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# Recovery technology of oil spill in Vietnam to reduce the marine pollution

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**Abstract:** Current oil spills are a potential threat to coastal states. In many waters of many countries with sea, the phenomenon of "black tide" is very common. There are many causes of this situation such as collision, accident of water transport means (especially oil tankers), oil rig incident, oil spill incident due to geological changes, on the sea. Spill over the sea, affecting the fish habitat, reducing fish stocks, killing animals such as seabirds, seals or otters. Also rare species such as sea turtles, sea pigs are also threatened. There are many reasons for the oil spills on the sea, first of all the oil tanker accident or deliberate accidental discharge of oil, oil pipeline leaks, Exploitation of torn oil bags caused by seismic seizures, or because factories consume large amounts of oil and then discharges into the sea without oil treatment.

**Keywords:** oil spill, recovery technology, marine protection, ocean environment.

## 1. Introduction

Recently, in the sea area at the port No. 1, Dung Quat port, Dung Quat economic zone, in the Binh Thuan commune (Binh Son), rafts of 43,000 tons Racer Expresss while anchoring Exporting wood, while pumping oil from the vaults in the ship, caused a breakdown of the pump hose, resulting in 1,000 liters of oil spilled into the sea. Immediately after the accident, the Oil Spill Response Team of Quang Ngai Petroleum Services Joint Stock Company (PTSC) collaborated with the Border Guard, Dung Quat Economic Police and Binh Thuan authorities, , Control and handle oil spills, prevent oil spill. It took more than a day to force the new functions to finish processing. After collecting oil spill, the rescue team used detergent soaps to clean the entire Dung Quat port area. Outflows of FO oil have been collected and treated in a process that does not pollute the marine environment. Before that, the oil tankers Jian Mao 9 (China) on the way from Malaysia to China sank 72 nautical miles from Ly Son Island. On board, 80 tons of FO oil, 20 tons of DO oil, 200 liters of LO oil, causing the oil spill incident in the Central Vietnam. Two years ago, while pumping oil from the EAGLE MILWAUKEE (Singaporean nationality) tonnage of 85,000 tons carrying 52,500 tons of oil for Dung Quat oil refinery, Wharf (SPM) of the factory in Viet Thanh Bay. Due to excessive waves, the joints of the pipeline connecting the vessel to the SPM caused oil spill incident to the waters of Viet Thanh Bay, Binh Tri Commune, Binh Son District. Dung Quat Oil Refinery Project Management Unit together with the main contractor of Technip and other functional branches of the province have to concentrate their efforts on oil spill response, isolation, spill oil spills into the sea, multiple oil spill.

In recent times, as the volume of inland waterway transport is increasing and inland waterway transport is becoming increasingly important, accounting for a high proportion of the shipping industry, the number of waterway accidents as well as incidents Large, serious oil spills are also increasingly becoming a painful problem. The phenomenon of leaking or spilling oil on the river greatly affects the water ecosystem, the life of people living on both sides of the river.

Oil spill incidents often leave very serious consequences, which can pollute the environment, affecting the ecological environment, aquatic resources, water resources, and land resources in a relatively large area, causing damage to the environment. Economic activities, especially activities related to the exploitation and use of aquatic resources.

Normally, ships arriving at the port to unload cargo ashore will clean the vessel to prepare for the new shipment. This work often generates a lot of waste in the form of sludge. Depending on the load and technical state of the vessel, the amount of sludge generated more or less. In particular, a number of Vietnamese river ships due to old equipment, backward risk of causing oil pollution also occurs in larger proportion. River boats also often cause local pollution by rinsing toilets where they dump right there.

On 23/6/2010, barge Huynh Nhi 01, registration number BL-0304, load 250 tons suddenly sank across the area under Ton Duc Thang bridge (Bac Lieu 2 bridge) in ward 1, town Bac Lieu, Bac Lieu province when the barge on trying to "pass dry" on the river Bac Lieu - Ca Mau to the loading docks, the obstacles in the riverbed should sink. Oil reservoirs on the barges have spilled into the water, polluting the local aquaculture water supply.

On 27/4/2010, from the mouth of the river to the sea, to anchor position A12 (in the sea of Sao Mai, Ward 5, Vung Tau City, more than 1 km from the mainland), the ship Bien Dong 50, Changsha Sea Cargo Oil has suddenly sunk in the Vung Tau Sea. In the incident, the Bien Dong 50 carried more than 370 tonnes of DO and more than a dozen empty tanks. Immediately after sinking, the oil has spread out to the sea surface and floating off the surface. After only a few hours, the oil was spread across the sea in long strides. Around the location of the sinking ship with the smell of oil rising.


Figure 1. An accident of ocean ship resulting in oil spill

The above are just two of the latest examples of oil spills among the major oil spills that occur in our country. According to statistics from the HCM City Department of Natural Resources and Environment, an average of one year on the Saigon River occurred more than one oil spill caused by collision or leakage. Especially, along the Saigon River there are many units operating in the oil and gas industry, potential oil spill causing environmental pollution.

Meanwhile, the Saigon River along the Dong Nai River system is the source of clean water for the localities of Ho Chi Minh City, Dong Nai and Tay Ninh. Cat Lai Oil Refinery, Cat Lai Petroleum Factory (District 2, Ho Chi Minh City), Petechim - Nha Be petroleum factory, Hiep Phuoc Petrochemical Product Trading Company Limited Nha Be) is on the list of potential oil spills. In addition, Ganh Rai Bay (an area bordered by Ho Chi Minh City and Ba Ria - Vung Tau Province) is also on the list, as there are more than 40 gasoline transport barges on the river every day. Moving at high risk. The danger is that these old barges are old lack of safety support devices in circulation

Currently, the costs of overcoming oil spill incidents are huge and depend on the level of oil spills, spills, and offshore or offshore areas. According to environmental experts, oil spills often cause serious environmental consequences, especially in estuarine waters, bays and coastal waters. Residents and businesses live and have coastal and marine development activities such as fishing, aquaculture, tourism, agriculture ... They often have a direct impact on the economy and life, health Of the people of the same area.

## 2. The effect of oil spill on the environment

Depending on the environmental and weather conditions in each area and time, the impact of oil on the environment is different. The areas that need to be protected first are water sources for daily use and production, aquaculture, coastal rice fields, salt fields, mangroves, wetlands, seagrass beds, coral reefs, The beaches are located in tourist resorts, residential areas and historical sites.

Oil spills occur, often causing serious environmental consequences, especially in rivers, estuaries, bays and coastal waters. As the oil floats on the water, it reduces light when entering the water, limiting the photosynthesis of marine plants and phytoplankton. This reduces the number of individuals in the fauna and affects the food chain in the ecosystem. Light hydrocarbon components in the oil, sulfur, nitrogen, light, temperature and evaporation will pollute the air source. Heavy metals, sulfur and other components will settle down and accumulate under the seafloor, which will pollute bottom aquatic species, such as coral and other species.

Birds and marine mammals that get oiled are also affected. Oil covers the coat of the otter and seals, reducing metabolism and reducing body heat. When eating oil, animals will dehydrate and reduce their ability to digest.

In crude oil, besides the main constituent of hydrocarbons, it contains too many un-desorbed components such as sulfur, nitrogen and other heavy metals. The marine ecosystem consists of many microorganisms and organic matter that help maintain and create those microorganisms. Shrimp and live fish are also the source of this. When oil spills, these sources of microorganisms die off, leading to their food chain being affected.

## 3. Some recovery technology of oil spill

### 3.1. Physical methods.

According to experts on the marine environment, the main cause of the oil spill incident occurred, Vietnam has a lack of equipment and weak processing capacity, so handling the radical is very difficult because of the equipment she Establish and recover oil spills in the sea as many countries in the world often use the high cost of our country cannot invest. Like many countries in the world, our country often applies measures to overcome oil spills are: mechanics, biology and chemistry. For mechanical measures, carry out gathering, place the oil in a certain position to avoid spreading oil on a large scale. Use oil buoys to encroach the oil spill area, limit pollution and collect waste. After the oil is crimped, use the oil scraper machine to store it. The advantage of this measure is to prevent, control and quickly collect oil spills in the field.

When an oil spill occurs, measures must be taken to minimize the adverse effects on the environment. Revive the oil on the water by boom and set aside. Skimmers, oil recovery on the shore with oiled material handling equipment or use of oil impregnated materials. .

Collection measures:

- Reduce pollution and mobilize means, environmental workers and people in the area to collect.
-Use the boat, or canoe to pull the oil bag to collect the large oil traces. Clean the contaminated area by spraying or spraying water (either by hand or by means such as a helicopter ...).
- Oil spills over the beaches.

Figure 2. Rope skimmer for recovering the crude oil

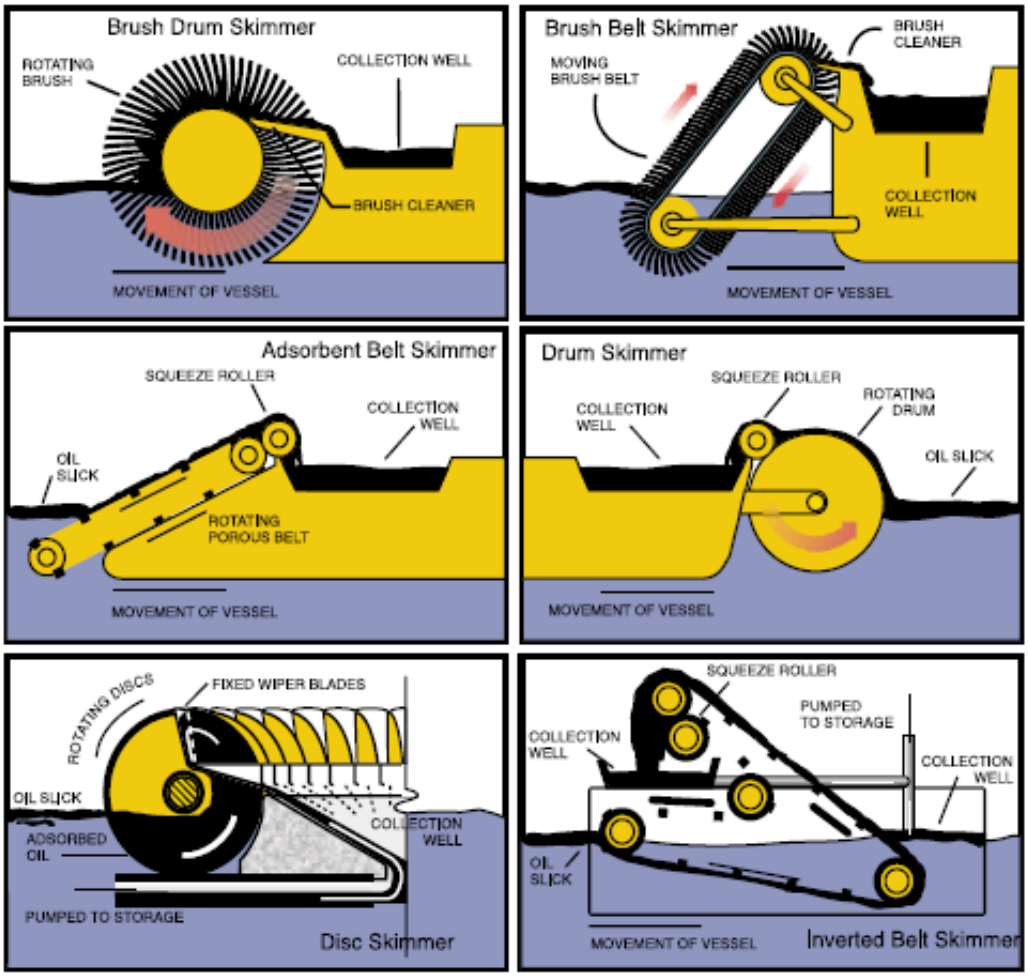

Figure 3. Oleophilic skimmers – a physical method


Figure 4. Oil-situ burning method

### 3.2. Chemical methods

Dispersal of oil at sea by chemical agents (dispersants, surfactants, coagulants ...), burned in place or transferred to another location for treatment. Use of chemicals that precipitate or neutralize oil spills, often made by means of vehicles such as helicopters and on a large scale.

Figure 5. Using dispersant for chemical method

**3.3. Biodegradable method**

Use of microbial products triggers the growth and development of some microbial species that break down oil, the hydrocarbon source of the oil will be used as the sole carbon source, or the hydrocarbon decomposition products of microorganisms. Is a substrate for growth of other microorganisms. Biological methods are the most effective and environmentally-safe method for treating spilled oil, and are used next immediately after rapid rescue measures. During the growth and development of some microbial species, the hydrocarbon source of the oil can be used as a single carbon source, or the hydrocarbon decomposition products of this microorganism are the substrate for growth. For other microorganisms. Hydrocarbons are oxidized, broken and their final products are simple substances: organic acids, CO2, water and microbial biomass that do not pollute the environment. Once the hydrocarbon source has been consumed, the microbial biomass decomposes itself by the biochemical pathway and the amount of microorganisms is returned as in the original condition.

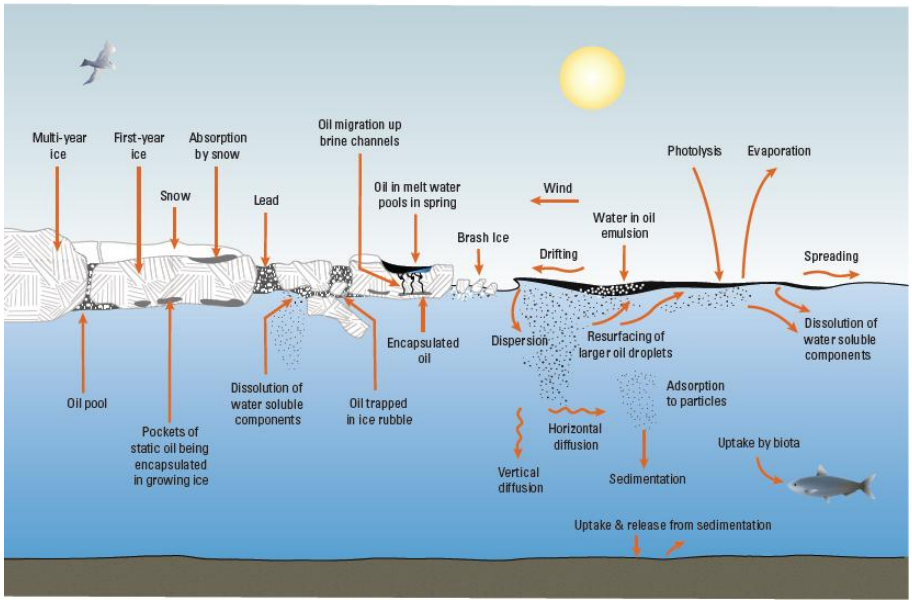


Figure 6. Using biodegradable method with bacteria

Biological methods are the use of oil-based microorganisms such as bacteria, mold, yeast ... However, when the oil spill accident occurs, mechanical measures are considered a prerequisite for the response. Oil spill

incident in the rivers and seaports. In addition, in order to meet the oil spill incident on a professional and synchronous basis, it is necessary to deploy multi-purpose shipbuilding to deal with oil spill incident at sea.

Recently, the Vietnam Sea and Islands Administration has perfected the oil-sensitive Sensitive Mapping System, along with a program to simulate oil spills in the South and South West coasts. According to the Marine and Coastal Resources Management & Surveillance Department under the General Administration of the Sea & Islands, 70% of the annual number of ships that run through Vietnam waters are oil tankers. Therefore, the issue of liability and reimbursement cannot be achieved due to a lack of legal basis, as well as a technical documentation system to monitor and track down the cause and cause of the oil spill.

Map systems and simulation programs will assist in monitoring, finding the culprit and troubleshooting, and contribute to overcoming the situation. Accordingly, with scenarios simulating oil spills given in wind conditions, seasonal flow fields, combined with environmental forecasting data, the NCEP Predictive Monitoring Center (US) regularly monitors Wind, air, humidity around the globe, meteorological field providing 6 hours and automatic data processing. Then, using a United States weather forecast model that interpolates the wind at sea, calculates the movement, variation and diffusion of ocean waves that will determine the oil spill affected area as well. Trace the culprit to cause oil spills.

With this scenario, it is possible to identify the most sensitive area for timely response. Along with this technical system, the Institute of Marine and Coastal Management of Vietnam continues to study the process of using dispersants for Vietnamese waters, a type of chemical sprayed into the oil spill will scatter Oil seeds, reduce oil content and reduce the oil's toxicity to the ecological environment.

There are two common biological methods:

- Biostimulation: is a supplement to bio-products (micro-waste water) containing essential nutrients: nitrogen (NH4NO3), phosphorus (K2HPO4, KH2PO4), minerals ... For the native microorganism, it is capable of decomposing oil. Microorganisms need proper sources of carbon, nitrogen and phosphorus to grow and grow. In addition to nutrients, biologically active surfactants are added to increase the contact area between the oil and the microorganism, enabling them to access nutrients more quickly. The most widely used microbial activator today is economics: low investment cost and environmentally friendly.

- Unlike microbial treatment of microbial contamination, bioaugmentation method is to supplement bio-preparations containing microorganisms that break down oil into contaminated environment. . This method is quite complex, the cost of processing is high due to the production of organisms that break down oil at laboratory scale and it is unlikely that they will compete with the available strains in the environment. That school to grow and develop.

## 4. Conclusion

In order to improve the effectiveness of the tasks of coping with oil spills, it is necessary to develop a plan for the implementation of oil spill incident response tasks in each period. Develop and implement the coordination mechanism between the Ministry of Natural Resources and Environment and the National Committee for Search and Rescue for the implementation of oil spill response tasks. The general solution to the above problem is that the law enforcement agency should force the polluter first to fully implement measures to overcome pollution and restore the environment. In cases where they fail to take such measures, the State management bodies in charge of environmental protection shall determine the damage so that the polluters must pay compensations strictly according to the provisions of law.

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