# STUDY ON OIL ADSORBENT BEHAVIOUR OF NATURAL BY PRODUCT

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**ABSTRACT**

Oil spills on water and land are of major environmental concern. Oil is one of the most important energies and raw material sources for synthetic polymers and chemicals worldwide. Whenever oil is explored, transported, and stored and its derivatives are used, there is risk of spillage with the potential to cause significant environmental impact. When oil spill occurs not only cleaning up the spill is significant but also recovery of the oil is of prime importance. Numerous studies have shown sorbents to be one of the most economical and efficient means for oil spill cleanup from both land and sea. In a state of abundantly available synthetic sorbents, the merit of using environmentally friendly natural waste by-product such as banana fibers are our goal. In this proposal, it is proposed to study the properties of the banana fibers in a detailed manner for its suitability to produce spun laced nonwoven adsorbent pad for separation of oil from sea water and commercial wastewater. Primarily these works involve the surface modification of fibre for enhancing the sorption efficiency and then develop fibrous assembly (adsorbent pad) using Hydroentanglement technique. The mechanisms of the reaction leading to the formation of cross links (fibre and chemicals) have analyzed with FTIR spectrometer. The buoyancy behavior of the developed fabrics is characterized by oil-alone absorption capacity and the oil removal efficiency. The general surface and performance characteristics of the developed fabrics are compared with commercially available sorbent (synthetic) material.

**Keyword: Banana fiber, Sorption, Acetylation, Oil recovery, Sorbent**

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## 1.INTRODUCTION:

Marine oil spills are the most important threat to the coastal environment and ecosystems of the sea. They are formed mainly by occasional accidental episodes of supertankers, oil rig drilling, war, and natural events. There are various ways to deal with oil spills, but using sorbents is the most cost- effective way. The primary considerations for sorbent effectiveness are the hydrophobic and oleophilic properties of the material. There are 3 types of sorbents: Natural organic, Natural inorganic and Synthetic sorbents. An advantage of natural organic sorbents is that they are bio-degradable and often cheaper in cost. This project focuses on using bagasse, a by-product of sugar industry as an oil sorbent. Bagasse is naturally hydrophobic and with further treatment it can be made more hydrophilic. Development of the oil sorbents made of natural organic waste materials is initiated in order to provide resources for marine oil spill response with less environmental load and cost [1]. Sorbents of the oil spill in water are materials that soak up the oil. They can be used to recover oil through the mechanisms of absorption and adsorption or both. Absorbents allow oil to penetrate into pore spaces in the material they are made of, while adsorbents attract oil to their surfaces but do not allow it to penetrate into the material. Once sorbents have been used to recover oil, they must be removed from the water and properly disposed of on land or cleaned for reuse. Any oil that is removed from the sorbent materials must also be disposed of or recycled. Sorbents can be divided into three basic categories: natural organic, natural inorganic and synthetic. The first category includes peatmoss, straw, hay, sawdust, ground corncobs, feathers, and other carbon-based products. They are relatively inexpensive and generally readily available.

Organic sorbents can absorb 3 to 15 times their weight of oil, but they do present some disadvantages. Some organic sorbents tend to absorb water as well as oil, causing them to sink. Many organic sorbents are loose particles, such as sawdust, and are difficult to collect after they are spread on the water [2]. Natural inorganic sorbents include clay, perlite, vermiculite, glass, wool, sand, and volcanic ash. They can absorb from 4 to 20 times their weight of oil. Inorganic substances, like organic substances, are inexpensive and readily available. Most organic materials can only be used on land and are not adaptable to water use for oil spill cleanup. Synthetic sorbents include man-made materials that are similar to plastics, such as polyurethane, polyethylene, polypropylene, and nylon fibers. Most synthetic sorbents can absorb as much as 70 times their weight of oil. Synthetic sorbents that cannot be cleaned after use can present difficulties because they must be stored temporarily until they can be disposed of properly. They are best suited to absorb lighter viscosity oils that can perpetrate or wick into its fibre [2]. Walkup et al., [3] reported that an oil spill cleanup is a question of options and not solutions. Even though no oil spill cleanup system is likely to be completely effective. Sorbents are one of the most widely used methods for compacted oil spills in the sea. The most widely used sorbent is polypropylene (PP) due to its oleophillic and hydrophobic characteristic [4]. Poile [5] discusses the collection and cleaning methods available in the oil spill. He found that the natural and biodegradable sorbents have particular advantages over synthetic sorbents. Johnson et al. [6] report the potential for using cotton fiber for oil spill cleanups. Choi et al. [7, 8] conduct further studies on milkweed and cotton fiber. When the results of these studies are compared to results gained from PP it was shown that milkweed and cotton sorb oil more efficiently, but PP can be reused.

The aim of this work is to evaluate and compare waste by-product such as Banana fibre and Sugarcane Bagasse as oil spill sorbents which can recover oils.

**2. OBJECTIVE:**

- To utilize natural organic waste by-product i.e., Banana fibre and Sugarcane Bagasse for separation of oil from sea water and domestic wastewater.
- To characterize the selected sorbent material and modify the surface properties by chemical treatment
- To optimize the oil adhesion property of the modified fibre sorbent using Box-Bhenken design by varying concentration of the modifying agent, temperature, and time.
- To develop fibrous assembly from the sorbent material by Hydroentanglement technique.
- To analyze the developed material with varying oil type, viscosity, and time.

**3. COLLECTION OF LITERATURE:**

Abdul Aziz Al-Majed, Abdulrauf Rasheed Adebayo, M. Enamul Hossain(2012)- Acetylation increases the sorption capacity of the natural sorbents significantly, in this date palm leaves used as sorbent mat.

Abd El-Aziz A. Said a , Adriane G. Ludwick b , Heshmat A. Aglan b,(2008)- Grafted bagasse by acytylation adsorbed more water than raw bagasse (sorbent mat).

Ahmad Bayat, Seyed Foad Aghamiri* Ahmad Moheb and G.Reza Vakili Nezhaad (2005)- Wetted bagasse/ rice hull were difficult and this Sorbent material were contained in hydrophobic bag.

Deepa G. Devadiga, K. Subrahmanya Bhat & GT Mahesha (2020)-Acetylation, Permanganatte treatment, Peroxide and Benzolation treatment increases the hydrophobic properties of bagasse.(sorbent mat)

Reza behnood,Bagher Anvaripour,Neematollah Jaafarzadeh,masoumeh farasati(2016)- modification of raw bagasse with acetic anhydride decreases bagasse solubility in water.modified bagasse had good affinity for oil.(sorbent bag)

Hyung Min Choi, Rinn M.Cloud(1992)- Milk weed showed highest sorption capacity and it was due to the large wax content on its surface and non collapsing lumen (sorbent material contained in hydrophobic bag).

I.M. Muhammad, U.A. El-Nafaty, S. Abdulsalam, Y.I. Makarfi (2012)-Egg sheels contain oxygen, carbon & calcium which attracts oil. The surface morphology of egg shells has lot of pores and allows oils to settle on it (sorbent pad).

M.Hussein, A.A.Amer, Sawsan(2009)- Fibers extracted from bagasse and carbonized it were found to be high performance for sorption. (sorbent with oleophilic bag).

Hyung-Min Choi(2008)-Needle punched cotton non wovens and other natural fibers as oil cleanup sorbents

M. Husseien, A.A.Amer, A.El-Maghraby, Neama Hamedallah (2015)- Oil spill removal from water by using corn stalk

**4. SOCIAL RELEVANCE AND USEFULNESS OF THE PROJECT:**

Concerns related to the ever-growing use of raw-materials from non-renewable sources by modern society is driving the interest of the academic and scientific sectors for a new concept of material, which considers not only mechanical performance, cost and availability, but also environmental-related issues, such as biodegradability, renewability and waste disposal along with the promotion of social and economic development of the economically challenged segment of the population. In this work, two environmental problems are encountered. A solution of one problem is to find a useful application of the waste by-product such as banana fiber which increases day after day all over the world. The second problem is the oil spill in aquatic locations. Here, waste by- product i.e. Banana fiber is study as sorbent materials for oil. The goal of the project is to remove oil from impacted areas as soon as possible and to treat, recycle, or dispose of recovered oily material in the most efficient and environmentally sound manner.

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