Hydrodynamics Analysis of Spilled Oil Tracking Buoy Based on Spilled Oil Model Improved

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ABSTRACT
The hydrodynamics principle of the spilled oil tracking buoy is analyzed in this paper. The relativity of the wind item in the drift model of the spilled oil is emphasized and the drift model is improved. The understanding of the relativity of the wind velocity is implemented throughout the theoretical analysis process. The balance equation for the spilled oil tracking buoy tracks the oil spills is established. Some important factors about the effectiveness of the spilled oil tracking buoy are considered, such as velocity of current and wind, environment temperature, geometric shape of buoy, density of water and air, etc.

HYDRODYNAMIC ANALYSIS OF OIL SPILL BUOY
Drift Model
In the drift model of oil spills, the drift motion of the oil spill film is mainly affected by the current and wind. The velocity of the oil film drifting on the sea is defined as the vector sum of current velocity and the product of wind velocity and wind drift factor:

\[ V_o = V_c + \zeta V_{10} \]  

Here, \( V_o \) is the velocity of oil spill film; \( V_c \) is the velocity of the sea current and \( V_{10} \) is the velocity of the wind in 10m height above the sea surface. \( \zeta \) is the wind drift factor, which usually obtained by the sea measured manner. Different oil spills data, the value of \( \zeta \) is different, changing roughly from 2% to 5%. The experimental results show that the wind drift factor is between 1.6% and 3.5%, while the main factors affecting the value of the wind drift factor is the film thickness (Cui Weicheng, Liu Yingzhong, Ge Chunhua, Sun Hui, 2007). By equation (1), it can be seen that when the wind drift factor is constant, the velocity of oil spills depends on the surface current velocity and the 10m wind velocity. It should be especially noted that here \( \zeta \) is the role item of wind.

\[ V_o = V_c + \zeta (V_{10} - V_c \cos \theta) \]  

Here \( \theta \) is the angle between the velocity of wind and current. \( V_{10} \) is the absolute velocity of the 10m wind above sea surface and not the wind velocity relative to surface current. Here \( V_{10} \) is independent of current velocity.