

Sea Ditch: New barrier for sea life

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Abstract

This research paper is made by two cadets who were curious of problems residing in the shipping industry. With the increasing environmental concerns, we narrowed down our research to aquatic life and resources. With the demand of petroleum needs and the increase in tanker vessels, the danger of oil spill goes on increasing. Millions of tonnes of oil are spilled in aquatic environment every decade. This paper shows how aquatic environment reacts to the oil pollution, and the need of preventing it. Through a review of various case studies and analyses, the findings reveal the need of due importance to the topic. We propose our innovative idea with simple mechanism which could potentially reduce the oil spill from tanker as well as dry fleet vessels. We hope the innovation offer viable solutions for the IMO's sustainable goals directing to no. 14 "Life below water".

Keywords: Oil spill, aquatic life, innovation, IMO's sustainable goals

Introduction

The oil has its own journey of discovery, new ideas, struggles, and change. What started as a basic resource in ancient times is the backbone of modern energy consumption today. Let us go back in the 600 B.C. when oil was first discovered by the Chinese and was transported through bamboo pipelines, which was not much effective. Later on a Russian Major Alekseev drilled a 69-foot well in the Bibi-Heybat Baku, Azerbaijan using cable-tool drilling (an ancient technique that involved repeatedly slamming a chisel-like tool into the rock). This is even considered as the world's first successful drilled oil well. The official date of the discovery of the Bibi-Heybat field is 1871, about 7 billion barrels of oil was produced in Azerbaijan. In 1859 oil was again found in Titusville,

Pennsylvania when Colonel Edwin Drake drilled an well of almost 69.5 foot. The discovery was met with great excitement and thousands of people rushed to the area in search of oil. With the increase need of oil, was further being transported in oil barrel on cargo ships. The first cargo ship to transport oil in bulk was THE CHARLES, which left the United States in 1869 carrying 7,000 barrels of crude oil to Europe. As the demand of oil increased, the world's first oil tanker ZOROASTER was released by Ludvig and Robert Nobel in 1878. Which sailed through the seas of England and India. The ship was built with iron tanks to hold oil. The Zoroaster oil tanker established the method of carrying liquid cargo by ship. The ship's design allowed for the cargo to expand and contract due to temperature changes. In 1873, the first oil-tank steamer, Vaderland (Fatherland), was built for Belgian owners. Due to insufficient technologies, it was very difficult to prevent any type of collision or oil leakage on any early oil tanker. This is where ships with double hull, expansion trunk and vertical ladder called as modern oil tankers were introduced. But still the oil spill in the sea due to manifold leakage or bunkering has not been effectively sorted today, this is where our innovative idea of "SEA DITCH" takes places which will prevent the direct exposure of oil into the sea.

Case studies

The ship MARIPOSA, in October 2004 regularly loading oil near the port of Hong Kong. During bunkering operations, an overflow in fueling system resulted in an oil spill and the fuel was discharged into the water. Approximately 2,800 gallons (about 11,000 liters) of oil was spilled. The spill caused significant concern over the potential for damage to marine life and port's delicate ecosystem.

Relating incident took place when the PRESTIGE oil tanker sank off the coast of Spain in 2002, During a storm, it burst a tank on 13 November, and French, Spanish, and Portuguese governments refused to allow the ship to dock causing almost 60,000 tonnes or a volume of 67,000 m³ of heavy fuel oil to spill. The oil spill polluted 2300 kilometers of coastline and more than one thousand beaches on the Spanish, French and Portuguese coast, as well as causing great harm to the locals using fishing as their means of work. The spill is considered as the largest environmental disaster in the history of both Spain and Portugal. The amount of oil spilled was more than the Exxon Valdez incident.

From the previous studies it is observed that oil spills from ships have significant and harmful effects on aquatic life and resources. Here's how they impact the environment:

Direct Exposure of oil is toxic to many marine species. When oil settles on the water's surface, it can affect fish, marine mammals and birds. Toxic chemicals in the oil can damage the respiratory, digestive, and reproductive systems of aquatic organisms.

Bioaccumulation plays crucial role as toxic substances from oil can accumulate in the food chain, leading to harmful effects on predators like larger fish and marine mammals that consume contaminated organisms.

Oil not only affect the aquatic life but also can coat beaches, wetlands, and large rivers, destroying vegetation and disrupting habitats critical for breeding and feeding. This damages the biodiversity in these areas and affects species that rely on them for survival. Oil also disturbs the reproduction cycle of aquatic life as oil can coat the eggs of fish and other marine organisms, preventing them from hatching, or it can poison developing larvae, significantly impacting future generations of aquatic species.

Oil exposure also harms the reproductive systems of marine mammals, causing long-term impacts on their populations.

Oil spills can lead to the economic losses such as closure of fisheries, impacting livelihoods and food resources for coastal communities that rely on fishing. The long-term contamination of fishing grounds can take years to recover. Sometimes Contaminants from oil can end up in seafood, making it unsafe for human consumption and further harming the economy and public health.

Oil spills also degrade the quality of water, affecting the overall health of aquatic ecosystems. Pollutants from oil can continue Ecosystems affected by oil spills can take years or even decades to recover fully. Some

species may never recover, leading to irreversible damage and hence results in slow recovery.

Here we come with an absolute easy, simple and effective innovation of "SEADITCH".

A barrier for marine life and resources, last defence against oil pollution. The system is simple and quite effective in nature.

Construction

A narrow ditch is laid out in the edge of the continuous main deck around areas having cargo manifold, air vents of tanks and other pipe fittings available on deck. The ditch should have covering mechanism in order to maintain watertight integrity of a vessel. The ditch should remain close only while encountering rough weather or while raining. The ditch is connected to slop tanks or dedicated tanks near the pump room via pipeline having non-return valve. This ensures no oil should go back to the ditch.

Advantage:

1. Easy to retrofit in existing vessels.
2. Less maintenance required.
3. No complex mechanism involved.

Disadvantage:

1. There has to be a good closing mechanism to maintain watertight integrity.
2. Prevents from oil pollution that can happen only due to mishap at deck level. This system cannot prevent oil spill that occur below deck level.

Research Methodology

1. This research is done collectively with information being gathered by various sources.
2. We approached Faculties who are from this industry, as well as people who are actively working in the industry.
3. We also referred to articles published by Classification societies, P&I clubs, circulars for authenticity.
4. The system shown is purely the idea of the Cadets and their imagination on how the system will work onboard a vessel.
5. The system may have drawbacks and limitations including the reliance on self reported data. Future research will include more diverse data and if possible through experimental designs.

Conclusion

In conclusion, preventing oil spills is crucial for protecting marine ecosystems, wildlife, and coastal communities. The research highlights the importance of implementing safety measures and adopting SEA DITCH technology can contribute to minimize the risks of direct exposure of oil spill into the sea. While progress has been made, continued innovation and a proactive, preventive approach remain essential to safeguarding our oceans for future generations.

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