MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

Department of Mechanical Engineering

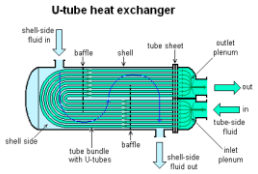
REPORT OF SKILL BASED MINI PROJECT

Heat and Mass Transfer (190513)

Title of Project :SHELL AND TUBE HEAT EXCHANGERS

Introduction: A **shell and tube heat exchanger** is a class of heat exchanger designs. It is the most common type of heat exchanger in oil refineries and other large chemical processes, and is suited for higher-pressure applications. As its name implies, this type of heat exchanger consists of a shell (a large pressure vessel) with a bundle of tubes inside it. One fluid runs through the tubes, and another fluid flows over the tubes (through the shell) to transfer heat between the two fluids. The set of tubes is called a tube bundle, and may be composed of several types of tubes: plain, longitudinally finned, etc.

Description of Model



There can be many variations on the shell and tube design. Typically, the ends of each tube are connected to plenums (sometimes called water boxes) through holes in tubesheets. The tubes may be straight or bent in the shape of a U, called U-tubes. In nuclear power plants called pressurized water reactors, large heat exchangers called steam generators are two-phase, shell-and-tube heat Surface condensers in power plants are often 1-pass straight-tube heat exchangers (see surface condenser for diagram). Two and four pass designs are common because the fluid can enter and exit on the same side. This makes construction much simpler.

Applications of Model

The simple design of a shell and tube heat exchanger makes it an ideal cooling solution for a wide variety of applications. One of the most common applications is the cooling of hydraulic fluid and oil in engines, transmissions and hydraulic power packs. With the right choice of materials they can also be used to cool or heat other mediums, such as swimming pool water or charge air.[5] There are many advantages to shell and tube technology over plates.One of the big advantages of using a shell and tube heat exchanger is that they are often easy to service, particularly with models where a floating tube bundle is available.[6](where the tube plates are not welded to the outer shell).The cylindrical design of the housing is extremely resistant to pressure and allows all ranges of pressure applications

What I Learned Through Project:

In shell and tube heat exchangers there is a potential for a tube to rupture and for high pressure (HP) fluid to enter and over-pressurise the low pressure (LP) side of the heat exchanger.[7] The usual configuration of exchangers is for the HP fluid to be in the tubes and for LP water, cooling or heating media to be on the shell side. There is a risk that a tube rupture could compromise the integrity of the shell and the release flammable gas or liquid, with a risk to people and financial loss. The shell of an exchanger must be protected against over-pressure by rupture discs or relief valves. The opening time of protection devices has been found to be critical for exchanger protection.[8] Such devices are fitted directly on the shell of the exchanger and discharge into a relief system.

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