(12) PATENT APPLICATION PUBLICATION

(19) INDIA

(22) Date of filing of Application :07/06/2024

(21) Application No.202441044179 A

(43) Publication Date : 14/06/2024

(54) Title of the invention : DEVELOPMENT OF LOW COST PARALLEL AND COUNTER FLOWHEAT EXCHANGER

(51) International classification :F28D7/16, F28F9/02, F28F9/22
(86) International Application No :NA
Filing Date :NA
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :
This document presents a comprehensive study on the thermal design, construction, and performance of shell and tube heat exchangers, extensively utilized in various industries such as power plants, refineries, and process industries. The study emphasizes the significant impact of pressure loss due to fouling on the performance of these heat exchangers and aims to predict the ideal performance condition considering different mass flow rates and associated heat transfer with respect to the fouling factor. The document also discusses the flow characteristics and heat transfer in helical heat exchangers, highlighting the enhancement of heat transfer due to centrifugal forces. The effectiveness of the heat exchanger is calculated using the average heat transfer rate and the minimum heat capacity rate. The document provides a detailed account of the design of the tube and the effectiveness calculation for parallel and counter flow heat exchangers. It elaborates on the fabrication process, which involves procuring the materials, ensuring the dimensions of the materials meet the design specifications, preparing the shell for processing, and testing the heat exchanger. The components of the heat exchanger, including the shell, tubes, baffles, transfer line exchangers, and tube sheet, are listed. The document also explains the operation of the heat exchanger, its advantages such as lower environmental impact and minimal operating costs, and its applications in various fields like oil refining, preheating, oil cooling, steam generation, and more. The study concludes that shell and tube heat exchangers are highly adaptable and widely used in numerous applications, and their cleaning and repair are not overly complex.

No. of Pages : 13 No. of Claims : 10