

## 2. heat exchangers

### Shell and Tube Exchangers

A heat exchanger is a device in which two fluids flow against the opposite sides of a solid boundary wall which separates them while permitting heat to pass from the hot to the cold fluid. Of the various types of heat exchangers the shell and tube type is the most widely used in oil refineries and chemical plants. It consists of a number of tubes enclosed in an outer circular shell. One fluid flows inside the tubes and the other fluid flows outside them. This discussion will be confined to applications in which one fluid flows inside the tube and the other flows outside perpendicular to it.

The fluids considered here are those which do not change state—that is, all of the heat transferred goes into changing the temperature of

the fluid. The term *fluid* includes both liquids and gases. Units in which one oil gives up its heat to preheat another oil are known as exchangers and those in which oils are cooled by means of water are known as coolers. The following discussion applies to both.

### Construction

In heat exchanger design it is desirable to place the maximum number of tubes in the enclosing shell. Basically, a shell and tube heat exchanger consists of (1) a tube bundle which is circular in cross section and contains many closely spaced tubes, (2) a hollow shell which encloses the tube bundle and (3) baffles equally spaced along the tube length which have segmental cutouts at the opposite sides of successive baffles to cause flow back and forth across the tube bundle.

The simplest type of construction for a shell and tube heat exchanger is known as the fixed tube sheet type (Figures 2-1 and 2-2). In this type of unit the distance between the tube bundle and the inside circumference of the shell is at a minimum. The construction is simple, because the tube bundle is welded to the shell.

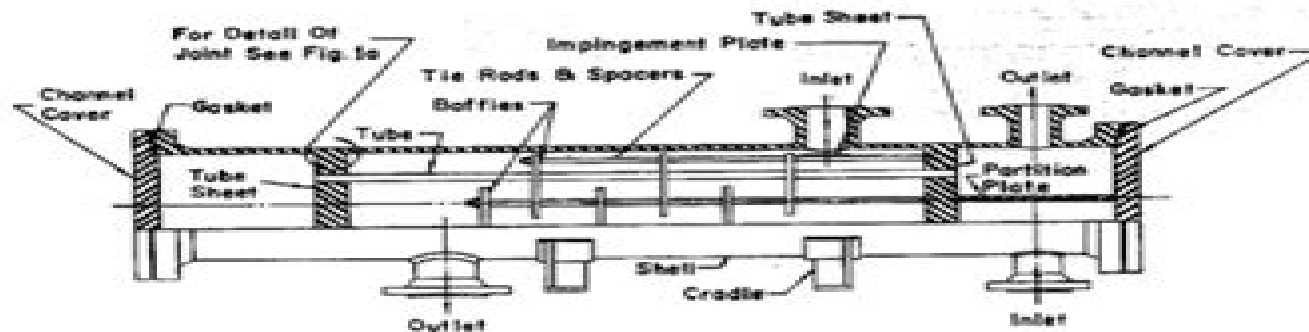


Figure 2-1. Fixed tubesheet exchanger.

# Heat Exchanger Design Handbook

**Ying Liu**



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