetics. In addition, IPA is used in the production of acetone, glycerol and isopropyl acetate.

Hazards

Although it does not react with water or any common materials, IPA, like all flammable liquids, should not be regarded as harmless. It is a grade C flammable liquid and has a NFPA hazard classification of three under the flammability category because of its relatively low flash point of 53°F. IPA's vapors may explode if ignited in an enclosed area and a flashback may occur along a vapor trail. Flammability limit in air reaches from a low of 2.3 percent to a high of 12 percent. If a fire occurs, extinguish it with dry chemical, foam or carbon dioxide. (Water may not be effective.)

IPA has a slightly bitter taste, but is not at all potable. Although it is harmless to the skin, ingestion of 100 milligrams of IPA can be fatal. Inhalation of large quantities of the vapor can cause nausea, dizziness, vomiting, headache, coma, narcosis or mental depression.

A victim overcome by vapors should be immediately removed from exposure, and a physician should be called. Anyone who gets IPA in the eyes should flush them with water for at least 15 minutes.

Shipping

IPA is shipped in grades of 91 percent, 95 percent and 99 percent. Other than being flammable, the chemical presents no great shipping hazard. It is stable when stored at normal surrounding temperatures. Open ventilation or a pressure vacuum is required.

IMO considers IPA a non-pollutant, and has assigned it to appendix III of Annex II of MARPOL 73/78.

IPA does not react with most common construction materials. However, water solutions will react with aluminum, especially at elevated temperatures, and will cause rusting of mild steel. Shipping regulations require that a "flammable liquid" label be attached to any container of IPA.

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Isopropyl alcohol

Chemical name:	Isopropyl alcohol
Formula:	$(CH_3)_2CHOH$
Synonyms:	Dimethyl carbinol, IPA, isopropanol, 2-propanol, propyl alcohol, rubbing alcohol
Chemical family:	Alcohol
Physical description:	Colorless liquid, sharp unpleasant odor

Physical properties:

Boiling point:	182°F (82°C)
Freezing point:	126°F (-88°C)
Vapor pressure:	33 mmHg @20°C (68°F)
Reid vapor pressure:	3.0 psia

Threshold limit value:

Time weighted average:	400 ppm
Short-term exposure limit:	500 ppm

Flammability limits in air:

Lower flammability limit:	2.3% by volume
Upper flammability limit:	12.0% by volume

Combustion properties:

Flashpoint:	53°F, TCC
Autoignition temperature:	750°F

Densities:

Vapor (air = 1):	2.07
Specific gravity ;	0.79 @ 20°C

Identifiers:

IMO class:	3.2
U.N. number:	1219
CHRIS code:	IPA
CAS registry number:	67-63-0
Cargo compatibility group:	20 (Alcohols, glycols)

NFPA:

Health hazard:	1
Flammability:	3
Reactivity:	0

M. D. Bush was a fourth class cadet at the Coast Guard Academy when this article was written as a special chemistry project for LCDR Thomas Chuba.

All data in this article was reviewed by the Hazardous Materials Branch of the Marine Technical and Hazardous Materials Division of the Coast Guard's Office of Marine Safety, Security and Environmental Protection. Telephone: (202) 267-1577.

Final rule correction

CGD 88-040, Benzene correction (46 CFR parts 30, 151, 153 and 197) RIN 2115-AD08 (December 13).

On October 17, 1991, the Coast Guard published a final rule in the *Federal Register* (56 FR 52122) revising the special carriage requirements for benzene and benzene mixtures, and adding new regulations limiting occupational exposure to benzene on Coast Guard-inspected vessels. This document corrects the final rule which will be effective January 15, 1992, by clarifying: (1) that the new rules do not require all U.S. flag vessels carrying liquid mixtures containing 0.5% to 10% benzene to comply with the requirements of 46 CFR 151 and 153; and (2) that the new rules do not apply to foreign flag vessels. This correction document also changes the effective dates for some of the monitoring and medical surveillance requirements.

EFFECTIVE DATE: January 15, 1992.

For further information, contact: Dr. Alan L. Schneider, Hazardous Materials Branch, Office of Marine Safety, Security and Environmental Protection, (202) 267-1217.

Notice of proposed rule

CGD 91-030, Direct user fees for inspection or examination of U.S. and foreign commercial vessels (33 CFR part 143, 46 CFR part 2) RIN 2115-AD78 (December 18).

The Omnibus Budget Reconciliation Act of 1990 requires the Coast Guard to establish user fees for services related to the inspection and examination of U.S. and foreign vessels, and issuance of Certificates of Inspection, Certificates of Compliance, and related documents. The proposed fees are based on the way the Coast Guard presently conducts vessel inspection activities. This proposal is intended to recover costs of providing certain vessel inspection services.

DATE: Comments must have been received by February 18, 1992.

For further information, contact: CDR Bruce A. Russell, Chief, Plans and Analysis Branch (G-MP-1), Office of Marine Safety, Security and Environmental Protection, (202) 267-6923.

Notice of proposed rule correction

Appendix A was omitted from the notice of proposed rule concerning direct user fees (above) when published in the *Federal Register* on December 18, 1991. This appendix appears in full in the December 24, 1991, issue of the *Federal Register* on page 66766.

For further information, contact: CDR Bruce A. Russell, Chief, Plans and Analysis Branch (G-MP-1), Office of Marine Safety, Security and Environmental Protection, (202) 267-6923.

Notice of proposed rule

CGD 91-204, Use of automatic pilot: area restrictions and performance requirements (46 CFR part 35) RIN 2115-AE00 (January 6).

The Coast Guard proposes to implement a provision of section 4114(a) of the Oil Pollution Act of 1990 (OPA 90), by defining the conditions under which, and designating the waters where, tank vessels may operate with the automatic pilot engaged. This proposed rulemaking will promote the safe operation of tank vessels in U.S. waters. Section 4114(a) also requires restrictions on operations of tank vessels with unattended machinery spaces. Regulations restricting operations with unattended machinery spaces are the subject of a separate rulemaking.

DATE: Comments must be received on or before March 6, 1992.

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Addresses: Comments may be mailed to the executive secretary, Marine Safety Council (G-LRA-2/3406) (CGD 91-204), U.S. Coast Guard headquarters, 2100 Second Street, S.W., Washington, D.C. 20593-0001, or may be delivered to room 3406 at the above address between 8 a.m. and 3 p.m., Monday through Friday, except federal holidays. The telephone number is (202) 267-1477.

The executive secretary maintains the public docket for this rulemaking. Comments will become part of this docket and will be available for inspection or copying at room 3406. A copy of the material listed in "Incorporation by Reference" of this preamble can be inspected at room B110, Coast Guard headquarters.

For further information, contact: LCDR Paul Jewell, project manager, Oil Pollution Act Office, U.S. Coast Guard headquarters, (202) 267-6746.

Notice of advisory committee for regulatory negotiation

CGD 91-034/90-068, Vessel response plans, and carriage and inspection of discharge-removal equipment (33 CFR part 155) RIN 2115-AD81 and 66 (January 10).

The Coast Guard is announcing the establishment of the Oil Spill Response Plan Negotiated Rulemaking Committee to develop a report, including a recommended proposed and final rule, concerning tank vessel oil spill response plans and carriage of removal equipment. The rulemaking will implement certain amendments to the Federal Water Pollution Control Act included in OPA 90. The committee will adopt its recommendation through a negotiation process. The committee is composed of persons who represent the interests substantially affected by the regulations.

For further information, contact: LCDR Glenn Wiltshire, project manager, OPA 90 staff (G-MS-1) at (202) 267-6739.

Notice of establishment

CGD 92-001, Merchant Marine Personnel Advisory Committee establishment (January 10).

The secretary of the Department of Transportation has approved the establishment of the Merchant Marine Personnel Advisory Committee. The purpose of the committee is to provide expertise on matters concerning personnel in the U.S. merchant marine, including, but not limited to: training, qualifications, certification, documentation and fitness standards as required by the Coast Guard.

For further information, contact: LCDR Scott J. Glover, Merchant Vessel Personnel Division, (202) 267-0221. This notice is issued under the authority of the Federal Advisory Committee Act, Public Law 92-463, 5 U.S.C. App. 1.

Notice of availability

CGD 90-051, Draft regulatory impact analysis, including Regulatory Flexibility Act analysis, and finding of no significant impact for double hull standards for tank vessels carrying oil (33 CFR part 157) RIN 2115-AD61 (January 15).

The Coast Guard has prepared a draft regulatory impact analysis (RIA), including a Regulatory Flexibility Act analysis, an Environmental Assessment (EA) and a draft finding of no significant impact (FONSI) on the human environment for double hull standards for tank vessels carrying oil. The draft RIA is part of a programmatic RIA which will address the individual and cumulative impacts from all the regulations issued under titles IV and V of OPA 90. The Coast Guard accepted comments on both the drafts RIA and FONSI by February 14, 1992.

Copies of the draft RIA, the EA and the draft FONSI are available for inspection and copying at Coast Guard headquarters, room 3406, between 8 a.m. and 3 p.m., Monday through Friday, except federal holidays. Telephone: (202) 267-6740.

Copies of these documents may also be obtained by contacting Mr. Bruce Novak, manager, clearance and coordination, OPA 90 staff, (202) 267-6189. Although there is no fee for the EA and the draft FONSI, high production costs for the draft RIA require a $25.00 per copy fee. Checks should be made payable to the U.S. Treasury.

For further information, contact: Mr. Albert J. Klingel, Jr., OPA 90 staff, (202) 267-6818.

The Gloucester fishing schooner Evelyn & Ralph ran ashore in dense fog at Maddaquecham on the south shore of Nantucket on December 6, 1924. When the vessel struck the sand bar, the fo'c'sle stove tipped over and started a fire.

Photo courtesy of Charles F. Sayle, Nantucket, Massachusetts.