

DESIGN AND PERFORMANCE ANALYSIS OF SHELL AND TUBE HEAT EXCHANGER BY VARYING THE FLUID MEDIUM USING CFD

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Abstract: In thermal systems, heat exchangers are used to control the operating temperature of the working fluids. Shell and tube style heat exchangers are the most common kind of heat exchangers used in industries. In this work, shell and tube heat exchanger performance analysis is performed using CFD tools under industry-collected boundary conditions. Instead, the cooling liquid ammonia is replaced by Al_2O_3 and evaluated accordingly to increase the performance of the system. Instead the heat exchanger of the shell and tube is replaced by the heat exchanger of the u tube and analysed under the same boundary conditions. Then, the results are compared and the application of Al_2O_3 was found to have a better thermal efficiency.

Keywords – Heat exchangers – CFD analysis – Optimization of output – Nano fluids.

I. INTRODUCTION

In various thermal and thermal related industries, heat exchangers are commonly used to maintain a desired temperature within the device. The flow of heat occurs in many ways, one of which is convection, also known as convective heat transfer. This method of heat transfer is commonly utilized in all heat exchanger forms. Given this simple construction and less maintenance, shell and tube style heat exchangers are commonly used by different types of heat exchangers. This type of heat exchanger operates under modes of parallel and counter flow.

A shell and tube heat exchanger is taken in this project for the purpose of research. The heat exchanger model is performed using solid works software and the same package will be used for future CFD research, as this program will combine the process between modeling and simulation. The simulation data would be obtained from a nearer dairy plant, as they use heat exchangers to hold the temperature within their device. The current system will first be subjected to CFD review, and the findings will then be recorded. Instead, the working fluid is switched from ammonia to titanium oxide while attempting to improve the transfer of heat from gas to liquid. This then tabulates the CFD tests and compares them accordingly.

II. METHODOLOGY

Methodology is the basic prerequisite of a project, since it establishes the correct requirements for beginning and completing the research to be completed. Proper process preparation and implementation decides the project will be successfully completed. The project's approach is as shown.



III. PROBLEM DEFINITION

Heat exchangers are commonly used heat transfer devices and are primarily used in food industries for food preservation and also for maintaining constant temperature at different points of the liquid movement. The following is the schematic of the heat transfer network of a typical food processing field.