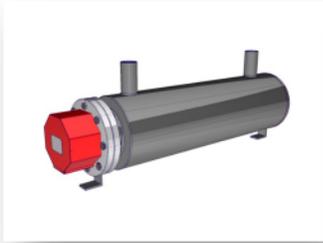


Industrial Heaters

There are many different types of heaters in WATTCO™ product lines. Despite many names that are used, they are more or less categorized to 2 or 3 groups. The immersion heaters is one category that predominantly represent many sub groups such as flanged, screw plug, circulation/inline, and over-the-side heaters. Other heaters are also more or less immersion type of heaters, directly or indirectly, in



terms of operation styles. There are, however, a few peculiar heaters that are different in design or functionality: i.e. strip heaters and band heaters in terms of shape; as well as infrared radiant heaters and silicone rubber heaters in terms of functionality and design. These heaters are somewhat less common but deserves nonetheless a special attention.

The strip and band heaters are called component heaters correspondingly in the shape they appear. The strip heater is a long strip of metal that are usually attached on the surface of the vessel container to effectively heat up the container with an excellent heat transfer capability. The heater is



designed by inserting heating elements in a protective sleeve or sheath to maximize the heating surface area. The band heaters bring the same concept in design except that the heater is in a band shape so that it could cover around a tubular shape of containers or a cylindrical shape of pipes, large or small, to transmit the heat through the surface of the area it covers. These heaters typically involve indirect heating (meaning they don't come in contact with the medium), but at times also installed in a direct heating (immersed directly into the medium) application.

In a variation of design approach, the silicone rubber heaters are not the typical heaters that can be seen in the form of a conventional appearance. The heater is composed of silicone rubber that is reinforced with fiberglass, and resistant to moisture and chemical. It is used for medium to low temperature applications that require the flexibility of irregular shape, size and dimension. As flexible as the silicone rubber is, it can also withstand the mechanical shock and vibration. The silicone rubber heaters are constructed by sandwiching the heating resistor between two "wafers" of silicone. As is the

case with strip and band heaters, the silicone rubber heaters are used in an application that require a direct attachment on a surface, which is uneven or irregular in shape (i.e. barrel or conical).



On the other hand, the infrared radiant heater is rather a different breed in that it is designed for comfort heating through a direct infrared heat transfer of indoor/outdoor applications as well as exposed areas. Unlike other heaters that WATTCO™ design, which are mostly for heating some form of liquid medium, the primary function of infrared radiant heaters is to emit radiant heat to keep warm an open space areas such as auditorium, gymnasium, ice rink, parking garage, or any of the large open area. These heaters are equipped with tubular heating elements that can reach high temperature. The heating elements are encased in a high grade stainless steel sheath to prolong the life of the heater.

All these heaters are of the same principle with different purposes and/or applications in that the only commonality of these heaters is that they are electric powered. Even so, these heaters are the example of how WATTCO™ can design heaters to various specific approaches that require customized solution. More information can be found at www.wattco.com.