

A Routine Inspection of the Fixed CO₂ Fire Extinguishing System that led to the Death of Four Officers!

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Synopsis

On preparing the survey items on the fixed CO₂ fire extinguisher system for the Safety Equipment Certificate, a crewmember accidentally triggered the CO₂ starting cylinders of the system. Subsequently, 92 bottles of CO₂ were activated and the released CO₂ gas was trapped inside the CO₂ manifold.

Without well aware of the safety of the vessel had been jeopardized and its latent danger, crewmembers did not inform this incident to their flag State and Classification Society. Instead they only contacted their company and tried to release the trapped CO₂ gas in the manifold into the atmosphere outside the CO₂ room by a fabricated steel pipe connected to the down stream side of the Engine Room section valve. As a result, 4 officers viz. the Master, the Chief Officer, the Chief Engineer and Third Engineer were killed inside the CO₂ room in this incident.

The Incident

On 27 September 2004, the fixed CO₂ fire extinguishing system on board a Hong Kong registered ship was somehow activated with 5,060 kg of CO₂ gas trapped in its manifold. After receiving advice from the management company, an attempt was made by the ship's crew to release the trapped CO₂ to the atmosphere using a discharge pipe fabricated by the ship's crew. When CO₂ gas was suddenly released, the improvised discharge pipe bent and detached from the manifold resulting direct discharge of a large quantity of CO₂ gas into the CO₂ room. Four seamen including the Master, the Chief Engineer, the Chief Officer and the Third Engineer inside the CO₂ room were suffocated and died as a consequence. The incident happened when the Ship was 430 nautical miles east of Sri Lanka on a voyage from Singapore to Suez Canal.

The Investigation

The investigation revealed that earlier on the 23rd of September 2004, while the Ship was approaching Singapore, the Chief Engineer might have accidentally triggered the starting cylinders of the CO₂ system during an inspection of the fixed fire extinguishing system. As a result, CO₂ from 92 bottles of CO₂ gas was released and trapped under pressure inside the manifold. The Master reported the incident to the management company in Japan to seek advice without informing the flag State and the concerned Classification Society. Neither had the port authority been notified of the problem when the ship arrived Singapore in the next day.

The investigation identified that the cause of the incident was due to releasing of the trapped CO₂ gas to the atmosphere in an unsafe, ill-planned and uncontrolled manner.

Observations

- The vessel was about 1 year old.
- The vessel was manned by Filipino crewmembers with a Korean Master and a Korean Chief Engineer.
- Both the Chief Engineer and the Second Engineer signed on the vessel on 19 September and 20 September 2004 respectively, which was less than a week before the incident occurred.
- Shortly before the incident, an Annual Safety Equipment survey had been carried out by a surveyor from Classification Society on 14 September 2004 with outstanding recommendations to request the master to carry out an annual servicing and maintenance of the fixed fire extinguishing system, semi-portable and portable fire extinguishers.
- 92 bottles of CO₂ were activated and the CO₂ gas was trapped inside the CO₂ manifold while the Chief Engineer was carried out a routine inspection on the fixed CO₂ fire extinguishing system.
- The Master did not immediately inform the flag Administration and the Classification Society of the Ship after the accidental release of 92 bottles

of CO₂ cylinders.

- The Master immediately reported the inadvertent release of CO₂ that was being trapped inside the manifold to the company's Designed Person in Japan on 23 September 2004 without informing the flag State and the concerned Classification Society. The Master could not obtain immediate advice from the Company, as it was a public holiday in Japan.
- The Company after seeking assistance from the manufacturer in Japan for method to close the cylinder valves on 24 September 2004, instructed the Master and the Chief Engineer by satellite telephone in Japanese language of the possibility of fabricating a tool that could clamp on the CO₂ valve for closing.
- The Chief Engineer reported to the Company that the attempt to close the CO₂ valves by means of a home-made clamping devices was not successful.
- The Company further sought assistance from the manufacturer with suggestion to release the trapped CO₂ into the atmosphere.
- The Company gave a verbal instruction without detailed written instructions or diagrams relating to the fabrication of the discharge pipe and procedures required to release CO₂ safely into the atmosphere to the Master on 25 September 2004.
- The Company believed that the Master could understand the verbal instructions and passed it to the capable hand of the Chief Engineer.
- The Chief Engineer then ordered the Second Engineer to cut off the lower portion of the CO₂ releasing pipe at the floor level after the engine room section valve. The cutting was carried out before the vessel approached the pilot station of Singapore without realizing the fire protection of the Ship had been jeopardized.
- The Master did not inform the Port Authority of Singapore about the accidental release of 92 bottles of CO₂ and the cutting off the piping from the fixed CO₂ fire extinguishing system when the Ship berthed for cargo

operation on 24 September 2004

- After departure from Singapore on 25 September 2004, the Company instructed the Master by satellite telephone to make preparation for the atmospheric release of CO₂ gas.
- The Chief Engineer then fabricated a 100A discharge pipe with one end connected to the flange of the selection valve for engine room while the free end of the pipe locating outside the CO₂ room without any securing arrangement.
- At around 0900 hrs on 27 September 2004, the Master and the Chief Engineer gathered the Chief Officer and the Third Engineer inside the CO₂ room for opening the engine room selection valve to release the carbon dioxide from the 92 bottles of activated CO₂ cylinders to the atmosphere.
- All four senior officers inside the CO₂ room were killed after the release of the trapped CO₂ in the manifold to the atmosphere.
- The four deceased were sent to shore at Sri Lanka for postmortem examination on 28 September 2004. It was reported that the probable cause of death of the senior officers was suffocation due to inhalation of irrespirable gases.
- The Company reported to the flag State two days after the fatal accident on 29 September 2004.

Conclusions

Based on the evidence available, the following causes are considered to have contributed to the accident.

Direct Cause

The direct cause of the accident was that the release of carbon dioxide gas trapped in the manifold of a fixed fire extinguishing system into the atmosphere was not carried out in a safe, well-planned and controlled manner.

Contributory Causes

- The Chief Engineer showed that he lacked the knowledge to prepare the CO₂ fixed fire extinguishing system for inspection and maintenance; and might have tampered with the system resulted in accidental release of 92 CO₂ cylinders.
- All accidentally activated CO₂ cylinders could not be manually closed because the control gas for activation of 92 bottles of CO₂ cylinders was continuously supplied from the carbon dioxide gas trapped in the manifold.
- The Company and the crew on board the Ship did not have any previous experience in handling similar situations. They did not appreciate the seriousness of the incident so that the relevant authorities would have been informed and shore assistance sought. Consultation for proper correctives action was found insufficient.
- The Company and the crewmembers were lack of safety awareness. No effective risk assessment had been carried out by the Company and the crewmembers on board before the release of trapped CO₂ gas in the manifold to the atmosphere.
- The lack of written instructions and guidance from the Company as to how, and under what precautions and conditions, CO₂ gas could be released.
- Since the Master and the Chief Engineer are both Korean who understood Japanese, all given instructions, both written and verbal from the Company were in Japanese and direct to the Master. The other crewmembers that were Filipino, were not aware of the hazardous situation they were facing.
- The Company failed to inform the flag Administration and the Singapore port Authority immediately after the accidental release of 92 bottles of CO₂ cylinders. Had they done so, external assistance to the Ship might have been obtained when the Ship arrived in Singapore.

Lessons Learnt

The lessons learnt from the incident are as follows:

- a) Ships' officers should be reminded of the importance of proper handling of the fixed fire extinguishing system. Sufficient and clear instructions and warning should be provided to avoid improper handling of the system and the danger of accidental release of CO₂.
- b) A large amount of CO₂ gas trapped in the fixed fire extinguishing system manifold is a very serious incident. To release the gas to the atmosphere while the vessel is on passage is also a very risky and unsafe operation. Furthermore the engine room and cargo holds would not be under the protection of a fixed fire extinguishing installation once the CO₂ gas has been released. Under no circumstances should such release of CO₂ gas be carried out when the ship is at sea.
- c) It is the responsibility of the management company or the Master to report to the flag State without delay when such a serious incident has occurred. Neither the management company nor the Master of the vessel reported the incident to the flag Administration or the port authority in this case. Furthermore, no attempt had been made to seek any shore assistance when the Ship was in Singapore.