

Evaluation of the Elliptical Flange Configurations for 24-inch and 30-inch Heater/Cooler Units

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ABSTRACT

KOCH Heat Transfer Company contracted Stress Engineering Services, Inc. to perform a design/parameter study of a return bonnet used in hairpin heat exchangers that employs an elliptical flange design. The return bonnet is an important component of the heat exchanger as it can be removed to permit inspection of the heat exchanger tubes. The return bonnet is bolted to the hairpin leg flange. To maintain sealing integrity a gasket is placed between the return bonnet flange and the hairpin leg flange.

The sealing efficiency of two return bonnet sizes (24-inch and 30-inch) was investigated in this study using finite element analysis. The sealing efficiency is an indication of how the contact pressure changes circumferentially around the gasket and is calculated by dividing the local contact pressure by the maximum contact pressure calculated in the gasket for each respective design. The study assessed the effects of geometric changes to the mating flanges. Using an iterative design process using finite element analysis, the elliptical flanges were optimized to maximize sealing efficiency. Upon completion of the study, the manufacturer successfully employed the modifications as evidenced with multiple successful hydrotests.

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