

Thermal Design of Heat Exchanger

Ridh Engineering and Services LLP

Executive Summary



RIDH Engineering and Services LLP is specialized firm that design high-performance heat exchangers tailored for industrial application. We combine domain expertise with international standards to deliver robust and cost-effective thermal solutions.

Introduction

Thermal design of a heat exchanger is a critical engineering task that ensures the heat exchanger performs efficiently, safely, and economically. Here's a clear explanation of **why it is required** and what the **benefits** are

Benefit	Description
Improved Efficiency	Maximizes heat transfer per unit area and reduces energy consumption.
Cost Optimization	Saves capital cost (by preventing oversizing) and operating cost (by minimizing pressure drop and heat loss).
Reliable Performance	Ensures that the exchanger works under all expected conditions without frequent maintenance.



Benefit	Description
Safety and Compliance	Meets industry codes (e.g., TEMA, ASME), and ensures structural integrity under thermal load.
Longer Equipment Life	Avoids overheating, erosion, and thermal fatigue, thereby extending lifespan.
Scalability and Flexibility	Easier to upgrade or modify based on future process changes.



Objectives

To Achieve Desired Heat Transfer

The primary purpose of a heat exchanger is to transfer heat from one fluid to another. Thermal design calculates how much heat will be transferred, ensuring the exchanger meets process requirements (e.g., heating/cooling rates, outlet temperatures).

To Size the Equipment Accurately

Thermal design determines:

- Surface area needed for heat transfer
- Number of tubes, tube length, shell size
- Flow arrangement (counterflow, parallel flow, etc.)

To Ensure Energy Efficiency

Proper design minimizes heat loss, pressure drop, and pumping power, leading to lower operational costs.

To Avoid Undersizing or Oversizing

- **Undersized exchanger** may not achieve target temperatures and can damage downstream processes.
- **Oversized exchanger** wastes capital cost and occupies more space.

To Meet Safety Standards

High temperatures or thermal stresses can lead to material failure. Thermal design helps avoid such risks through appropriate temperature control and material selection.

To Handle Process Variations

It ensures the exchanger can handle variable flow rates, fluid properties, and transient conditions without failure.



Our Products

RIDH Engineering and Services LLP provide optimized thermal, hydraulic and vibration free design calculations of shell & tube heat exchangers, air cooled heat exchangers, double pipe exchangers, multi-tube exchangers according to the latest international codes and standards in HTRI for safety and reliability of our customers.

AIR COOLER HEAT EXCHANGER

Air cooled heat exchanger is a finned tube heat exchanger that uses the air as cooling medium. It requires a wide surface area for heat transfer hence provided with finned tube for increasing the heat transfer surface and compact design of construction area. Widely used as Aircooled heat exchanger.



SHELL AND TUBE HEAT EXCHANGER

Shell and tube heat exchanger consists of plain tube or finned tube to increase the thermal performance.

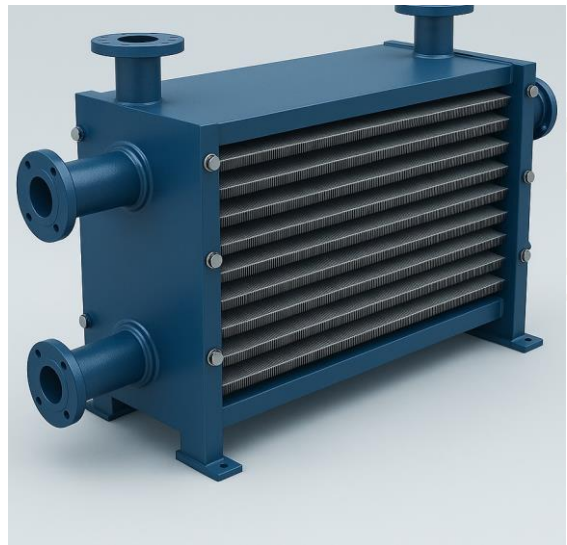
The fluid can be either liquid or gas, and one of each flows into the tube and the other flow out of the tube is used to boil, condense or cooling the fluid.



ECONOMIZER-RECUPERATOR

An average boiler operates with an efficiency of approximately 66%, which means that 34% of the energy can be considered waste heat. An economizer, also called regenerators, is a type of heat exchanger that recovers heat from flue gasses to preheat fluids or puts it to use in another part of the production process. This recovery process saves on fuel consumption and costs, as well as it reduces the CO2 emission.

Investing in an economizer increases the efficiency with 8%. Including both an economizer and an air preheater realizes an even higher efficiency of 20%.



STEAM AIR HEATER- STEAM COIL

Steam air heater or steam coil are designed for use with water, steam, or oil as heating or cooling medium. The heat exchangers are manufactured from individual elliptical or round finned tubes, or from smooth tubes, or as compact heat exchangers.

Services

- **Rating**
- **Designing**
- **Adequacy check for revamp projects**

