



Contribution ID: 160

Type: **Poster presentation (105min)**

## **Analysis of Frost Layer and Heat Transfer on Cryogenic Tank Wall without Insulation**

To maintain the temperature and pressure in liquid oxygen tanks, the cryogenic tanks must be thermally insulated to prevent or minimize heat transfer from the ambient environment. Frost will form on the wall of the cryogenic tanks if the liquid oxygen tanks have been left bare. The frost layer, which has low thermal conductivity and obvious heat insulation effect, is a porous media consisting of small ice crystals and air. Here we analyze the property of frost layers on liquid oxygen tanks in different regions. The heat transfer process through the tank wall with frost is studied. A static model is built by considering convection heat transfer and radiation heat transfer modes. In the case of bare liquid oxygen tank, the effect of some important parameters such as wind speed, air temperature and humidity on the amount of heat transfer into the tank is investigated. Correspondingly, the liquid oxygen evaporation rate in the tank is calculated. It is found that the heat transfer by solar radiation is significant and also that air humidity and temperature strongly affect the heat transfer. The feasibility of using frost layer as insulation of liquid oxygen tank in different regions is analyzed.

Keywords: frost layer, liquid oxygen tank, insulation, heat transfer, evaporation rate

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**Track Classification:** C-06: Heat transfer and thermo-physical properties of solids and fluids