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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: JUL 17 1995

In Reply Refer To: M-95-18 through -22

Mr. Kenneth Bowhay
President
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About 0930 on July 24, 1994, while bound for Dutch Harbor, Alaska, in the Aleutian Chain, the U.S. fish processing vessel ALL ALASKAN caught fire near the western end of Unimak Island, Alaska. The fire burned out of control for several days before burning itself out. One person died, and the vessel and cargo damage was estimated between $25.3 and $31 million.[1] The National Transportation Safety Board determined that the probable cause of the fire aboard the ALL ALASKAN was the failure to isolate heat tape from combustible rigid polyurethane (RPU) insulation and the lack of heat tape standards for fish processing vessels. Contributing to the severity of the fire was the lack of adequate firefighting (detection and suppression systems) standards. Contributing to the loss of life was the lack of formal firefighting training of the fire team.

All Alaskan Seafoods, Inc., (AAS) had the responsibility to ensure that the vessel operated safely and efficiently. Although the company president had conducted ship visits, these visits focused on the fish processing operation. The master was responsible for all vessel operational decisions, and the on-board vessel superintendent was responsible for the processing operation.

Although frequent drills were held at the urging of the master, neither how much training each member of the firefighting team had received nor how well the drills served as a training aid was routinely determined. The ALL ALASKAN had one major fire during its conversion;

[1]For more detailed information, read Marine Accident Report--*Fire on board U.S. Fish Processing Vessel ALL ALASKAN near Unimak Island, Alaska, Bering Sea, July 24, 1994* (NTSB/MAR-95/02).

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according to crew testimony, it had experienced several "small" fires before this casualty; and the AAS was probably aware of the major fire on the fish processing vessel OMNISEA in Seattle, all these incidents should have highlighted the AAS concern for potential fire emergencies. The company had no system to detect fires; however, fire detection (outside of accommodation spaces), either by an installed system or crewmember fire rounds, is not required for this vessel. Of his own volition from his stated concern about a foam fire, the master had instituted fire watches when the vessel was underway and not processing. The Safety Board concludes that the AAS because of its experience with the past fires should also have recognized the problem and provided written fire watch guidance to the master. Therefore, the Safety Board believes that the AAS should provide written guidance on fire watch procedures and duties for its vessel masters and also for those employees who are assigned to fire watch duty.

Despite the lack of regulatory requirements for fire protection and firefighting training, the AAS had responsibility for the ALL ALASKAN and the safety of its personnel. Although the company had taken measures to better the safety on its vessels, formal fire team training and guidance is needed to further improve vessel fire safety. The Safety Board therefore believes that the AAS should provide members of the fire team aboard its fish processing vessels with formal marine firefighting training.

The deckhand who was the one fatality probably became disoriented after encountering the flames and heavy smoke and was unable to locate the door leading into the refrigeration machinery room. Using a lifeline would have made it possible either for the deckhand to find his way out or for others to locate him had he needed assistance. The able seaman (AB) stated that he was aware of the lifelines in the fire lockers but had never been trained in their use during fire drills. Therefore, the Safety Board concludes that had the AB and deckhand used a lifeline when entering the freezer deck and been trained in its use during fire drills or formal firefighting training, the deckhand may have found his way to safety or signaled for help.

The ALL ALASKAN safety manual contains firefighting operation guidelines; however, the AB said that he was not aware of any manual aboard the ALL ALASKAN. He stated that his training had been received only verbally and only during fire drills. The firefighting appendix to the safety manual included prefire planning and fire precautions, but these were not taught during drills. Had the safety manual precautions, such as having a charged fire hose available when entering smoke-filled compartments and using lifelines plus self-contained breathing apparatus when opening areas, been taught to the firefighting team and practiced during drills, the AB and deckhand may have exercised these safeguard precautions in this accident. Safety manual firefighting procedures are only beneficial when provided to crewmembers in practice emergency situations. The Safety Board concludes that had the ALL ALASKAN safety manual procedures been provided to the AB and used during fire drills, the consequences of the fire may have been lessened. Therefore, the Safety Board believes that the AAS should ensure its vessel crewmembers with responsibilities in emergencies are knowledgeable of the company safety manual contents, such as the use of lifelines, fire assessment, and fire team coordination, to enforce proper firefighting procedures.

The fan motors on the evaporators aft, the heating pads on the drain collector pans under these evaporators, and the electric circuits (other than heat tape circuits) in hold No.3 and lighted tobacco materials were considered and eliminated as ignition sources. The burn pattern eliminated the first three items considered because the RPU insulation on the overhead and the cellular plastic foam insulation Rubatex on the piping were smoke damaged and charred but not destroyed. Had the ignition initially occurred in this overhead area, the insulation would have been destroyed, and the flame probably would not have spread down to the deck. In addition, the Rubatex, covering the drain pipe connected to the collector pan with the heating pad, was heat damaged but still in tact and not burned. Any discarded smoking material, such as a burning cigarette, was not considered a feasible ignition source because it would have had to smolder for 8 1/2 hours, which is a very unlikely possibility. Also, the odor was described as unusual, and a smoldering cigarette smell would probably have been recognized as such. Finally, Safety Board investigators found no evidence after the fire of smoking in the hold.

The burn pattern on the vessel indicated that the lowest point of the fire was in hold No.3 on the port side aft of the aft elevator. The plywood covering and the sprayed-on RPU insulation on the hull from the aft elevator to the aft bulkhead were completely burned away. The hold No.3 aft area was also where the "strange smell" was reported during various times in the 8 1/2 hours before the fire. Two potential ignition points were identified during the investigation in this area of the vessel as likely ignition sources, based on the burn pattern and other evidence.

The first potential ignition source for the fire was the heat tape on the 2-inch diameter vertical drain pipe from the number 1 evaporator in hold No.3. The Rubatex, the electrical insulation on the heat tape, and the semi-conducting material between the heat tape conductor wires were burned from the pipe. The heat tape bus wires remained spiraled around the pipe and were separated about 3 feet above the deck. A whitish area, consistent with a hot spot, was noted on the hull behind the pipe. The ends of the bus wires did not appear to have been cut but were severed and rounded consistent with electrical shorting and failure under power.

Because the end cap and all insulation were destroyed, the Safety Board could not determine whether the heat tape failed at the end cap. The proximity of the drain pipe to the loading and unloading activities near the elevator subjected it to possible mechanical damage and failure particularly because the plywood protection did not extend over the drain pipe. Because the drain line was insulated with Rubatex that was close to the RPU insulation, the fire could have easily spread into the foam.

The second potential ignition source was another heat tape in the port corner aft of hold No.3 that was wrapped on a 4.5-inch-diameter vertical pipe. The failure was behind a concrete barrier about 26 inches from the hull frame face forming a trough covered with plywood sheathing and about 14 inches below the plywood cover. The tape end cap and about 5 inches of the electrical insulation jacket above it were intact. Above this area, the bus wires were exposed and separated. Much of the Rubatex pipe insulation was still intact, although some insulation was burned. The electrical insulation and the heat tape matrix were burned away only at the failure site; however, about 2 inches above this failure, the heat tape spirals were

undamaged. The failure appears to have taken place under power because the wire ends are beaded and metal beads/fragments were in the end cap. This failure site could have been the ignition source for the fire, although a number of factors suggest otherwise. First, the tape failed at the termination and did not progress for a complete turn around the pipe. Second, a 2-inch turn of heat tape above the failure site indicates that the fire did not spread upward, a typical mode of fire spread. The heat tape above the 2-inch spiral should have been burned if ignition had occurred here. Third, the Rubatex, which had to be removed to uncover the failure site, would have been consumed if the fire had started there. Fourth, except for the still-present Rubatex, the closest combustible material, the plywood, is about 14 inches above the failure site. Consequently, without direct fire spread upward to the plywood at this location, an easy route for the fire to spread into the RPU foam does not appear to exist.

Because the concrete barrier and the plywood cover protected the heat tape from mechanical damage, it is probable that the tape failed at its end cap, which most likely occurred from salt water leakage into the end cap. The x-ray analysis of the end cap showed copper beads and broken wires, and the electrical tape wrapped at the end seal indicates that a repair was made to the heat tape or end seal. The use of electrical tape, according to the 1990 Raychem Corporation *Auto-Trace "R" Heat-Tracing Systems for Ordinary and Hazardous Division 2 Locations; Installation and Maintenance Guide*, is not an appropriate method of repair. From this evidence, an improper repair and/or installation of the end cap appears to have allowed sea water to enter the end cap, which led to the failure.

Furthermore, the tape seems to have failed while the end cap and a short length of the tape were under water. This supposition would explain the unburned end cap, unburned electrical tape, and short length of good electrical insulation with the semi-conducting heat matrix burned away. The experimental results of tape taken from the vessel and a new tape show that when the bus wires arc to the matrix, the matrix heats up and the system ignites. Water had accumulated on the aft port side of the vessel at various times. The chief steward testified that ice had to be chipped out after fish processing cleaning procedures and that he believed the water came down the elevator shaft. Thus, salt water most likely accumulated around the drain pipe and entered the end cap leading to an electrical failure. This evidence shows that the tape had failed some time earlier and, thus, was not the ignition source for this fire.

All evidence indicates that the fire originated in hold No.3. The RPU foam insulation in contact with the pipe insulation and heat tape on the 2-inch diameter vertical drain pipe allowed the fire to spread directly into the RPU foam. Thus, the Safety Board concludes that the ignition source for the fire was the failure of the heat tape on the 2-inch diameter vertical drain pipe in hold No.3 on the port side aft. In addition, had the RPU foam insulation in hold No.3 been physically separated from the heat tape failure by a noncombustible material, the fire may not have occurred. Therefore, the Safety Board believes that the AAS should inspect its fish processing vessels that use heat tape to ensure the heat tapes are physically separated from RPU foam and other organic combustible material insulations by a noncombustible material.

The master taking the prescription medication Zoloft did not appear to be a factor in this accident, but the Safety Board is concerned about the possible effects of medication on performance. As a result of its investigation into the collision of the towboat MAUVILLA with a railroad bridge,[2] the Safety Board recommended on September 30, 1994, that the employer of the operator of that vessel:

M-94-45

> Establish procedures that encourage towboat operators to inform management when they are taking medication, to determine whether such medication may affect performance of their duties, and to arrange for a qualified relief, if necessary.

This recommendation has been classified "Closed --Acceptable Action" because the towing company complied with the intent of the recommendation. According to the company, it:

> established a medical monitoring program to ensure fitness for duty of those operators who are on medication or who are returning to work following an illness or extended absence (60 days or more). In addition, the company encourages these personnel, at no cost to the employee, to participate in periodic, voluntary physical exams.

Such a medical monitoring program to ensure fitness for duty would enable the AAS to be aware of employees' medications, to determine whether such medications may affect performance, and to arrange for a qualified relief, if needed. Therefore, the Safety Board believes that the AAS should develop and institute procedures designed to require employees to inform management of any medication being taken that could potentially affect performance.

Therefore, the National Transportation Safety Board recommends that the All Alaskan Seafoods, Inc.:

> Provide written guidance on fire watch procedures and duties for its vessel masters and also for those employees who are assigned to fire watch duty. (Class II, Priority Action)(M-95-18)

> Provide members of the fire team aboard its fish processing vessels with formal marine firefighting training. (Class II, Priority Action)(M-95-19)

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[2]Railroad-Marine Accident Report--*Derailment of Amtrak Train No.2 on the CSXT Big Bayou Canot Bridge near Mobile, Alabama, on September 22, 1993* (NTSB/RAR-94/01).

Ensure its vessel crewmembers with responsibilities in emergencies are knowledgeable of the company safety manual contents, such as the use of lifelines, fire assessment, and fire team coordination, to enforce proper firefighting procedures. (Class II, Priority Action)(M-95-20)

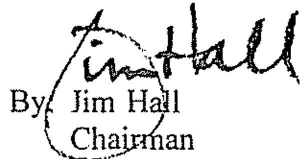
Inspect its fish processing vessels that use heat tape to ensure the heat tapes are physically separated from rigid polyurethane foam and other organic combustible material insulations by a noncombustible material. (Class II, Priority Action)(M-95-21)

Develop and institute procedures designed to require employees to inform management of any medication being taken that could potentially affect performance. (Class II, Priority Action)(M-95-22)

Also, the Safety Board issued Safety Recommendations M-95-13 through -17 to the U.S. Coast Guard, M-95-23 to the Commercial Fishing Industry Vessel Safety Advisory Committee, and M-95-24 and -25 to the National Fire Protection Association.

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations M-95-18 through -22 in your reply. If you need additional information, you may call (202) 382-6860.

Chairman HALL, Vice Chairman FRANCIS, and Member HAMMERSCHMIDT concurred in these recommendations.



By: Jim Hall
Chairman