GRAHAM
ENGINEERING ANSWERS

Heliflow Heat Exchanger Applications

High Pressure Application

What is a High Pressure Application?

High pressure applications are when the operating/design pressures exceed 1,000 psig. The Heliflow heat exchanger becomes an attractive alternative to the traditional shell & tube type as the pressures exceed this threshold. Please consider the Heliflow for these higher pressure applications.

Graham Heliflow Overview

The Heliflow Heat Exchanger is a compact, helically coiled shell and tube heat exchanger. The spiral, countercurrent flow path enhances thermal efficiency, reduces fouling, and delivers exceptional heating and cooling in a fraction of the surface area of standard shell and tube exchangers. Large temperature gradients and close approach temperatures are possible due to the 100% countercurrent flow configuration.

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The Heliflow Heat Exchanger is a very economical and efficient choice for heat transfer applications involving high pressure streams on either the tube side, shell side, or both. The unique spiral coil design allows the tube side to accommodate pressures to 15,000 psig without excessive material thickness or difficulty in manufacture. In most high-pressure applications a single process stream is at elevated pressure while the utility stream uses a reduced, nominal pressure fluid. The high-pressure stream is directed to the tube side where, using the application's required alloy, the coil design will mitigate the use of heavy wall components. In addition, due to the relatively small size and circular shape of the shell, it is possible to custom design units that are able to accommodate shell side pressures up to 5000 psig. Graham's exclusive WeldSeal shell design eliminates the gasketed shell joint and reduces the size and weight of the unit when accommodating a high-pressure shell side stream.

High Pressure Application

Heliflow Design

The helically coiled Heliflow Heat Exchanger uses a range of small diameter tubes in various quantities coiled together in an Archimedean spiral shape to produce adjacent tube and shell side flow paths that allow for true counter-current flow. In lieu of flat tubesheets, the Heliflow uses round bar or pipe manifolds as the terminals of the tubing thus allowing for significantly higher tube side design pressures than typical straight shell and tube heat exchangers. The tube bundle shape also allows for a compact, circular shell side design that is advantageous when required to accommodate a high pressure stream on the shell side. Graham has also incorporated our unique WeldSeal design shell where there is no bolted joint in the shell design. This design eliminates a heavy flanged joint with large bolting and reduces the thickness and diameter of the endplate, resulting in a lighter, more compact unit than is typically associated with higher design pressures. The Heliflow is also compatible with many specialty, high-pressure connection components that will allow the unit to be plugged into the customer's arrangement without field modification.

Potential Applications

Heat exchangers are a crucial part of refinery, petrochemical, food and beverage and power plant operations. Therefore, engineering companies often have decision rights for heat exchanger selection in grassroots plants, plant revamps and plant expansions. Heat exchangers intended to operate under very high design pressure requirements, because of the potential size, can have additional impact on equipment layout considerations. Also, Graham can easily size an appropriate Heliflow Heat Exchanger to replace existing high pressure units if the operating conditions are available.

Reliability

Heliflow Heat Exchangers offer outstanding operating reliability. The effects of fouling and high temperature scaling are minimized by the turbulent flow and mixing induced by the spiral fluid passages. On a standard, low-pressure shell design the casing can be easily unbolted and removed, which allows for the thorough cleaning of the coolant side. The removable casing also allows for quick and easy replacement of the tube bundle, if necessary. The Heliflow design is ideal for high-pressure and high-temperature heat transfer applications. The spiral tube bundle eliminates the thermal expansion issues that plague shell and tube heat exchangers because the tube bundle is allowed to expand and contract, the thermal stress on the material and the welded joints of the bundle is minimized. This allows for extended unit life even under the demanding service of high-pressure applications.

Figure 1. Special spherical design for 4,000 psig application

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