

IMPACT OF OIL SPILLAGE ON WATER BODIES & METHODS OF RECLAMATION

Mukesh Singh¹, Hans Pal²

¹M.Tech. Student, Environmental Engineering, Institute of Engineering and Technology, Lucknow, Uttar Pradesh, India

²Assistant Professor, Civil Engineering Department, Institute of Engineering and Technology, Lucknow, Uttar Pradesh, India

Abstract - An oil spillages may be due to releases of crude oil from tankers, offshore platforms, drilling rigs and wells, as well as spills of refined petroleum products (such as petro, diesel) and their by products, heavier fuels used by large ship such as bunker fuel, or the spill of any oily refuse or waste oil spill. Because of tanker accidents, vessels collisions, industrial and urban discharges, or offshore exploration and production, oil spills has become a major issue in the protection of the marine environment over the past decades. Oil spillages are the release of a liquid petroleum hydrocarbon in to the environment, especially the marine ecosystem, due to human activity, and in a form of pollution.

Key Words: Oil spillage, tanker, vessel, oil-water separation, skimmer.

1. INTRODUCTION

Oil remains the most important power supply, transportation of oil and its derivatives with the aid of using tankers or submarine oil pipelines, which increases the possibility of oil spillage with inside water both with the aid of using leakage from submarine oil pipeline or accidents with the tankers. The impact of pollutants studies on floor water and soil are mostly related to an effect from the industrial operation or some other supply of pollutants. Oil spill typically evokes images of crude oil pouring out of an oil tanker in the sea due to an accident, but it can be used to refer to any type of oil release. Ocean oil spills are among the most commonly depicted and catastrophic forms, al even though they can also occur on land. Accidents frequently cause spills as oil is released from a container or pipeline due to damage or mechanical failure. There also are oil spills that arise because of dumping, often on land, which then runs off into water; natural seepage of oil can also be damaging to the environment.



Source: <https://www.hakaimagazine.com>

Fig-1: vessel carrying oil sinking in ocean.

Table 1.1 Recent cases of oil spillage

SR. NO.	YEAR	EVENT
1.	February 2021 (SAN FRANCISCO, BAY AREA)	1.9 tones' oil spilled by the owner Chevron Corporation. They do have a containment boom and they are working to contain that to minimize the spread of the sheen and the petroleum product."
2.	JULY, 2020, (MAURITUS)	4000 tonnes oil leaks from stranded vessel owned by Wakashio suisan company limited. Wakashio ran aground on a coral reef on 25 July, but did not immediately begin leaking oil.
3.	JANUARY 2017 (CHENNAI ENNORE PORT)	251 tonnes oil spill at Ennore port, Chennai by the ship owner Darya Shipping Solutions.
4.	2014 (SUDARBANS, BANGLADESH.	350K liters oil spill in Bay of Bengal. Carrying 350,000 liters of furnace oil, was in collision with a cargo vessel and sank in the river.
5.	APRIL 2010 (GULF OF MEXICO)	About 4.9 million barrels, (1 barrel= 119.24 liters) were spill in the ocean. Oil drilling rig deep-water horizon, operating in the Macondo Prospect in the Gulf of Mexico.

1.2 SOURCES

Oil spills may be because of human error, natural disasters, technical failures or deliberate releases. It is anticipated that 30-50% of all oil spills are at once or not directly because of human error, with about 20-40% of oil spills being attributed to system failure or malfunction.

1.2.1 Oil tankers and vessels

Vessels can be the source of oil spills either through operational releases of oil or in the case of oil tanker accidents. Operational discharges from vessels are estimated to account for 21% of oil releases from vessels. Accidental oil tank vessel spills account for approximately 8-13% of all oil spilled into the oceans. The main causes of oil tank vessel spills are collision (29%), grounding (22%), mishandling (14%) and sinking (12%), among others. Oil tanker spills are considered a major ecological threat due to the large amount of oil spilled per accident and the fact that major sea traffic routes are close to large marine ecosystems.

1.2.2 Offshore oil platforms

Accidental spills from oil systems in recent times account for about 3% of oil spills inside the oceans. Prominent offshore oil platform spills commonly came about because of a blowout. They can cross on for months till alleviation wells were drilled, ensuing in large quantities of oil leaked. Notable examples of such oil spills are deep-water horizon.

1.2.3 Pipelines

Pipelines as reassets of oil spills are envisioned to make contributions 1% of oil pollutants to the oceans. Reasons for this are underreporting, and plenty of oil pipeline leaks arise on land with best fractions of that oil accomplishing the oceans. Overall, however, there was a great growth of pipeline oil spills with inside the beyond four decades.

1.3 IMPACTS ON OIL SPILLAGE

1.3.1 Impact on environment

Spilled oil can have an effect on animals and plant life in ways, dust from the oil and from the reaction or cleanup process. There is no any clean dating among the quantity of oil with inside the aquatic surroundings and the probably effect on biodiversity. Oil floats at the floor of salt and sparkling water. In addition to the capability bodily loss to humans, animals, and the ecosystem, oil spills can also additionally reason damage to each bodily belongings and business.

1.3.2 Impact on public health

Human fitness affects can be direct or indirect – and they will be instant or long-term. In a few cases, the occasions surrounding the spill itself contain lack of lifestyles or accidents to the ones operating on a deliver or rig. Similarly, injuries can take place all through containment and cleanup sports – ensuing in extra accidents or deaths. Employees and volunteers concerned in cleanup sports can also go through contamination, injury, or loss of life from respiratory

infected air, and the general public may want to conceivably increase contamination due to infected food.

1.3.2 Impact on marine life

Oil penetrates into the shape of the plumage of birds and the fur of mammals, lowering its insulating cap potential, and making them greater susceptible to temperature fluctuations and lots much less buoyant within side the water. Oil can impair a bird's cap potential to fly, stopping it from foraging or escaping from predators. As they preen, birds may also ingest the oil coating their feathers, demanding the digestive tract, changing liver function, and inflicting kidney harm maximum marine organisms uncovered to grease from herbal seeps have tailored to those releases over the years to the factor wherein they could metabolize the substance. Even spills due to human sports may also have broadly differing impacts.

1.3.3 Impact on economy

The quantity to which monetary affects could be felt via way of means of the fisheries quarter following an oil spill will depend upon various of things such as: the traits of the spilled oil, the instances of the incident and the form of fishing pastime or commercial enterprise affected Contamination could have an monetary effect on tourism and marine aid extraction industries.

2. METHODS OF RECLAMATION

2.1 Burning in-situ

In this method, the oil floating on the surface is ignited to burn it off. This in-situ burning of oil can efficaciously get rid of up to 98% of an oil spill, which is more than most of the other methods. The spilled oil is contained using a fireproof boom and the oil is set to fire in a controlled manner. Though oil is removed quickly from the surface of water, the toxic smoke coming out from the fire causes harmful air pollution.



Source:<https://response.restoration.noaa.gov>

Fig-2: In-situ burning method of reclaiming ocean

2.2 Manual cleanup

This technique is the maximum simple one wherein the oil which washed up ashore is eliminated via way of means of guide labor. Workers are positioned to paintings on cleaning the shore the use of shovels and rake frequently the use of the assist of bulldozers and tractors. The use of equipment in extra can result in destruction of biodiversity within side the shores. Also, this method does not save you the oil from spreading into the shore.

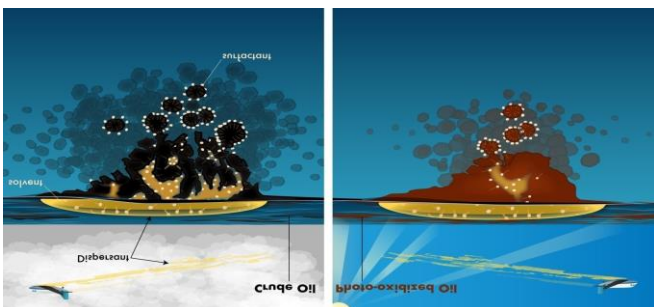


Source: <https://www.hakaimagazine.com>

Fig-3: Manual cleanup method for reclaiming ocean

2.3 Using dispersants

When the spilled oil can't be contained via way of means of the use of booms, the best choice left is to boost up the disintegration of oil. Dispersal agents, inclusive of Corexit 9500, are chemical compounds which can be sprayed upon the spill with the assist of plane and boats, which resource the herbal breakdown of oil components. They permit the oil to chemically bond with water via way of means of growing the floor place of every molecule. This guarantees that the slick does now no longer tour over the floor of the water, and is less difficult to degrade via way of means of microbes.



Source: <https://response.restoration.noaa.gov>

Fig-4: Cleaning of ocean using dispersants

2.4 Skimmers

Once the oil has been restrained through the usage of oil booms, skimmers or oil scoops may be deployed onto boats to take away the contaminants from the water floor. Skimmers are machines mainly designed to suck up the oil from the water floor like a vacuum cleaner. They are used to bodily separate the oil from the water in order that it may be gathered and processed for re-use. Skimmers may be used to efficiently get better maximum of the spilt oil, so it's far economically viable. The presence of particles poses a main roadblock to this technique, as skimmers can get clogged easily.



Source: <https://response.restoration.noaa.gov>

Fig-5: Cleaning of spilled oil using skimmers

3. CONCLUSION

The oil spillage is causing a lot of environmental, public health and socio-economic problems as evident in the present day, use of chemical dispersants can be an effective spill responses and control method, especially to minimize environmental damage. And the oil-water mixture recovered by skimmer can be inhaled into separator smoothly and obtain an upward base velocity in the flow field, so the oil droplets could obtain larger diameter and float upward with higher speed. Most oil spills and most serious accidents are caused human error, so this can be reduces if one take extreme precautions and proper safety assessment, and also environmentally oil spills are polluting the land and water, they are also destroying animals health and food webs.

REFERENCES

- [1] Nwilo, S.F., Okpala, K.A. and Nwoke H.A. Impact of Spill on the Ecosystem. UNN Publishing, Nsukka. (2007).
- [2] Talley, W. K., Jin, D., & Kite-Powell, H. Vessel accident oil-spillage: post US OPA-90. Transportation Research Part D: Transport and Environment, (2001), 6(6), 405-415.
- [3] Frank A. Richards, Oil Skimmer Inventor, 11 Martha Drive, Bowmansville, NY, 14026, 1972.
- [4] Kaylor et al., Oil Skimmer," K. Elissa, "Title of paper if known," unpublished). 1993, Appl.No:38,641.

- [5] M. Patel, Design and efficiency of various belt type oil skimmers, Int. J. Sci. Res. 2319–7036.
- [6] Atle B.Nordvik, “Time window-of-opportunity strategies for oil spill planning and response”, Pure Appl. Chem., 1999, vol.71 (1), 5-16.
- [7] Anderson, E.L., Howlett E., Kolluru, V., Reed, N., Spaulding. The Worldwide Oil Spill Model (WOSM): An Overview. Ontario Environment.Chicago University Press, 1993.
- [8] Cohen MA (1986) the costs and benefits of oil spill prevention and enforcement. Journal of Environmental Economics and Management, 1986, 13: 167–188.
- [9] GowthamRajagopal, RahulNath.R, Savin Viswanathan, Satheesh Babu P.K “Determination of Efficient Recovery Methods Based on Nature of Spilled Oil” pp1
- [10] NOAA, (2010): NOAA’s Oil Spill Response, Using Boom in Response; National Oceanic and Atmospheric Administration, US Department of Commerce; May 18, 2010.

BIOGRAPHIES



Mukesh Singh is a student of Master of Technology, Environmental Engineering, Dept. of Civil Engineering, Institute of Engineering and Technology, Lucknow, Uttar Pradesh.



Er. Hans Pal is working as Assistant Professor, Dept., of Civil Engineering in Institute of Engineering and Technology, Lucknow, Uttar Pradesh.