

# WASTEWATER TREATMENT OF OIL REFINERIES

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In this work the current environmental problem, associated with waste treatment, in particular oily wastewater treatment, was considered. Influencing factors on water purification were analyzed. The impact of sawdust, peelings of sunflower, walnut shells thermal treatment on the wastewater purification degree was researched.

Among the main environmental problems of the present time, the problem of utilization of waste is dominated. For today there are many classification of waste by various features, among which the main attention should be paid to the danger level of waste.

Water quality standards breaking which leads to water ecosystems degradation, decreases reservoir productivity. Among the most dangerous impurities, that get into reservoirs, are oil products. Strong requirements concerning oil products concentration in quality of drinking household water dictate the necessity of new materials application and new technologies development complex solution of water reservoirs pollution problem.

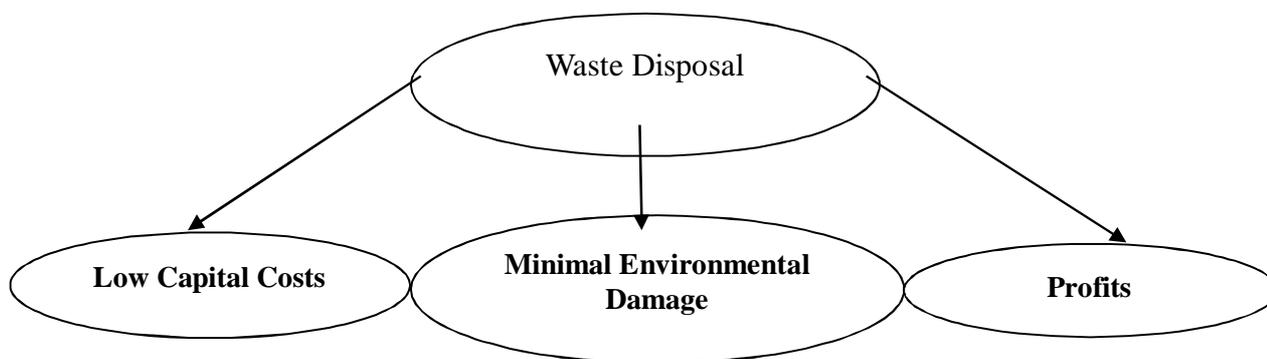
In this article we would like to pay our attention to such class as oil-containing waste. Petroleum products are one of the main polluters of the environment. Oil-containing waste can be divided into the following main groups:

- 1) waste of reagentless and reagent treatment of oily wastewater;
- 2) mixed waste of hardly separable oil-containing materials (machine emulsions, synthetic surface-active substances etc.);
- 3) not accepted for oil regeneration and oil tank cleaning products.

Production, refining and conversion of crude oil to useful chemicals are associated with direct or indirect release of waste materials and pollutants into the environment. Water consumption in oil refineries is huge and so is the wastewater generation. At any enterprise waste management requiring system approach and must include the next methods:

- legal & regulatory
- economical
- informational
- technical
- organizational & managerial

To effectively dispose of waste, technologies that cause minimal environmental damage to the environment are required, with low capital costs and profits (Fig.1).



*Fig.1. Waste Disposal Management*

In order to develop a system for purifying sewage contaminated with petroleum products, many factors that have a direct impact should be taken into account. Since it concerns oil refineries, it is imperative to take into account the type, concentration of petroleum products and the state in which they are (dissolved, emulsified, filmy).

Difficult to remove types of impurities, as a rule, are in a drip (coarsely dispersed) state. Depending on their quantity, they can form on the water surface either a floating film or a single surface layer. Such impurities account for most of the oil contamination.

Easily separated impurities constitute a much smaller part. Basically, when they are combined with water, an emulsion forms. If the time is not taken to remove it, then, due to its high stability, it can persist in the water for a long time. However, the appropriate treatment of contaminated water emulsion translates this type of impurities into a state that can be easily removed.

Soluble compounds - even less, because the organic components that make up the structure of oil and petroleum products are poorly soluble in water. However, the concentration of oil products, more precisely - their water-soluble compounds, with prolonged contact of contaminants with water gradually increases.

Research show in the case of an increase in the duration of direct contact of water and oil products from two hours to five days, the concentration increases as follows:

Oil - from 0.2 to 1.4 milligrams per liter; Diesel fuel - from 0.2 to 0.8 milligrams per liter.

Knowledge the oil droplet size distribution in refinery wastewater is paramount to understanding the wastewater behavior in an oil/water separator. This size distribution is crucial for determining the proper oil/water separation system and its efficiency. Oil and grease present in the wastewater generated in the oil processing industries can be removed by various established or novel techniques. Many researchers tried to divide the oil droplets size spectrum and then propose an appropriate treatment technique for each section.

As can be seen from the scheme, presented in Fig. 2, as a finish stage treatment of sewage with carbon is used.

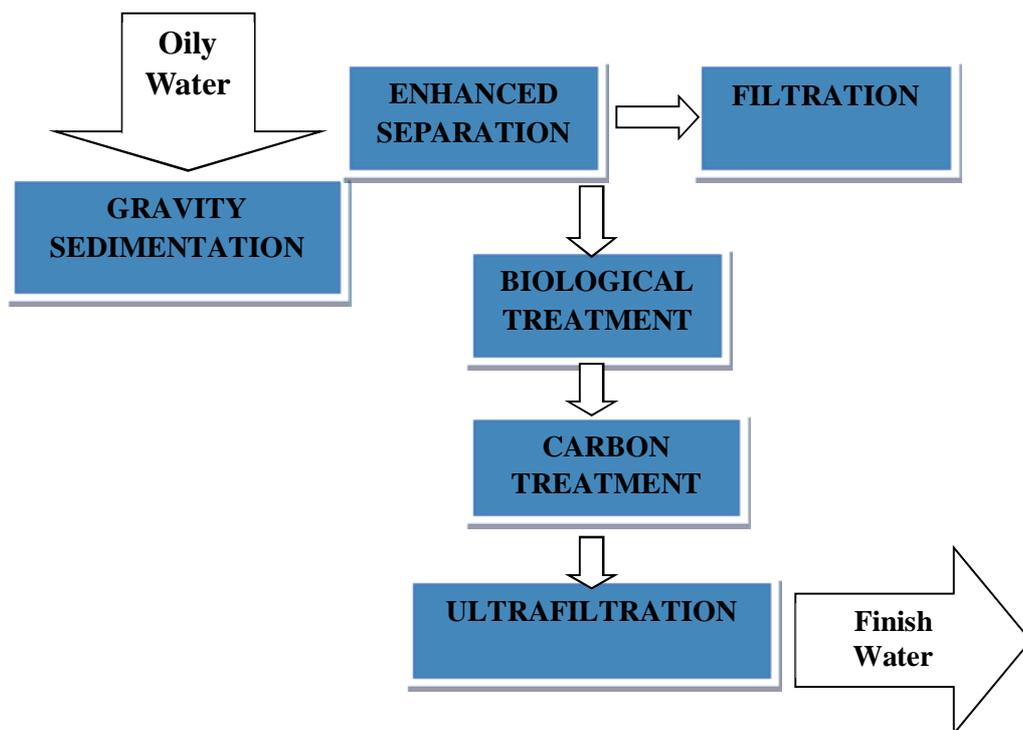


Fig. 2. Oily Water Treatment Techniques

Among the wide range of carbon-containing materials, which are used today for the purification of water used in various purposes, more and more attention is paid to plant waste as the most available source of sorbents for ecological needs. Due to the application of such base materials as husk of buckwheat, sunflower, oat, rice, walnut shells, maize waste, waste of grass processing, fallen leaves, straw, chitin, chitosan that are widely spread in comparison with other materials used for oil sorbent manufacturing.

Sorbents, used for waste water purification from pollution by oil products, must meet a number of requirements:

1. Sufficient raw material base.
2. High hydrophobicity and oil capacity.
3. High restorative properties (regeneration and utilization).
4. Low cost.

The raw plant material costs less in comparison with such well-known sorbent as active granulated carbon the technological production of which is complicated and requires expensive equipment.

Usage of plant materials provides better purification and gives the opportunity to remove the oil products from water, and, moreover, to eliminate agricultural wastes, that is hardly possible to achieve applying usual sorbents.

There is a number of works that research the methods of carbon materials receiving from husk of rice by means of different activators [1, 2]. Japan plays a leading role in the field of active carbon technologies development from rice husk and adsorbents [2].

*Table 1*

**Influence of sawdust, peelings of sunflower, walnut shells thermal treatment on the wastewater purification degree**

Material	Initial concentration of oil products, mg/l	Temperature of treatment, °C	Purification degree, %
Sawdust	1,88	20	8,5
		100	22,9
		200	50,4
Peelings of sunflower		20	19,4
		100	27,7
		200	56,8
Walnut shells		20	1,5
		100	13,6
		200	17,7

Another method of sorbents manufacturing is treatment by chemical reagents, mineral chemical compounds, organic acids. The main disadvantages of raw plant material chemical treatment are, mainly, toxic level and the complicity of the process.

**CONCLUSION:** waste management at any enterprise is complex issue, in particular oil-containing wastewater processing. Petroleum refinery effluents are hazardous compounds containing waste. The discharge of these waste waters into the environment adversely affects the ecosystem. That's why so many scientific research are devoted to this sphere. To minimize negative impact of oil refineries on the environment it is ought:

1. To analyze the quality of acting legislative acts, to remove divergences and to introduce necessary changes. To consider the main directions of: developing economic regulation

mechanisms in waste product management, stimulating the development of progressive technologies and equipment for waste product treatment and creating a market of services in this sphere.

2. To develop mechanisms of regulating the economy of primary material resources in manufacturing and their replacement with corresponding secondary material resources.
3. To consider emissions into the atmosphere and water basins as waste product pollution. To implement a system of statistical reporting and pollution indices based on contemporary global standards.
4. To develop a national program of toxic and dangerous waste product and sustainable organic pollutants treatment, directed towards efficiently resolving principle tasks and ensuring it's financing.
5. To perform engineering inspections of wastewater treatment systems and to forbid their use without the necessary equipment, in order to prevent negative effect on surrounding natural environment.

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