TPH-PAH Contamination and Benthic Health in the Surface Sediments of Bandar-E-Imam Khomeini - Northwest Of the Persian Gulf

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Abstract: The distribution and sources of PAHs in sediments as well as TPH were investigated in the Northwest of the Persian Gulf. Also, some biological analysis was performed in the study area. Moreover, the effluent outlets of Bandar-e-Imam Khomeini Petrochemical Company were monitored during the study. This research reached a conclusion that, in addition to petrogenic input as a major source, pyrolytic inputs are also a source for PAHs. The levels of TPH concentration in the studied area were relatively moderate. Moreover, the AMBI results showed that, this area can be classified as slightly polluted and the results of effluent outlets demonstrated that, although the concentration level of TPH was greater than the guideline value, the PAHs concentrations did not exceed the guideline values.

Index Terms—PAHs, TPH, AMBI, Northwest of the Persian Gulf.

I. INTRODUCTION

The word "petrochemical" is referred to the raw materials that are achieved from oil and it is compounded of two words; 'petrol' and 'chemistry'. Petrochemical industries are those industries in which hydrocarbon of the natural oil and gas are transformed into chemical products [1]. Although petrochemical industries have too many benefits for our life, they are considered as point source pollution and today's the pollution caused by these industries has been a cause for concern and a major challenge to save the environment against their adverse impacts in all over the world [2]. These impacts are not only affecting the biological factors of the ecosystem but also can affect the water resource quality and threat the human health [3]. Owing to the diverse industries, Musa Bay and Bandar-e-Imam Khomeini has become one of the main economic assets of the northwest coast of the Persian Gulf [4] (Fig. 1). Bandar-e-Imam Khomeini located in the Musa bay that is a semi-closed ecosystem with a limited connection to the Persian Gulf, lower capacity for self-purification and high concentration of suspended solids. Thereupon great amount of discharged wastewater into the bay is the major water pollution factor and also frequent tide has considerably expanded the scope of pollution [5].

According to the IMO, declaration, the Gulf area is the most sensitive area in the world [6], and several studies showed that the Persian Gulf is the most oil-polluted marine area in the world, even before the Gulf war and the Gulf oil pollution is about 48 times that of any other similar area on the earth [6-8]. Iran Department of Environment has reported that, the Musa Bay is considered as the most sensitive marine area in Iran and the Gulf area (due to its unique ecosystem). Therefore, Musa Bay is important for the whole northwestern coast of the Persian Gulf [6]. Several creeks branch out from the Bay including, Zangee, Jafari, Moavi, Ghanam, and Marimus [1].

Oil pollution is one the major pollution in this area, especially due to its vast natural reserves of oil and gas. Oil pollutants in water environment can cause serious pollution in aquatic ecosystems and harm living organisms, so it has a potential to harm human beings too [9]. Immediately after the release of crude oil into marine waters, due to lipophilic characteristics and bio-resistant properties of the petroleum compounds, they adsorb to the suspended particulate matter (SPM) and accumulate in bottom sediments and they can remain unchanged and toxic for long term; thereupon, they can have a long-term effect on the structure of the benthic community. Most studies on the fate of hydrocarbons within the effluent (especially studies of refinery wastes) have shown that