

Selection Guide

Heater construction is selected on the basis of the following criteria:

- **Space Available** for both elements and headers. If a great deal of heat must be concentrated in a small volume, one heater with multiple elements should be used. If it is desirable to distribute the heat over a large volume, multiple heaters should be installed at intervals along the vessel.
- **Watt Density**, or watts per square inch of element surface area, compatible with the fluid heated and the maximum fluid temperature. See Table I for recommendations. The lower the watt density required, the larger the physical size of the heater.
- **Structural Strength** of the vessel, both for supporting the heater(s) and to maintain system pressure.
- **Controllability**, to determine how closely the temperature will be maintained. In addition to the selection of a control system it is often necessary to stage the heater to achieve good control. Distribution of heat also affects controllability.

Application Factors

Carry-over - Avoid contaminating the process with chemicals carried over from other processes. This can be particularly critical in plating and cleaning lines where parts may be dipped successively in different solutions.

Sludge - Be sure that heaters are located above the point of maximum sludge buildup since sludge will insulate the heater from the solution and cause premature failure.

Temperature - Control the process temperature as closely as possible. Excess temperature reduces heater life.

Heater Cycling - Match the heater wattage as closely as possible to the actual load requirements to limit on-off cycling.

Galvanic Action - Between the heater and adjacent metallic surfaces will cause premature heater failure and may similarly corrode the tank.

Maintenance - Routine heater maintenance will help prevent small problems from becoming serious. Heaters should be examined at regular intervals for corrosion and scale buildup.

Iron Content - In critical processes where no trace of iron can be tolerated, stainless steel heaters can be passivated with nitric acid before installation.

Headers - In some applications, the header material can be as critical as the sheath material. In those cases, specify the header to match the sheath and specify "welded joints" if the solution will attack silver solder.

Calculating KW Capacity

In general, KW capacity will be determined by one of two factors: the heat required to bring the process up to temperature, and the heat required to maintain the process at operating temperature. Both requirements must be calculated; heaters are selected on the basis of the method that results in the higher KW rating.

For assistance in calculating the KW capacity for your job, consult your local INDEECO representative.

Watt Density And Sheath Selection

Watt density and sheath material are the two most critical factors affecting immersion heater life. Watt density (watts per square inch of heater surface area) determines heater operating temperature for a given set of fluid conditions. Sheath material similarly determines the rate of corrosion. Both vary with fluid temperature.

Table I has sheath materials recommended for each fluid and temperature. Those with an "A" rating have the best corrosion resistance, a "B" rating indicates fair resistance. Where a range of watt densities are shown, the lower end of the range represents a more conservative design.

The maximum watt density shown is 75 watts per square inch. In some applications, even higher watt densities may be suitable depending upon the details of the application (fluid velocity, contaminants in the fluid, space between elements, etc.). Consult your local INDEECO representative if a higher watt density is desired.

Since we specialize in custom-built industrial heating equipment, INDEECO can review your applications that are out of the ordinary, including heaters for immersion in fluids not shown in the table.

While Table I represents our most current knowledge, many application factors are beyond our control. Thus, this table should be used only as a guide. INDEECO cannot be responsible for heater failures due to corrosion.

