

## Numerical Study of the Convective Heat Transfer Within the Hold of an Oil Tanker Subjected to Rolling Motion

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**Abstract:** Crude oil tanker usually encounters rolling motion during sea transportation, which leads to a rotational movement and sometimes a sloshing for the liquid hold. This rolling-induced body motion seriously affects the thermal and hydraulic behavior of liquid hold, which then affects the heating process and heat preservation of the tanker. Clarification of the involved thermal and hydraulic characteristic is the basic requirement for establishment of a scientific heating scheme and heat preservation method. Numerical simulation for such a problem faces challenges in terms of free liquid surface movement, rotational acceleration and shear-dependent viscosity (non-Newtonian behavior) of the liquid. Free surface movement and non-Newtonian behavior are critical for the flow and heat transfer, but were not taken into consideration in the previous research due to the complexity. Therefore, this research aims to establish a full model for thermal calculation for the liquid holds in oil tankers to include these important influencing factors. Taking VLCC (a type of large oil carrier) as an example, the model will be calculated numerically, then thermal and hydraulic characteristic of the liquid hold will be investigated under different combinations of dimensionless parameters, and the combined effect of rolling and fluid non-Newtonian behavior will also be investigated. The proposed model is expected to obtain more reasonable results and provide reference for design and optimization of the heating and heat preservation method for oil tanker operation.