



Hazard Identification and Risk Assessment of X-press Pearl Marine Disaster

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Abstract: This review paper discusses the devastating impact of the X-Press Pearl incident, which is considered the worst maritime disaster in Sri Lanka's history, on the country's coastal environment, local communities, and economy. To mitigate the impacts of shipping on the marine environment, the paper proposes a hazard identification and risk analysis system. The system aims to identify potential hazards associated with shipping and assess the risks they pose to the marine environment. By adopting a proactive approach, this system could help minimize the potential negative impacts of shipping on the marine environment, protecting both local communities and the economy.

Index Terms: Xpress Pearl, Environmental Effect, Risk Analysis

1. INTRODUCTION

X-Press Pearl was a Singapore-registered Super Eco 2700-class container ship which was entered service in February 2021 and was around 186 meters (610 ft) long [1]. It was operated by X-Press Feeders. X-Press Pearl was built by Zhoushan Changhong International Shipyard Co. Ltd at Zhoushan, China for Singapore-based X-Press Feeders, along with its sister ship X-Press Mekong. The 37,000-deadweight tons container vessel could carry 2,743 twenty-foot equivalent units. The ship was launched on 28 September 2020 and delivered on 10 February 2021 [2].

X-Press Pearl carried 1,486 containers of those, 81 were classified as dangerous goods,[4] with contents including 25 tons of nitric acid (which can be used in the manufacture of fertilizers and explosives), other chemicals, cosmetics, and low-density polyethylene (LDPE) pellets, several tonnes of potentially toxic epoxy resin, plastics, oil and metals such as lead and copper [3]. When it departed the port of Hazira on 15 May 2021, arriving off Colombo on 19 May. Fig .1 shows the X-Press Pearl Incident.



Fig. 1. X-Press Pearl Incident

2. THE INCIDENTS

The Marine Environment Protection Authority (MEPA), Sri Lanka Armed Forces, technical government departments, local authorities, and Indian coastguards controlled the incident. Fig 2 shows the how “boundary cooling” technique was applied, and a dry chemical powder was dropped from the air. After the fire was under control, the ship was towed nearly 1NM west of coastline sank completely at a depth of 21m on the seabed and Fig 3 shows the Sunken x press pearl near the Sri Lankan coastal bed. Coastline cleanup, and pellet recovery was done by Sri Lanka Armed Forces with collaboration of UN [4].



Fig. 2. Boundary cooling by coast guards



Fig. 3. Sunken x press pearl

Conclusion from the Incident

The Sri Lankan government and responsible institutions were not ready to manage a disaster like this. The incident was unable to control with minimum environmental damage because of the following reasons. Insufficient resources, lack of proper equipment and technologies, no policies or agreements with foreign countries, response delay, illiterate governing bodies, no proper disaster plan, and risk analyzing system, not having protocols in place to seek necessary support from better equipped marine powers, etc. So it is crucial to implement a hazard identification and risk assessment system to prevent similar situations in the future [5].

3. THE ENVIRONMENTAL EFFECTS OF THE EXPRESS PEARL INCIDENT

When considering about the express pearl incident, this can be considered as the most environmental effected incident that happened in Sri Lanka in recent history. As mentioned before this incident caused such a huge effect especially in the coastal environment of the Sri Lanka. Not only the coastal environment, but there are also so many environmental effects that caused due to this incident [6, 7].

A detailed examination into the environmental harm brought on by the incident was carried out by the Sri Lankan government as well as other organizations, notably the United Nations Environment Programme (UNEP). To quantify the amount of the pollution and the ecosystem's harm, the evaluation comprised surveys of the affected areas, including the shoreline and the marine environment [8].

The results of the environmental evaluation showed that both the local communities and the marine ecosystem suffered serious harm because of the occurrence. The Sri Lankan government declared an emergency and put steps in place to control the pollution and lessen its effects on the environment and nearby residents. To aid in the response activities and make sure that the incident's environmental effects were properly addressed, the UNEP also offered technical help.

Some such incidents are,

Marine pollution: The ship was carrying a large amount of hazardous cargo, including nitric acid and plastic pellets, which were released into the sea because of the fire and sinking. The pollution caused by the plastic pellets is particularly concerning, as they are easily ingested by marine life and can cause severe harm.

Destruction of marine habitats: The incident caused significant damage to the local coral reefs and other marine habitats. Coral reefs are critical ecosystems that support a vast array of marine life, and their destruction can have far-reaching environmental consequences.

Impact on fisheries: The pollution caused by the incident has had a significant impact on local fisheries, which are a critical source of income for many communities in the region. The contamination of the water and the destruction of marine habitats have made it difficult for fish populations to recover, which could have long-term consequences for the region's economy and food security.

Threats to wildlife: The pollution caused by the incident has also posed a significant threat to local wildlife, including sea turtles, dolphins, and whales. The ingestion of plastic pellets and other pollutants can cause severe harm and even death in many species [8, 9].

Overall, the environmental effects of the X-Press Pearl incident are significant and far-reaching, and it will likely take years for the ecosystem to recover fully. The incident highlights the importance of proper regulation and oversight of the shipping industry and the need to prioritize environmental protection in all aspects of human activity. As well as always there should be hazard identification and mitigation process. If not these types of incidents can be happened in the near future as well.

4. RISK ANALYSIS

The risk analysis assessment for the X-Press Pearl incident shows that the chemical and oil spill poses a significant risk to public health, marine ecosystems, and the economy of Sri Lanka. Immediate action is needed to contain and clean up the spill, as well as mitigate the impact on affected communities and ecosystems. The risk assessment also highlights the importance of preventive measures and proper risk management practices in the shipping industry to minimize the risk of similar incidents in the future [10].

The risk assessment should focus on the X-Press Pearl incident and its potential impact on the environment, economy, and public health and safety. The risk assessment will use a scale of the probability of occurrence ranging from rare to certain and a scale of severity of occurrence ranging from insignificant to catastrophic. The stakeholders involved in the risk assessment include the Sri Lankan government, local communities, environmental organizations, the shipping industry, and international organizations.

- Identification of hazards

Identifying and assessing these hazards is crucial for developing appropriate control measures to minimize. Their risks and prevent similar incidents from happening in the future [11].

- The main hazard is the chemical and oil spill resulting from the X-Press Pearl incident.
- Other hazards include the release of plastic debris, toxic gases, and heavy metals.
- The incident may also cause damage to marine ecosystems, the fishing industry, tourism, and public health.
- Elimination of hazards

After identifying the hazards associated with the X-Press Pearl incident in Sri Lanka, the next step is to eliminate or control the hazards as much as possible.

- The preferred means of control is to eliminate the hazard, but it is not feasible in this case.
- The acceptable risk level will be determined by analyzing and evaluating the risks.
- Analysis of risks of the remaining hazards

The risks will be prioritized based on their potential impact and likelihood of occurrence [12].

The risk analysis should include:

- A description of the hazard or hazardous situation: Chemical and oil spill from X-Press Pearl
- Interaction methods: Spreading of the spill through ocean currents and weather conditions.
- Frequency and conditions of exposure to the hazard: Continuous exposure until containment and cleanup measures are completed.
- Severity of potential exposure: Health risks to humans and marine life, economic and environmental impact
- Duration of exposure to the hazard: Unknown, depends on the effectiveness and speed of cleanup measures.
- Environment in which the work is conducted: Coastal and marine environment, potentially affected areas include beaches, coral reefs, and fishing grounds.
- Education and training workers have received: The expertise and resources of local and international organizations involved in the response effort.
- The method in which a reasonable person would react in a particular situation: Immediate action to contain and clean up the spill, as well as mitigate the impact on affected communities and ecosystems.
- Evaluation of risks of the remaining hazards
- The risks will be evaluated based on their likelihood of occurrence and severity of impact using the probability and severity scales mentioned in the context section.
- The risk evaluation will consider the available risk controls and treatment options, including avoidance, reduction, transfer, and acceptance.
- The stakeholders involved in the risk assessment will make decisions based on the evaluation results and the risk criteria established in the context section.

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