

TREASURY DEPARTMENT
UNITED STATES COAST GUARD

ADDRESS REPLY TO:
COMMANDANT
U.S. COAST GUARD
HEADQUARTERS
WASHINGTON 25, D.C.



MVI-3
(MARY LEE a-2 Bd)
28 Dec 1962

Commandant's Action

on

Marine Board of Investigation; ruptured compressor manifolds aboard Barge MARY LEE while discharging ammonia cargo alongside pier at East St. Louis, Illinois, with attendant loss of life and personnel injury on 21 March 1962

1. The record of the Marine Board of Investigation convened to investigate subject casualty, including its Findings of Fact, Conclusions and Recommendations, has been reviewed.
2. The non-self-propelled cargo barge MARY LEE, while discharging cargo on 21 March 1962 at Phillips Petroleum Barge Dock, East St. Louis, Illinois, suffered material failure of the manifolds on the port and starboard compressors resulting in the discharge of liquid ammonia. As a result of this casualty one person lost his life and another suffered injuries. A third person sustained relatively minor injuries immediately following the casualty while endeavoring to render assistance.
3. At the time of this casualty the barge MARY LEE was moored in company with the cargo barge MARJORIE B alongside Phillips Petroleum Dock, East St. Louis, Illinois. Although both barges contained anhydrous ammonia, only the MARY LEE was discharging at this time. The towboat DOROTHY I. SOUTHERN was moored astern of the MARJORIE B and a shoreworker, assisted by the chief engineer of the M/V DOROTHY I. SOUTHERN, was aboard the MARJORIE B effecting electrical repairs. Discharging operations were being supervised by the port captain who, at about 4 p.m., approached the gaugeboard aboard the MARY LEE to check the progress of the discharge. Noting an excessive pressure reading the port captain reached to slow down the cargo pump, but then, hearing a pounding of the compressors, he immediately opened the main switches to the cargo pump and compressors. At this instant the compressor manifold, port and starboard, ruptured releasing liquid ammonia. The electrical shoreworker on board the MARJORIE B was observed to run toward the coupling spanned between the MARJORIE B and the MARY LEE. In proceeding he entered the path of the cargo escaping from the ruptured port compressor and, turning to the right, passed into the discharge from the ruptured starboard compressor. Engulfed by liquid ammonia, he thereafter toppled between the barges MARY LEE and MARJORIE B where he became suspended

by one leg. Although the chief engineer of the M/V DOROTHY I. SOUTHERN made a hasty exit from the immediate scene of the casualty, he was subsequently found to have suffered injuries necessitating treatment for external burns and inhalation of ammonia vapors. The master of the DOROTHY I. SOUTHERN, hearing the sound caused by the ruptured manifold, immediately donned a gas mask and proceeded to the scene where, upon dissipation of the attendant fumes, he observed the body of the shoreworker suspended between the two barges and was able to raise the body onto the deck of the MARY LEE where it was found to be coated with frost and frozen.


4. The compressors aboard the MARY LEE are designed primarily for the purpose of refrigerating the cargo. They are equipped with spring loaded heads so as to safely accommodate small quantities of liquid ammonia should it become inadvertently introduced into the compressor unit. They are also designed to be utilized in connection with the discharge of cargo. Investigation revealed that, on prior occasions, liquid ammonia had been detected in quantities requiring extensive draining operations of the condensers and compressors. On these prior occasions, the condition would be recognized by the pounding of the compressor at which time, in each instance, the compressor was secured and a small one-half to three-quarter inch hose line would be let over the side for drainage of the liquid cargo from the condenser and compressor unit. This operation would generally take approximately one hour to complete and indicates the quantity to be in excess of that which was intended to be accommodated by the spring loaded heads.

REMARKS

1. It is considered that this casualty resulted from an excessive amount of liquid ammonia being drawn into the port and starboard compressors of the barge MARY LEE through the suction side of the compressor thereby causing the compressor manifolds to rupture. The Board's conclusion that the equipment installation aboard the barge would not function satisfactorily is not fully concurred in. A manufacturer's representative stated that he did not believe the hot gas system of unloading would work. However, he did not state that any portion of the system, including the use of compressors to generate the hot gas for the unloading cycle, was not satisfactory, but rather that the quantity of gas introduced into the tank would not be sufficient to force the liquid from the cargo tanks to the receiver.


2. Consistent with the Board's recommendation for further study of the subject installation, alterations in the design and operation of the machinery and piping systems on barges of this type have been made. These alterations are directed toward minimizing the possibility of any recurrence of this type of casualty by upgrading the manifold material and by re-locating pertinent piping connections and the installation of an additional

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liquid trap so as to prevent liquid anhydrous ammonia from reaching the compressors. The possible need for additional regulations to cover acceptability requirements for special machinery such as compressors and cargo pumps is being considered. OK 

3. Concerning the Board's recommendation that personnel experienced in refrigeration operation be provided by operators of barges of this type, this problem is currently under study.

4. Subject to the foregoing remarks, the record of the Marine Board of Investigation is approved.


E. J. ROLAND
Admiral, U. S. Coast Guard
Commandant

UNITED STATES COAST GUARD



ADDRESS REPLY TO:

Officer in Charge
Marine Inspection
1520 Market Street
St. Louis 3, Missouri

A17-6/0749
21 May 1962

From: Marine Board of Investigation, St. Louis, Missouri
To: Commandant (MVI)
Via: (1) Officer in Charge, Marine Inspection, St. Louis, Missouri
(2) Commander, Second Coast Guard District (m)

Subj: Barge MARY LEE; compressors loaded with liquid ammonia and ruptured while discharging cargo at Phillips Petroleum Company Barge Dock, East St. Louis, Illinois, with loss of life to John Thomas FERNANDEZ due to freezing and probable suffocation, and personal injury to [REDACTED] on 3-21-62

- FINDINGS OF FACT -

1. The cargo barge MARY LEE suffered a casualty to the ammonia compressors located thereon, while discharging cargo at or about 4:00 p.m. on 21 March 1962, while tied up to and discharging cargo at Phillips Petroleum Barge Dock, East St. Louis, Illinois, (Mile 177 Upper Mississippi River). Both the port and starboard manifolds located on the Frick compressors of the barge MARY LEE ruptured allowing the liquid ammonia to be discharged on John Thomas Fernandez, which resulted in his death. Fernandez was on board, having been called from the St. Louis Shipbuilding Company to effect repairs to the barge MARJORIE B. The MARJORIE B and MARY LEE were moored together with the ammonia pumping equipment of the MARJORIE B located on its bow rake and the pumping equipment of the MARY LEE located on its stern rake. Fernandez, having heard the noise of the casualty to the MARY LEE, apparently ran directly into the stream of liquid ammonia from the port compressor of the MARY LEE then turned to his right and ran into the liquid ammonia being discharged from the starboard compressor of the MARY LEE. He fell onto the MARY LEE and then partially between the two barges, where he was located when the incident was over. [REDACTED] Chief Engineer of the M/V DOROTHY I. SOUTHERN, who was working with Fernandez, proceeded up a ladder and onto a catwalk over the tanks of the barge MARJORIE B and escaped with relatively minor injuries. The DOROTHY I. SOUTHERN was the towboat pushing the barges MARJORIE B and MARY LEE. It was located astern of the MARJORIE B.

2. The vessel involved was the cargo barge MARY LEE, Official Number 281652, an Anhydrous Ammonia barge. It is 1850 gross tons, 1850 net tons, 303 Feet long, and without propulsion. The home port of the MARY LEE is Wilmington, Delaware. It was constructed of steel in 1961 at Avondale Shipbuilding Company, New Orleans, Louisiana.

15. That Fernandez and [REDACTED] continued to work on the electrical installations on board the barge MARJORIE B.
16. That Stegbauer noted the discharge pressure gauge on the MARY LEE to be reading an excessive pressure amount.
17. That Stegbauer reached to slow the cargo pump.
18. That Stegbauer at this time heard the compressors pounding.
19. That Stegbauer shut down the cargo pump and the compressors from the switches on the panel.
20. That both the port and starboard manifolds on the compressors ruptured.
21. That Stegbauer climbed up on the catwalk on the barge MARY LEE and shut off the suction valve to stop the flow of ammonia.
22. That [REDACTED] on the barge MARJORIE B proceeded up a ladder to the catwalk on the MARJORIE B and ran aft.
23. That Fernandez on the barge MARJORIE B ran toward the coupling between the barges MARJORIE B and MARY LEE.
24. That Fernandez ran into the path of the ruptured port compressor on the MARY LEE.
25. That Fernandez turned to the right and ran into the discharge from the ruptured starboard compressor on board the MARY LEE.
26. That Fernandez fell, covered with liquid ammonia, at the extreme stern rake of the barge MARY LEE.
27. That Fernandez toppled between the barges MARY LEE and MARJORIE B and hung by his leg preventing his falling all the way into the water.
28. That the area at deck level was covered with ammonia vapors, making visibility impossible.
29. That the wind was blowing from the direction of Northwest at approximately 20 knots.
30. That the direction of the wind carried the ammonia vapors away from the port sides of both barges and quickly off the barges toward the dock area.
31. That Captain [REDACTED] on board the M/V DOROTHY I. SOUTHERN, having heard the pounding and ultimate rupture, went out on the bridge wing of the SOUTHERN and surveyed the scene.

3. (a) The shore-worker who was killed was John Thomas Fernandez, who held no Coast Guard license or document. Fernandez resided at [REDACTED]. He was serving as a repairman from the St. Louis Shipbuilding Co., at the time of the casualty.

(b) The crew member who was injured is [REDACTED]. He has a Tankerman's document No. [REDACTED]. Wilkenson was serving as Chief Engineer on board the towboat M/V DOROTHY I. SOUTHERN, which boat was the towing vessel of the barge MARY LEE and MARJORIE B, at the time of the casualty.

4. The weather at the time of the casualty was clear, good visibility, wind from the North at approximately 20 mph. The air temperature was 40°.

5. That the cargo barge MARY LEE, O.N. 284652, and the cargo barge MARJORIE B, O.N. 284653, loaded anhydrous ammonia at Lake Charles, Louisiana, on February 20-22, 1962.

6. That the M/V DOROTHY I. SOUTHERN towed the MARY LEE and MARJORIE B from Lake Charles, Louisiana, to its ultimate destination at East St. Louis, Illinois.

7. That on 21 March 1962, the MARY LEE and MARJORIE B arrived at Phillips Petroleum Dock, East St. Louis, Illinois, for the purpose of discharging cargo.

8. That on 21 March 1962, at or about 4:00 p.m., the cargo barge MARY LEE was discharging anhydrous ammonia at Phillips Petroleum Dock, East St. Louis, Illinois.

9. That the cargo barge MARJORIE B at approximately 4:00 p.m. on 21 March 1962 was not discharging cargo.

10. That John Thomas Fernandez from St. Louis Shipbuilding & Steel Co., St. Louis, Missouri, was on board the barge MARJORIE B.

11. That Fernandez was effecting repairs to electrical equipment on the BARGE MARJORIE B.

12. That [REDACTED], Port Captain, Caruthersville Towing Company, was on board the barges MARJORIE B and MARY LEE in charge of the discharge of the cargo.

13. That [REDACTED], Chief Engineer of the M/V DOROTHY I SOUTHERN, was on board the barge MARJORIE B assisting Fernandez.

14. That [REDACTED] walked from the MARJORIE B across the barge coupling and up to the gauge board on the MARY LEE to check the progress of the discharge.

32. That [REDACTED] noted the vapor cloud in the area of the coupling by the two barges.
33. That [REDACTED] immediately got a gas mask and proceeded up the MARJORIE B toward the scene of the incident.
34. That [REDACTED] met [REDACTED] when [REDACTED] was headed toward the SOUTHERN from the barge to start the main engine of the SOUTHERN.
35. That [REDACTED] proceeded into the area of the casualty.
36. That [REDACTED] noted [REDACTED] standing on the catwalk of the barge MARY LEE.
37. That as soon as the vapor ammonia cleared away, he was able to distinguish a body dangling between the two barges.
38. That [REDACTED] pulled the body back on to the deck of the MARY LEE.
39. That the body was covered with frost and frozen stiff and was not recognizable to [REDACTED]
40. That [REDACTED] and others procured a stretcher and blankets from the towboat DOROTHY I. SOUTHERN and placed the man on it.
41. That it was determined that the man was John Thomas Fernandez, an electrician from the St. Louis Shipyard.
42. That they placed the man into a boat from the SOUTHERN and transferred him to the beach.
43. That an ambulance had been called and said ambulance arrived shortly after the arrival of Fernandez on the bank.
44. That Fernandez was removed to St. Mary's Hospital, East St. Louis, Illinois at approximately 4:30 p.m. on 21 March 1962.
45. That Fernandez was pronounced Dead on Arrival at St. Mary's Hospital.
46. That [REDACTED] stated that upon his arrival at the coupling between the MARY LEE and MARJORIE B liquid ammonia was still erupting from the cracks in both the port and starboard manifold on the compressors of the barge MARY LEE.
47. That [REDACTED] noted a considerable amount of liquid ammonia on the decks of both barges in the rake area at the coupling.
48. That [REDACTED] was sent to the hospital with Fernandez and was admitted for treatment of possible burns and for inhalation of ammonia vapors.

49. That the compressors installed on the barges MARY LEE and MARJORIE B are Frick Compressors.
50. That these compressors are described as 10" x 11" Refrigerating Compressors by Frick Company plates located thereon.
51. That these compressors are equipped with spring loaded heads.
52. That they are designed in this manner in order to handle a "slug" of liquid ammonia, should this small quantity of liquid become introduced inadvertently into the compressor.
53. That the Frick compressors installed on the barges MARY LEE and MARJORIE B are built for the purpose of refrigerating the cargo.
54. That Phillips Petroleum Company and Avondale Shipbuilding Company effected the designs on the barges MARY LEE and MARJORIE B to utilize these compressors within the discharge of cargo operation.
55. That liquid ammonia in amounts considerably beyond that intended was introduced into the port and starboard compressors on the barge MARY LEE.
56. That liquid ammonia in amounts calling for extensive draining operations of the condensers and compressors has occurred on several occasions prior to this incident.
57. That the presence of liquid ammonia in the compressor system was detected by first noting the knocking or pounding of a particular compressor.
58. That on these occasions the compressor was shut down and a small one-half inch to three-quarter inch hose line was connected and led over the side.
59. That the drainage of liquid from the condenser and compressor was allowed to continue for periods of approximately one hour.
60. That this amount of liquid constitutes more than is described in Frick Company Bulletins relating to a "slug" of liquid being passed through the system with no bad results.
61. That the ruptures to the port and starboard compressors on board the barge MARY LEE was caused by excessive liquid ammonia in the system.
62. That the action of the compressor with this fluid in the system created very excessive pressures causing the rupture.
63. That a representative of Avondale Shipyard was advised by a representative of the Frick Company that the cargo pump-out system would not work satisfactory in his opinion.

- CONCLUSIONS -

1. That an excessive amount of liquid ammonia was drawn into the port and starboard compressors of the barge MARY LEE through the suction side of the compressor causing the compressor manifolds to rupture.
2. That there is evidence that the design of the suction side of the system was not such as to provide an adequate protection from an introduction of liquid ammonia into the compressors. From the testimony brought out in the proceedings, it was disclosed that on several occasions prior to the casualty amounts of liquid ammonia were drained out from the oil separator on the discharge side of the compressor evidencing previous introductions of liquid ammonia in the compressor system.
3. That due to the unfamiliarity of this complex installation, operating personnel were unaware of the possible dangers that could result from liquid ammonia being drawn into the compressors. This could account for the apparent unconcern of the crew over the periodic pounding of the compressors caused by liquid ammonia in the compressor system. That there is no evidence of willful violation of any law or regulation on the part of licensed or certified personnel which contributed to the casualty. All possible effort was made by these personnel at the time of the casualty to assist Fernandez, the deceased.
4. That the owners and builders of this equipment were advised by an experienced refrigeration representative that such installation would not function satisfactorily. No recommendation can be made for corrective action, because the barge is currently operating under temporary one-voyage certificate with Headquarters' approval of changes and is being closely checked by both owners, operators, and Coast Guard technical personnel to determine if the corrections are adequate.

- RECOMMENDATIONS -

It is recommended:

1. That further study of subject installation be conducted by the Commandant (MMT).
2. That personnel more experienced in refrigeration operation be provided by operators of such barges.

[REDACTED]

President of the Board

[REDACTED]

Member

[REDACTED]

Recorder