Best Practices for

Measuring Tube Bundles

Heat-Exchanger USA

Custom Heat Exchangers

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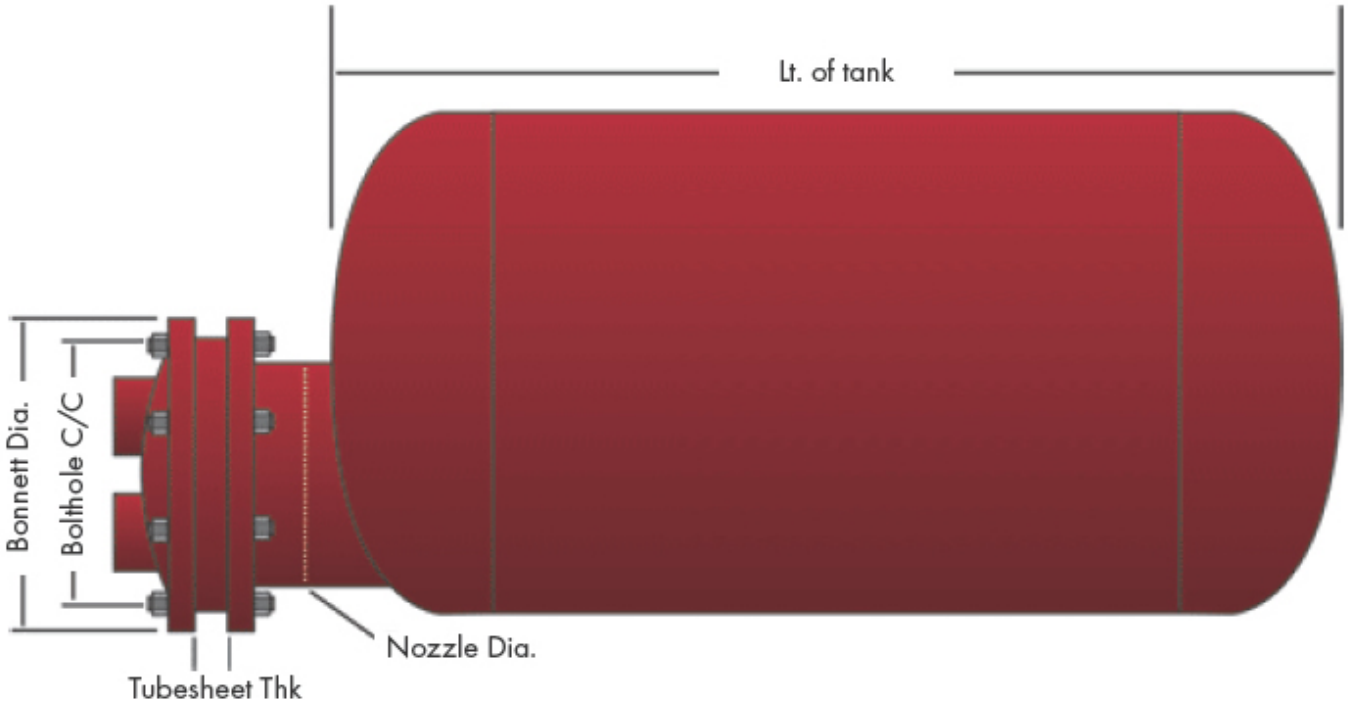
A lot of work and consideration can go into the installation of tube bundles and heat exchangers. With the effort and expense that goes into the equipment, clients will want to know that the measurements are accurate to ensure the proper operation and long life they expect from their equipment.

Measuring Up

Incorrect measurements in tube bundles can cause inefficiencies in the flow of liquid through the tubes, and can result in incorrect readings from the instrumentation. In order to ensure that installed equipment matches its specifications in the actual application, tube bundles must be correctly measured.

Tube bundles can include U-tubes or fixed tubesheet bundles for heat exchangers where the tubes cannot be removed. Tubes are made of various types of material. Copper and steel, are the most common, but carbon and stainless steel, as well as cupro-nickel and admiralty brass are also used. Other materials can also be used depending on the usage of the heater and the volume of water it will handle.

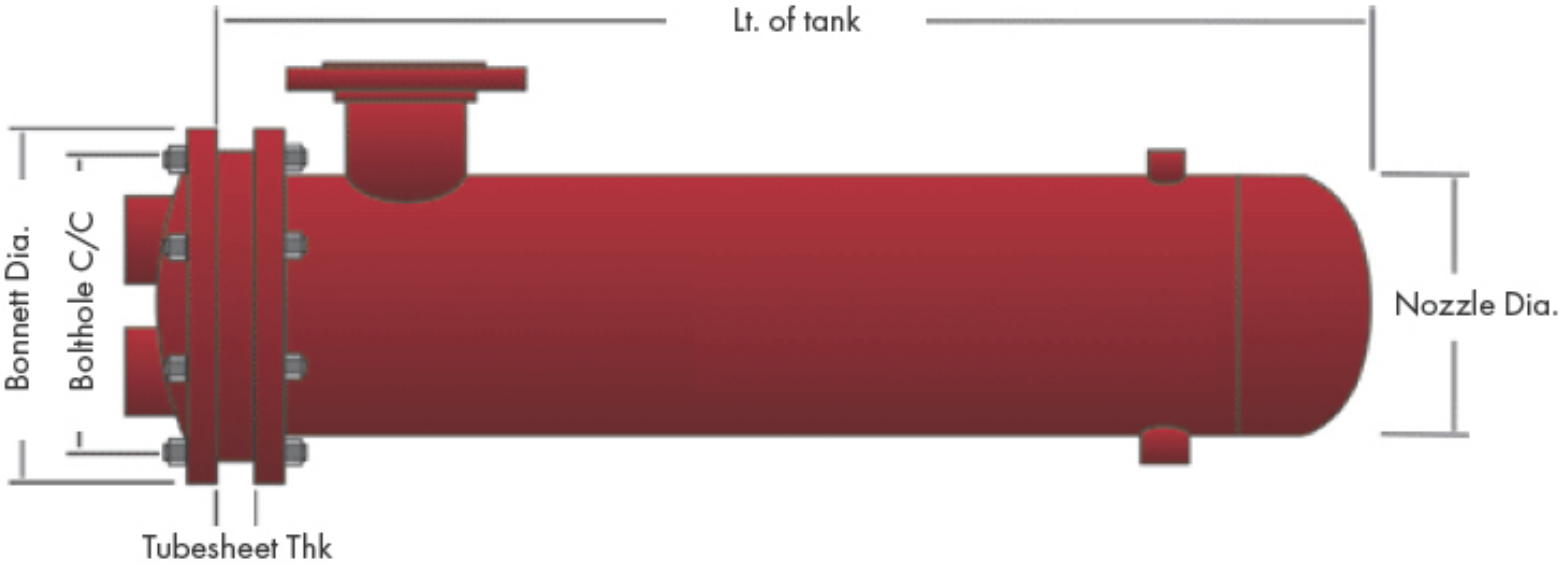
Tank heaters can be used for steam or hot water usage. They can be many different sizes and diameters, and require an equally diverse range of tube bundles. Length and diameter of piping affect the operation of the heater they are installed in. Problems with the installation may cause inefficiencies in the system or, worse, a risk to health and safety.



Components of a Tube Bundle

There are a number of parts that go into a tube bundle, and the following is a list of the components that may be required to be manufactured:

- "D" Bundle Diameter is the full diameter that is needed for a tube bundle to fit inside a shell or tank. The "D" Bundle Diameter includes baffles and tube supports. An easy way to measure the diameter is to take the circumference of the shell, then divide by 3.14 to give you the diameter of the bundle.
- Overall Length (OAL) is the length measured from the face of the tubesheet through the entire length of the tubes. This also includes the last bend in the tubes.
- Tubesheet Thickness can vary between 5/8" to 3" in thickness. The thickness you require will depend on the use and volume of the tube bundle.
- Tubesheet Diameter will always be larger than the diameter of the bundle itself. This allows the tubesheet to be properly fitted and still contain all the tubes in the bundle.
- Bolt Holes may or may not be present in a tubesheet. Many bolts that pass through the head and shell will pass around the tubesheet. In this instance, bolt holes are not needed and the tubesheet will be boltless. If bolts do pass through the tubesheet, it is very important to know the number of bolts, as well as the size of each bolt hole. An excellent way of measuring bolts is to pick two bolts that are directly opposite each other, then measure the distance from the center of one to the other.
- Baffles help direct the flow of liquid through the exchanger, as it passes over and around the tube bundle. To help properly regulate the flow, it is vital to know the number of baffles, the type of baffle, and the spacing between them. If baffles are not present, but there are tube supports, it's important to know the distance between and thickness of the supports, as they can also affect the flow in the exchanger.



- Tube Diameter affects the flow rates and amount of fluid passing through the tubes. Some common tube outer diameters include 3/8", 1/2", 5/8" and 3/4".
- Materials that make up tube bundles on heat exchangers can affect the way the exchanger works. Most HVAC exchangers use copper tubes, but other material can be used. Examples are cupro-nickel, carbon steel, and other exotic material such as titanium.
- Tube Thickness normally consists of 18-gage for copper tubes with a 3/4" outer diameter and 16-gage for 1 1/4" outer diameter. Different tube thicknesses are available if required.
- Straight Tubes are present in some exchangers, and have tubesheets at both ends. Simply count the number of straight tubes to find the number of tubes.
- U-Tubes are present in most replacement bundles. To find the number of tubes in a U-tube bundle, simply count the number of complete "U"s.
- Shell/Sleeve Diameter is important, since it is needed to determine the size of the assembly inside. When ordering tube bundles, ensure that the inner and outer diameter is specified to ensure proper fitting.
- Number of Passes through the exchanger can be determined by looking at the tubesheet. Most tube bundles have 2 passes, but can also shave 4 or 6 passes.
- Tubesheet Material is normally carbon steel, which is a highly economic material to use. Other materials can be used as needed, such as stainless steel, titanium, copper and more.