

Plate Heat Exchangers for Efficient Heat Recovery in Crude Oil Preheat Trains

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The efficient heat recuperation helps to solve the problem of efficient energy usage, to reduce energy consumption and greenhouse gas emissions. The problem of energy saving in industry supposes the application of efficient heat transfer equipment with effective HEN for recuperation. It requires considering minimal temperature differences in heat exchangers of reasonable size, what can be satisfied by Shell-and-Plate Heat Exchangers (SPHE) or all-welded PHEs Compablock. Such equipment can be used not only as a separate item of equipment, but as elements of heat recuperation systems, that demonstrates the efficient solutions in industry and can be used for high temperatures and pressures at the same time.

The efficient application of proper type of the special equipment in complex recuperation systems and heat exchanger networks demands the reliable methods for their rating and sizing. The analysis of design parameters for Shell-and-Plate HEs and Compablock HEs, aiming to enhance the heat recovery and efficiency of energy usage, are discussed basing on design techniques [1]. The optimization problem targeting the minimal heat transfer area under the requirements of proper operating conditions is observed for each HE. To estimate the value of the objective function in a space of optimizing variables the mathematical models of Shell-and-Plate HE and Compablock HE are used. The software for HE design based on these models was developed and enables to design the heat exchange equipment of observed construction and to account the fouling effect during the operation period at the design stage. The thermal and hydraulic parameters can be calculated for the obtained HE unit forecasting its behaviour during the operation and it helps to make the decision about the use of the proper equipment for the specified process conditions.

The possibility of Alfa Disk and Compablock HE application in HEN of distillation unit preheat train of oil refinery are analyzed basing on the obtained design parameters. The fouling resistance prediction and thermal performance of HEs are analyzed for each position inside the HEN. The advantages for each equipment application and its fouling behaviour are discussed.

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1. Arsenyeva O, Kapustenko P, Tovazhnyanskyy L, Khavin G (2013) The influence of plate corrugations geometry on plate heat exchanger performance in specified process conditions. *Energy* 57: 201-207.