

Measurement of VIP Edge Conduction Using Vacuum Guarded Hot Plate

Authors : Bongsu Choi, Tae-Ho Song

Abstract : Vacuum insulation panel (VIP) is a promising thermal insulator for buildings, refrigerator, LNG carrier and so on. In general, it has the thermal conductivity of 2~4 mW/m•K. However, this thermal conductivity is that measured at the center of VIP. The total effective thermal conductivity of VIP is larger than this value due to the edge conduction through the envelope. In this paper, the edge conduction of VIP is examined theoretically, numerically and experimentally. To confirm the existence of the edge conduction, numerical analysis is performed for simple two-dimensional VIP model and a theoretical model is proposed to calculate the edge conductivity. Also, the edge conductivity is measured using the vacuum guarded hot plate and the experiment is validated against numerical analysis. The results show that the edge conductivity is dependent on the width of panel and thickness of Al-foil. To reduce the edge conduction, it is recommended that the VIP should be made as big as possible or made of thin Al film envelope.

Keywords : envelope, edge conduction, thermal conductivity, vacuum insulation panel

Conference Title : ICES 2015 : International Conference on Energy Systems

Conference Location : Singapore, Singapore

Conference Dates : January 08-09, 2015