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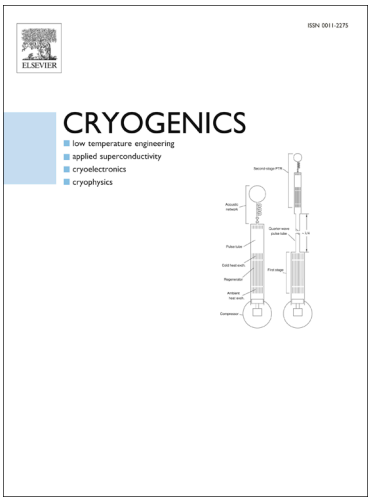


A thermodynamic and heat transfer model for lng ageing during ship transportation. Towards an efficient boil-off gas management

Rizos N. Krikkis

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# A THERMODYNAMIC AND HEAT TRANSFER MODEL FOR LNG AGEING DURING SHIP TRANSPORTATION. TOWARDS AN EFFICIENT BOIL-OFF GAS MANAGEMENT

**RIZOS N. KRIKKIS**

Institute of Thermal Research
2 Kanigos Str, PO Box 106 77, Athens, Greece
e-mail: rkrik@uth.gr

## ABSTRACT

A non-equilibrium thermodynamic and heat transfer model for LNG ageing during ship transportation has been developed based on experimental data. The measurements reveal that the liquid temperature remains nearly constant, whereas significant variations are observed for the gas temperature. The measurement of the liquid temperature along the tank height suggests that a small scale rollover phenomenon may have taken place in one cargo tank. A time dependent heat transfer mechanism has been considered by taking into account the temperature variations of the atmospheric air, the seawater and the cofferdam environment which affect the cargo tanks. An important finding is that the evaporation rate (boil-of rate) is forced to follow the fuel flow consumption profile imposed by the vessel's propulsion system in order to match the tank pressure and volume constraints. The theoretical model is favorably compared to a comprehensive set on per hour basis of on board measurements of cargo temperatures and pressures, recorded during laden voyages, providing a better understanding of the underlying processes involved. The dominant role of the fuel consumption on the evaporation rate may be utilized in order to devise an efficient cargo management strategy during the laden voyage.