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A NUMERICAL STUDY ON THE FLOW AND HEAT TRANSFER FOR THE INSIDE OF A NEW DIVERSION-TYPE LNG HEATING DEVICE

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ABSTRACT

LNG heating and gasification device is an indispensable piece of equipment in gas application systems. The present paper characterizes the inside flow and heat transfer of a new type LNG heating device with various guide plate structures. The natural convection model for both heating and cooling surfaces in the heat-exchanging cylinder is built. The finite volume method with unstructured body-fitted grids is employed. Analyses and comparisons of the flow conditions and temperature distributions with a single side completely blocking guide plate, or a single side partly blocking arc guide plate, or two side guide plates between the heating and cooling surfaces are carried out. The numerical simulation shows that using the new type of guide plate structures can form an overall smooth flow field effectively. Use of either a single side guide plate or two side guide plates can make the thermal boundary layer close to the wall thinner, and help the heat-transfer medium form an organized flow pattern that enhances the heat transfer. Such a diversion-type heat transfer mode is especially suitable for high viscosity heat-transfer media such as ethylene glycol.