10 Tips on Getting the Most from your Coil

When searching for a new heat exchanger, consider a custom-designed coil. The following tips will help you determine if a custom-designed unit will benefit your process.

Heating and cooling coils are offered as of-the-shelf standard units or can be designed to fit a specific application. At first glance, a coil does not look complicated, and attempting to enhance its performance may seem unnecessary and impractical. But in some applications, custom-designed coils allow you to meet stringent process heating demands and minimize performance problems. Before specifying a new coil, consider the following tips to determine if a custom-designed unit can provide benefits to your process.

Keep Performance in Mind

A coil has no moving parts, and no performance-improving adjustments are required – and a few can be made – once it is installed. It must be built with the required performance in mind. Therefore, performance optimization at the de sign stage is critical.

Consider a Variety of Materials

Assess the coil's operating environment, including both the external and internal environments so the proper materials and coatings can be selected. Other factors to consider include the temperature and pressure to which the tubes and fins will be subjected. Coils can be designed and built with the standard copper tube/aluminum fin construction or with other materials such as aluminum, copper, carbon steel, stainless steel, cupro/nickel, Hastelloy, or titanium. In addition, various coatings can be applied to enhance corrosion resistance.

Recognize Material Affect on Performance

A material's thermal conductivity largely determines a coil's total heat transfer capability. Of the materials listed above, copper tubes provide better heat transfer than steel tubes, and aluminum and copper fins provide better heat transfer than steel fins. Therefore, if the application requires steel components to withstand corrosive, high pressure or high temperature environments, the coil must be made larger than a coil using more heat-transfer-efficient components.

Consider Coil Shape

The basic shape (length, width and thickness relationship) is determined by the envelope into which the coil must fit. Usually, there are height, width or depth restrictions inherent to the installation that defines the space available for the coil. Therefore, this also should be an initial consideration in the coil's design.

Optimize Heat Transfer

The purpose of a coil, or finned tube heat exchanger, as it sometimes is called, is to transfer heat between two mediums while isolating those mediums so they do not mix. To achieve heat transfer, there must be:

- A temperature difference between the two mediums.
- A pathway made of material that allows conduction of heat so it can be conveyed from one location to another.
- A means of exposing the heat to the fluid medium.

If any of these items are lacking, heat transfer will not occur. This is reflected in the basic relationship from which all heat transfer equations are derived. Changing any one of these values affects the amount of heat that is transferred.

$$Q = U \bullet A \bullet \triangle T$$

Where:

Q is the amount of heat transferred over time (BTU/hr)

U is the heat transfer coefficient (BTU/hr-ft^2 - °F)

A is the heat transfer area of the fin and the tube material exposed to the mediums

$\triangle T$ = the Temperature difference between the mediums (°F)