

Effect of Environmental Parameters on the Water Solubility of the Polycyclic Aromatic Hydrocarbons and Derivatives using Taguchi Experimental Design Methodology

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Abstract : The MIGR'HYCAR research project was initiated to provide decisional tools for risks connected to oil spill drifts in continental waters. These tools aim to serve in the decision-making process once oil spill pollution occurs and/or as reference tools to study scenarios of potential impacts of pollutions on a given site. This paper focuses on the study of the distribution of polycyclic aromatic hydrocarbons (PAHs) and derivatives from oil spill in water as function of environmental parameters. Eight petroleum oils covering a representative range of commercially available products were tested. 41 Polycyclic Aromatic Hydrocarbons (PAHs) and derivate, among them 16 EPA priority pollutants were studied by dynamic tests at laboratory scale. The chemical profile of the water soluble fraction was different from the parent oil profile due to the various water solubility of oil components. Semi-volatile compounds (naphtalenes) constitute the major part of the water soluble fraction. A large variation in composition of the water soluble fraction was highlighted depending on oil type. Moreover, four environmental parameters (temperature, suspended solid quantity, salinity, and oil: water surface ratio) were investigated with the Taguchi experimental design methodology. The results showed that oils are divided into three groups: the solubility of Domestic fuel and Jet A1 presented a high sensitivity to parameters studied, meaning they must be taken into account. For gasoline (SP95-E10) and diesel fuel, a medium sensitivity to parameters was observed. In fact, the four others oils have shown low sensitivity to parameters studied. Finally, three parameters were found to be significant towards the water soluble fraction.

Keywords : monitoring, PAHs, water soluble fraction, SBSE, Taguchi experimental design

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