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Oil Spills- A Threat to the Ocean Life by Humans

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ABSTRACT: It is assumed that money can pay for everything also the damages caused by humans to nature. But in reality, nature damages are permanent and cannot be compensated resulting in permanent destruction of environment. Oil spills are one of the most disastrous types of sea pollution caused mainly due to humans. Oil spills mainly occurring during transportation have a harmful effect on the marine life. This is the main type of marine pollution disturbing the nature's cycle by affecting the aquatic flora and fauna. Oil spills are just as costly and can contaminate the oceans for thousands of years to come. Dead zones, enormous areas of oxygen deficient water where life ceases to exist, high levels of CO₂ in the environment as well as spent CO₂ being stored and pumped into the oceans are some of the alarming effects. The damage we humans have brought to the oceans show how irresponsible our actions have been and act as a wakeup call on a global level. If we the humans do not curtail our ways towards life style as taken to begin to respect the oceans and its importance for environment they will be changed irreparably and thus change the overall environment as they contribute major role in various natural cycles. This paper deals with causes, effects and remedial measure for oil spills.

KEYWORDS: Sea Pollution, Oil Spills, Environment, Harmful, Humans.

I. INTRODUCTION

An oil spill is the release of a liquid petroleum hydrocarbon into the environment, especially coastal areas, due to human activities and is a form of sea pollution affecting the environment negatively. Some of the common reasons for release of oil into the sea or coastal waters are due to release of crude oil from tankers, offshore installations, drilling rigs and wells, heavier fuels used by large ships etc...

This oil spills; penetrate into the bodies of aquatic animals and birds causing harmful effects on them which eventually lead to death.

Oil spills have disastrous consequences for society, economically, environmentally as well as socially.

One of the most hazardous oil spills occurring in India, is the Mumbai Oil Spill occurred in the Arabian Sea. It happened due to collision of two ships M V Khalija and MSC Chitra. At the time of incidence, MSC Chitra was carrying 2662 tonnes of fuel oil, 284 tonnes of diesel oil and 88 tonnes of lubricant oil. The accident resulted in oil spill and falling of cargos in sea from MSC Chitra. The collision has led to large quantities of oil spilling in the sea. The oil spill has caused considerable damage to the Marine Ecosystem and to 110 Km shoreline of four districts, Mumbai City, Mumbai Suburban, Thane & Raigad. It has washed to the shore, damaging shoreline, beaches & Mangroves. The effects caused by this spill were very serious. This contaminated water reached Elephanta caves. Several fishes died, fishermen were asked not to go in the water and people were appealed not to eat the fishes during that time. This accident of the huge ship carrying tons of oil gave a threat of changed fish habitat, alteration of the land topography nearby and spilling of poison in the sea, the impact of which may last for decades.

The Energy and Resources Institute (TERI) developed oil zappers which were used over one kilometre area of the beach to treat the contaminated soil.

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II. CAUSES OF OIL SPILLS

- 1) Oil wastes that enter the ocean comes from many sources, some being accidental spills or leaks and some being the results of careless habits in the use of oil and oil products by humans.
- 2) Most waste oils in the ocean consists of oily storm water drainage from cities and farms
- 3) Untreated waste disposal from factories and industrial facilities such as oil industry, food and beverages industries etc...
- 4) Due to various stages of well drilling and repair operations. These stages can occur while oil is being produced from offshore wells, handled and temporarily stored; or when oil is being transported off shore, either by flow line, underwater pipeline or tanker.
- 5) Disposal of offshore production waste can also pollute the ocean, as can deck runoff water, leaking storage tanks, flow line and pipeline leaks, and the wells themselves. Oil spilled from ships and tankers includes the transportation fuel used by the vessels themselves or their cargos, such as crude oil, fuel oil, or heating oil.

III. EFFECTS OF OIL SPILLS

It is estimated that approximately 706 million gallons of waste oil enter the ocean every year, with over half coming from land drainage and waste disposal. Offshore drilling and production operations and spills or leaks from ships or tankers typically 8 percent of the total. The remaining comes from routine maintenance of ships nearly 20 %.

Oil that contains VOC partially evaporates and a small quantity of oil dissolves in the water. The oil residue also can disperse almost invisibly in the water or form a thick mousse with the water. Part of the oil may sink with suspended particulate matter, and the remaining eventually congeals into sticky tar balls. Over time, oil wastes deteriorate and disintegrate by means of photolysis and biodegradation. The rate of biodegradation depends on the availability of nutrients, oxygen and microorganisms as well as temperature.

1) Effects on Aquatic animals and Plants:

When oil is spilled in the ocean, it initially spreads on the water; primarily on the surface, depending on its relative density and composition. This oil forms a thick layer on the surface of the water, thus arresting the sunlight to reach into the sea water in turn preventing the oxygen to reach the animals and plants below the sea. Due to insufficient oxygen these aquatic plants and animals cannot survive and eventually die.

In general oil spills can affect animals and plants in two ways, from the oil itself and clean-up operations. Oil penetrates into the structure of the plumage of the birds and the fur of mammals, reducing its insulating ability, and making them more vulnerable to temperature fluctuations and much less buoyant in the water. Animals that rely on scent to find their babies or mothers cannot due to the strong scent of the oil. This causes a baby to be rejected and abandoned, leaving the babies to starve and eventually die. Oil can impair a bird's ability to fly, preventing it from foraging or escaping from predators. As they preen, birds may ingest the oil coating their feathers, irritating the digestive tract, altering liver function, and causing kidney damage. Due to their diminished foraging capacity, this can rapidly result in dehydration and metabolic imbalance. Some birds exposed to petroleum also experience changes in their hormonal balance, including changes in their luteinizing protein. The majority of birds affected by oil spills die from complications without human intervention.

Heavily furred marine mammals exposed to oil spills are affected in similar ways. Oil coats the fur of sea otters and seals, reducing its insulating effect, and leading to fluctuations in body temperature. Oil can blind an animal, leaving it defenceless.

If oil remains on a beach for a while, other creatures, such as snails, clams, and terrestrial animals may suffer

2) Effects on Tourism: Tourism is a key sector in most populated coastal areas of the world that can be disrupted by the presence of oil in the water or on the shore. This may also cause disruption of traditional coastal activities such as bathing, boating and diving which in turn have an effect on hotels, restaurants and bar owners, as well as sailing schools, campsites and many other businesses and individuals who gain their livelihood from tourism. Thus it will in short affect the economy.

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3) Effects on Fisheries and Mariculture: Fishing and Mariculture are the important industries which can be affected seriously by oil spills in various ways. Commercially exploited plants and animals may be harmed due to oil spill. Sea-food may become contaminated or may become tainted, acquiring objectionable oil derived taste. Fishing gear and cultivation equipments may get oiled, leading to the risk of the catches or stock becoming contaminated or activities being halted until gear is cleaned or replaced. In addition to the losses of individual operators, the interruption of subsistence, recreational and commercial fishing and the disruption of sea-food cultivation cycles can also have important economic consequences. Consumers may become reluctant to purchase products from an affected region and the loss of market confidence can result in economic loss even if there is no actual contamination of the produce.

4) Effect on Economy: The second major effect of the oil spill is seen on the economy. When precious crude oil or refined petroleum is lost, it affects the amount of petroleum and gas available for use. This means more barrels have to be imported from other countries. Then comes the process of cleaning the oil spill, which requires a lot of capital. Although the company responsible for the oil spills and their effects has to clean it up, there is a lot of government help required at this point.

The workers that are brought on board to clean up the spill face tremendous health problems later in life as well as spilled oil can harm mainly because of its poisonous chemical constituents. This can affect both from internal exposure to oil through ingestion or inhalation and from external exposure through eye and skin irritation

Their medical treatment has to be paid for and becomes the responsibility of the government. Putting all the methods of recovery into place and monitoring them takes away resources from other more important work and hits the economy in subtle but powerful ways.

IV. REMEDIAL MEASURES

Cleanup and recovery from an oil spill is difficult and depends upon many factors, including the type of oil spilled, the temperature of the water and the type of shorelines and beaches involved.

Methods for cleaning up include:

- 1) Adding biological agents to the oil spill/ Biodegradation
- 2) Use of Dispersants
- 3) Use of Skimmers
- 4) Use of Booms
- 5) Let the oil break naturally

1) Adding biological agents to the oil spill/ Biodegradation: Oil that has washed up along a shoreline can be broken down through Biodegradation. Biodegradation occurs when bacteria and other microorganisms break down the oil into harmless substances, such as fatty acids and carbon dioxide. This process can be faster by externally adding fertilizing nutrients like nitrogen and phosphorous during the cleanup procedure.

2) Dispersants can be used to dissipate oil slicks. A dispersant is added to improve the separation of particles and to prevent settling or clumping. They rapidly disperse large amounts of certain types of oil from the sea surface by transferring it into the water column. They break up the oil slick and form water soluble micelles that are rapidly diluted. This method is suitable not in all locations. Dispersants should not be used when it can affect marine organisms, as the chemicals and broken-down oil can be absorbed by marine life including sub-tidal seafood that can enter into the food chain.

3) Use of Skimmers: Skimming includes use of skimmers may be Weir type, Oleophilic type or Non-oleophilic type to separate the water from oil. These skimmers suck or pump out the oil from the surface into the containment tanks on the shore or any other nearby storage vessel.

4) Use of Booms: Booms are floating barriers designed to contain oily water and to prevent it from spreading over the water surface and increase its thickness to facilitate recovery. After containing the oil in a suitable area, skimmers can then be used to scoop out the oil from the water.

5) Let the oil break down naturally: If there is no possibility that the oil will pollute coastal regions or marine life, the oil could be left to disperse naturally. The sun, wind, currents and waves can disperse and evaporate most oils, though light oils can disperse quicker than heavy oils

6) Setting fire to the oil spills: Crude oil is set on fire when an accident occurs. The problem with this method is the less thickness of the oil layer and large surface layer

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- 7) By naturally available materials: Plants like *Corchorus Depressus*, when used in powdered form can act as a sinking material for removal of the oil from seawater by absorbing oil and settling to the bottom. Bentonite clay acts as a sinking material when added to oil polluted sea water. Activated Carbon causes the oil to form a gel or coagulate, but due to its chemical composition it may have negative impact on the marine life.
- 8) The floating oil shall be cleaned with the help of gunny bags and collected in one big drum, and stored for inspection to be carried out by insurance agent.
- 9) The rocks and other fixed natural banks of the coastal areas shall be washed with hot water jet pumps and the spilled oil to be cleaned with the help of gunny bags or mopping / absorbing material.
- 10) The material which has reached to the coast due to tidal currents shall be physically collected and stored in drums

V. PREVENTIVE MEASURES OF OIL SPILLS

- 1) Ship crews must be well trained.
- 2) Strict safety regulations should be applied on the ships.
- 3) Proper inspection of the ships and vessels should be done before letting them into the sea.
- 4) Tanks inside the ships should be of limited size so that even if the accident occurs, spill will be small.
- 5) Care should be taken for controlling traffic in the sea to avoid collision
- 6) Computers based video display that allows the navigators to track the ship course in relation to the hazards and warns the navigator. Also this will help to take immediate action if any accident occurs.
- 7) Water coming from the industries, cities that contain oil should be treated before letting it off into the sea.
- 8) Off shore installations should be avoided. If necessary, then proper barricading should be done to prevent the wide spread of the oil.
- 9) Illegal dumping the oily products on the sea shore should be avoided.
- 10) Use of oily sunscreens used by the swimmers and divers should be avoided as far as possible as they also contribute oily matter to the ocean.

EQUIPMENTS USED FOR OIL SPILL CLEANING:

Booms: Large floating barriers that round up oil; and lift the oil off the water

Skimmers: Skim the oil

Chemical and Biological agents: Helps to break down the oil

Vacuums: Remove oil from beaches and water surface

VI. CONCLUSION

Discussing oil spills bring into picture lot many problems created by humans. Water pollution caused by oil spills is one of the hazardous types of pollution affecting the marine life and in turn affecting the human life which in turn disturbs the balance of the environment. Due to increasing technology and negligence toward nature, oil is allowed to seep in the ocean, thus having long term and permanent damages to the nature.

Knowing the intensified problem of oil spills, it is clear that we each need to get involved in contributing to the solution. It will require a high degree of participation and collaboration at the individual, family, community, industry, and government levels.

Thus greater precautions need to be taken to block the discharges into the sea. These procedures will help to save costs on clean up procedures and would stand in the way of environmental disruptions, thus helping to preserve the flora and fauna of the oceans.

REFERENCES

- 1) https://en.wikipedia.org/wiki/Oil_spill
- 2) <http://www.itopf.com/>
- 3) <http://www.livescience.com>
- 4) Effects of Oil Spills, EF Conserve Energy Future.



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(An ISO 3297: 2007 Certified Organization)

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- 5) Ocean Science Series, Pollution in the Ocean, the National Academics.
- 6) Office of response and restoration, US Department of Commerce, National Oceanic and Atmospheric administration.
- 7) New Aquarium, England, Protecting the Blue Planet.
- 8) Pollution in the Ocean- The Aquarium of the Pacific- Ocean on the Edge: Top Ocean Issues, May 2009
- 9) Keeping World Environment Safer and Cleaner-Marine Pollution- By Partha Das Sharma
- 10) Scott Post, "Oil Spill Clean Up Project" International Mechanical Engineering Congress & Exposition IMECE2011 November 11-17, 2011, Denver, Colorado, USA.