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THE PROBLEM OF OIL SPILL AND ITS LIQUIDATION BY USING OF ABSORBENTS

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Oil and petroleum products occupy one of the first places in the degree of pollution.]. As oil spill, it floats on water and prevents sunlight to pass through it. The shiny substance that you see sometimes on top layer of water is nothing but oil which makes it difficult for plants and sea animals to survive. Cleaning up of oil spill is no easy task. Various factors need to be considered before carrying out operations. Some of them being amount of oil spilled, temperature of water, type of beaches and many more.The environmental disasters related to oil spills and petroleum product leading to contamination of soil, water bodies. This article is devoted to the problem of oil spill and solving through the use of biomass for absorption in emergencies, tested the possibility of using fallen leaves the possibility as biomas.

Keywords: environmental safety, environmental protection, contamination, petroleum products, absorbent, biomass.

Нафта і нафтопродукти займають одне з перших місць за ступенем забруднення навколишнього середовища. Для сучасної цивілізації стали закономірними екологічні катастрофи, пов'язані з виливами нафти та нафтопродуктів, що призводять до забруднення ґрунтів, водних об'єктів. Більшість аварійних виливів нафти викликають сильні і незворотні пошкодження природних біоценозів для рослин і морських тварин. Очищення розливів нафти не є легким завданням. Різні чинники повинні бути розглянуті для очищення водного середовища. Екологічні катастрофи, пов'язані з розливами нафти і нафтопродуктів ведуть до забруднення водойм. Статтю присвячено проблемі розливу нафти і рішеннб за рахунок використання біомаси для поглинання в надзвичайних ситуаціях, а також виявлення можливості використовувати опале листя як біомасу.

Ключові слова: екологічна безпека, захист навколишнього середовища, забруднення, нафтопродукти, абсорбент, біомаса.

Introduction

In the last decade the idea of the interaction of healthy environment and sustainable economic development are growing up. At the same time in the world occurred major political, social and economic change, as the many countries began programs of radical structural reorganization its economy. Thus, the study of the environmental impact of general economic activities has become a hot issue that is of great importance and requires a speedy solution.

Oil spills may occur and there are virtually everywhere. For small spills little attention quickly removed them or they decompose naturally. Large spills attract public attention and usually require urgent action by government organizations. It is impossible to predict serious oil spills, but if they occur the ecologists and administrative bodies should be responsible.

Analysis of recent researches and publications

Analysis of research and publications showed that on the subject was invented several types of environmental clean-up of oil pollution. All methods are combined using a substance or material that has the ability to enter into reaction with petroleum products and absorb them.

All these materials were rather complicated process recycling for further use for the given goals.

Problem statement

Appearance about 35 % of petroleum hydrocarbons in marine waters in the early 70's was caused by spills and discharges during transportation of oil by sea. Spills during transportation and unloading are less than 35 % of total oil and discharges to soil and water in a clean environment. These late 70's show that this figure rose to 45 % in marine areas. In urban areas, oil spills and emissions can be 10 % or less. For comparison, most oil spills in coastal or mainland is in transit [1].

An oil spill happens when liquid petroleum is released into the environment by vehicle, vessel or pipeline. It happens on a large scale and is mostly seen in water bodies. It happens due to human negligence and is a major form of pollution. There are many sources of the spill. Crude oil can be released by tankers on land. In water bodies, the spill occurs due to drilling rigs, offshore oil platforms and well.

Oil spills and their effects can also be experienced with refined petroleum or even waste oil from large scale industries [2].

Today the number of accidents increases and the consequences of such cases increases, this problem cannot be ignored, especially if we understand that it is global. The main goal is eliminate pollution in emergency situations.

The solution of given problem. Oil provides external effects on birds, eating, contamination of eggs in the nests and habitat change. External oil pollution destroys the feathers, the feathers will burst, causing eye irritation. The death is the result of cold water, birds drown. Oil spills from medium to large usually cause the death of 5,000 birds. Birds that spend most of his life on the water, the most vulnerable to oil spills on the surface of water.

Birds swallow oil when cleaning beak feathers, drink, drink contaminated food and breathe fumes. Ingestion of oil rarely causes immediate death of birds, but leads to extinction from starvation, disease, predators. Eggs, birds are very sensitive to the effects of oil. Contaminated eggs and feathers of birds dirty oil shell. A small number of certain types of oil may be sufficient to death during incubation.

Oil spills in habitats can provide a quick impact on birds. Evaporation of oil, lack of food and cleaning measures could have affected the use of the site. Heavily contaminated oil raw plots tides ebb-muddy lowlands can change biogenesis for many years.

Always evaluated the direct or indirect effects of oil spills on bird populations. Recovery depends on the ability of species to reproduce survivors and features of the migration of the crash.

Some spreading and dispersion algorithms require knowledge of an oil's surface tension. Surface tension is the force of attraction between the surface molecules of a liquid. Chemicals which reduce surface tension can be used to facilitate dispersion. Laboratory data exist for the interfacial surface tension between oil and water and oil and air [16].

Spilled oil spreads quickly and its movement will be determined by the tides and current as well as wind speed and direction. Oil will move at the same speed as the water carrying it and about 3 % of wind speed. Crude oils are complex and variable mixtures of hydrocarbons of different molecular weight and structure. Crude oil may contain as many as 300 different compounds.

There is a great deal of difference in crude oils depending on where in the world they come from. A crude oil database has been compiled from oil companies around the world showing the different physical and chemical properties of their products. This information helps the response team know what they are dealing during a response. The different mixtures affect how the oil behaves on water and can determine the way in which it can be cleaned up.

When oils are spilled, they are subject to weathering and the prevailing environmental conditions. This will affect how long they remain a problem. Some oils will evaporate or disperse naturally within hours while others will persist in the environment for much longer. Until the oil is dispersed, it will move according to the wind, wave, tide and currents.

Some of the lighter grades of fuels (such as diesel) have vapors that are toxic and are also potentially flammable. Petrol, kerosene and diesel will spread quickly over the surface of the water and usually evaporate quickly.

Heavier fuels, most likely to be encountered at Marsden Port area, will not evaporate so easily. These types of oils will have to be treated with dispersants or collected in booms and skimmed into containers. Sometimes choppy water and whip an oil spill into what looks like a frothy chocolate mousse which is very difficult to dispose of because it floats so easily and forms large massesMethods of the emergency spills of oil and oil products are to use sorbents and is recognized internationally practice [3].

Today in the world for oil spill and petroleum products used about two hundred different sorbents. Their classification are shown in Fig. 1.

Table 1

Types of oil commonly transported and the likely time to disperse naturally

Oil types	Time to dissipate naturally
Petrol	A few hours to 1 day
Aviation gasoline	A few hours to 1 day
Jet fuel/kerosene	Up to 1 day
Light marine diesel	1–2 days
Light fuel oil	1–4 days
Medium fuel oil	1–7 days
Heavy fuel oil	1–2 weeks
Bitumen and crude oils	Months but will probably sink out of sight if not cleaned up

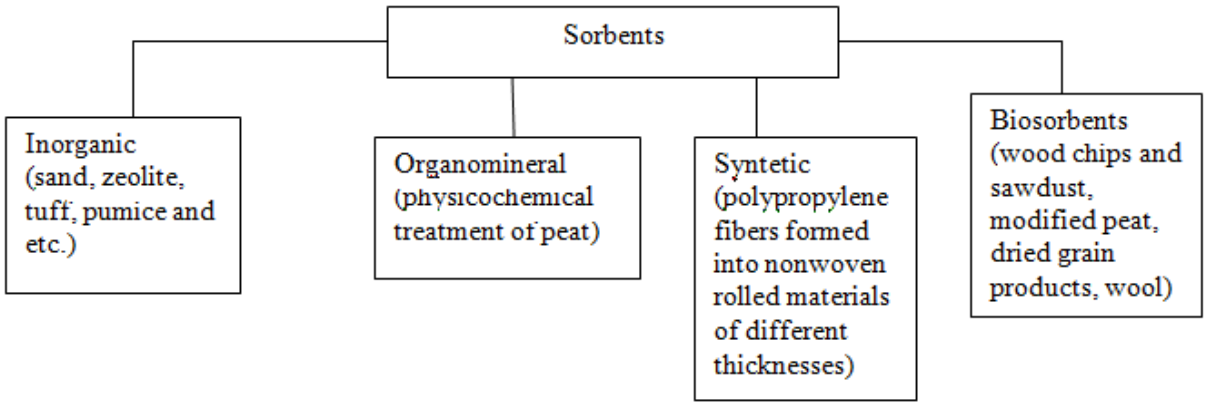

Fig. 1. Sorbents classification

Inorganic sorbents include various types of clay, diatomite rocks, sand, zeolite, tuff, pumice and etc. That clay and diatomite make up a large part of the goods on the market sorbents because of their low cost and the possibility of large-scale production. This may also include and sand used for backfilling small oil spills. However, the quality of inorganic sorbents totally unacceptable from environmental perspective point of view of. First of all, they have very low capacitance (70–150 % oil) and did not hold the lighter fractions such as gasoline, kerosene, diesel fuel. When oil spills on water, inorganic sorbents sink with oil, without solving the problem of water purification from impurities.

Synthetic sorbents are most commonly used in countries with highly developed petrochemical industry (USA, EU, Japan). Most often they are made of polypropylene fibers formed into nonwoven rolled materials of different thicknesses. Moreover, polyurethane is used in granular form or chancellors molded polyethylene polymer and other incipient plastics. At the same time use them in the form of fine powders for use in increasing the efficiency of thin films unacceptable because of the risk of carcinogenic diseases. Most of the weathering processes, such as evaporation, dispersion, dissolution and sedimentation, lead to the disappearance of the oil from the surface of the sea, whereas others, particularly the formation of water-in-oil emulsions (“mousse”) and the accompanying increase in viscosity, promote its persistence. The speed and relative importance of the processes depends on factors such as the quantity and type of oil, the prevailing weather and sea conditions, and whether the oil remains at sea or is washed ashore. Ultimately, the marine environment assimilates spilt oil through the long-term process of biodegradation.

In considering the fate of spilled oil at sea, the need for clean-up and the nature of likely impacts, a distinction is frequently made between non-persistent oils and persistent oils.

Non-persistent oils include light refined products (e.g. petrol) and even some light crude oils which are highly volatile materials with low viscosities.

As they do not normally persist on the sea surface for any significant time due to rapid evaporation and the ease with which they disperse and dissipate naturally there is usually only a limited requirement for clean-up, as demonstrated by the *Dona Marika* spill in Milford Haven in 1973. Such oils may, however, pose a significant fire and explosion hazard as well as public health concerns.

They can cause significant environmental impacts due to their high concentration of toxic components, but as these same components evaporate rapidly any such effects will be very localized. At the other end of the spectrum of oil types are heavy crudes, heavy fuel oils and other oils which form stable water-in-oil emulsions. These oils are highly persistent when spilled due to their greater proportion of non-volatile components and high viscosity. Such oils have the potential, therefore, to travel great distances from the original spill location, causing widespread contamination of coastlines and damage to amenity areas, fishing gear and wildlife, mainly through physical smothering. As a consequence, the clean-up of heavy oil spills can be difficult and extend over large areas. This is well illustrated by the recent *Nakhodka* spill in Japan and, longer ago, by the *Tanio*, which broke up off the north coast of Brittany, France in 1980. In this latter case the clean-up of the resulting spill of some 14,500 tonnes of the heavy fuel oil cargo was in many ways just as difficult as for the 223,000 tonnes of crude oil from the *Amoco Cadiz* which had contaminated the same coastline two years earlie.

Organomineral sorbent produced by the new technology — nonchemical physic andchemical treatment of peat. These technologies are based on the results of studies of water-repellency and hydrophilicity of different materials.

Natural organic and organic sorbents are the most promising type of sorbents for oil pollution emergency. The most common wood chips and sawdust, modified peat dried grain products, wool, paper for recycling. One of the best natural sorbents, comparable in its oil capacity of modified peat is wool. It can absorb up to 8.10 tons per ton of its mass, thus allowing the natural elasticity of wool overcome most of the light oil. However, after several such SPIN wool falls into bituminous felts and becomes unusable. The high price of wool, its lack of quantity and stringent storage requirements (fur very attracted rodents, insects undergo biochemical transformations) does not allow us to consider it as a promising massive oil sorbent.

Every fall in public parks and gardens are accumulated tonnage of autumn fallen leaves. Within the framework of modern environmental management, such material is considered as a valuable resource and should be processed as fully as possible. Typically, the use of urban autumn fallen leaves (AFL) is limited to production of biohumus. The other part of these "waste" is incinerated or exported in the dumps, polluting the air, soil, surface water, while products of incomplete combustion create serious environmental poisons.

Hydrophobized autumn fallen leaves (AFL) can be used for production of sorbents for spilt oil products removal. In terms of oil intensity and extent of oil retrieval the obtained sorbents are able to compete with industrial oil sorbents on the basis of peat.

Due to the high buoyancy after collecting oil and a minor degree of oil loosing they can be effectively used to eliminate oil impurities from the water surface. Such sorbent have good oil capacity and it is comparable to industry brands.

As a raw material for sorbents we have used autumn fallen leaves in air-dry state with residual humidity of 10 ± 2 %. Dry AFL was easily ground in a disintegrator, type "8255 Nossen" (Germany). For hydrofobized sorbents was used material with particle size: 1–2 mm — 2,3 %; 2,3 mm — 5,7 %; 5,3 mm — 43,8 % 5,10 mm — 48,2 %. AFL testing was carried by the mixture of kerosene RT-2. Weighed sample of AFL were incubated in this mixture for 2 hours and separated to achieve the bulk state. Hydrofobized samples allowed to be dried in the air.

The Fig. 2 presented results of experiment of absorption petroleum product by leaves that were grinded for different fraction. It has been found that in the classical experiment to determine the hydrophilicity-hydrophobicity to the measurement of contact angle of water droplet remains on the urface fraction small fraction of linden leaves for 40 minutes while the drop is absorbed kerosene RT for no more than 2–3 seconds. Itshows the dynamics of mass loss absorbed petroleum product for medium and fine fraction leaf linden. Seen a very significant difference of the initial amount of absorbate and dynamics of mass loss absorbate average fraction holds significantly more fossil fuels that makes it the most promising property is for use as a sorbent in the devices of cleaning water and ground surfaces from spills of hydrocarbon fuels.

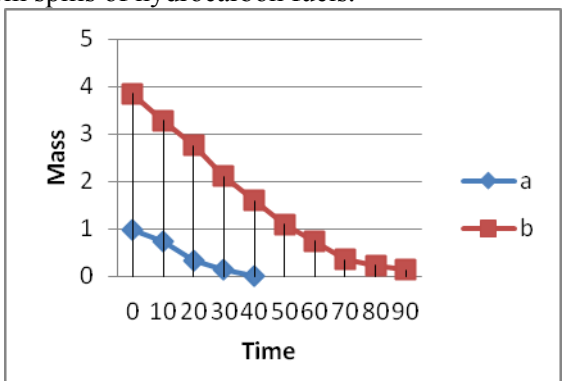

Fig. 2. Absorbtion by leaves, a — small fraction and b — middle fraction of grinding

Obtaining sorption materials is an additional means in possible novel complex autumn fallen leaves processing scheme. It should be noted that the production of new materials made of AFL with practically useful properties allow, if necessary, to adapt such materials to market needs.

Low-cost, locally available organic or inorganic materials may provide a more cost-effective option than stockpiled synthetic sorbents, despite of lower recovery efficiency for the same weight of sorbent material.

Conclusion: in this work was presented the results of the experiment that can help to solve the problem of cleaning up the oil spills. As we can see it is profitable and simple to use the AFL as absorbent in emergency situations. They have a big ability to absorb petroleum products.

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