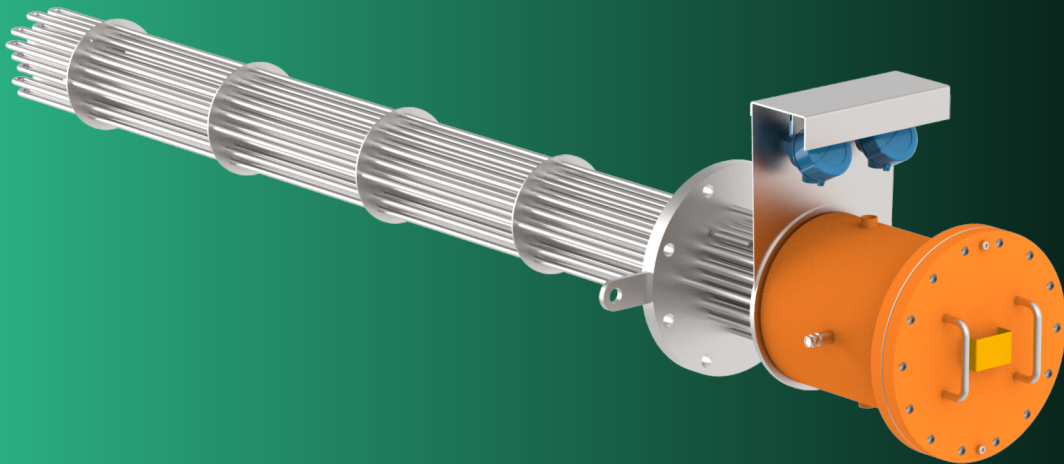


IMMERSION HEATER



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For any Production / process facility, when a large volume of fluid to be heated before pumping out to process application, the Immersion Heaters are always the best recommended solutions.

A single bundle or multiple smaller units can be installed in the Tank for the uniform heat transfer and steady heating of the fluid with all safety precautions in built within the heater and control system.

Some of the precautions to be taken while designing and selecting an Immersion heater are :-

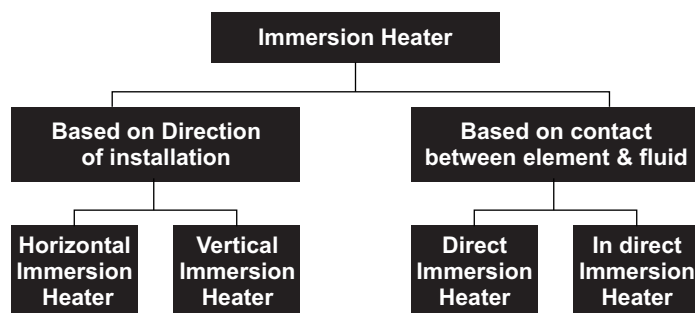
- Selection of right material for the wet parts to avoid

potential corrosion from the fluid to be heated.

- Proper cold length & active length ratio to avoid hot spots & dry heating.
- Element skin temperature within flashpoint limit of the fluid to avoid any hazard. A Proper thermal design is very much necessary whenever heating a flammable fluid or in hazardous area installation.
- Fixing method & support for the bundle considering the turbulence during the in & out flow.
- Control system for the both element skin & fluid temperature.

Types of Immersion Heaters

The Immersion Heaters can be broadly sub divided as below



Direct Immersion Heater : An Electric Heater bundle in which the heating elements will directly immerse into the fluid to be heated are known as direct immersion Heaters.

The Direct immersion heaters are compact sized heaters with direct heat transfer, makes it very effective method of the heating large volume of stored fluids.

The Direct Immersion Heaters can further designed as

Horizontal Installed : Known as Horizontal Immersion Heater. Usually installed little above the bottom of the tank (always below the lowest fluid level)

Vertical Installed : Known as Vertical Immersion Heater. Usually installed from the top of the Tank. A proper design is important to ensure correct cold length to avoid hot spot and dry heating in this design.

Vertical Installed with Horizontal heating : A special designed heater bundle with is installed from the top using a flange or Threaded connection. The cold portion of the elements will be vertical up to minimum oil level. The active areas of the elements are bent at 90 deg so that it always remains immersed in the fluid (similar to that of a horizontal immersion heater)

The mounting arrangement can be with a Flange or with a Threaded Nut assembly based on the rating and application. The heater can be designed for both Safe area installation as well as hazardous area installation.

The direct Immersion heaters are most recommended due to its fast heating and compact sizing,

IN DIRECT IMMERSION HEATER

There are many fluids in which installation of a direct immersion heater remains a challenge. While in some fluids the heating elements fails within few days of installation due to corrosion caused by the fluid, there are also a risk associated with the skin temperature and flash point of the fluid. Some unforeseen overheating or flashover may result in the accident (if control is not adequately supportive).

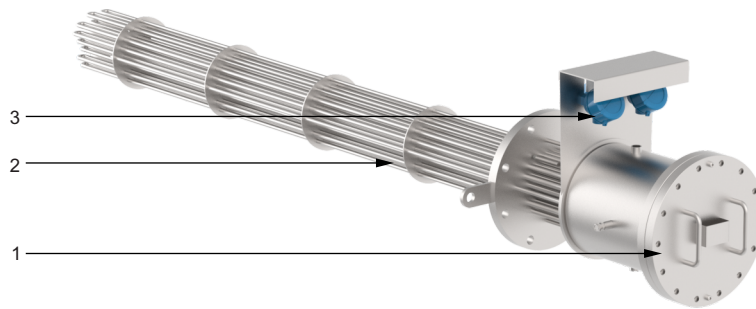
For all such applications, Marathon heaters have designed "IN DIRECT IMMERSION Heaters".

The heating elements are fitted to thread Nuts and are placed inside a Casing Pipes welded to the heater flange. Thus the heating elements will never be in direct contact with the fluids. The heat transfers to the fluid through the

thick casing pipe wall, which will be heated by the elements present inside. The Bundles are mostly used in Horizontal installation in both safe area as well as hazardous zones. The System provided full safety from any over heating & flash over inside the tank.

Another advantage of in direct Immersion heater is < even in case of any failure of the single element, the replacement can be done without draining the tank. Hence the down time & cost of maintenance spares are reduced to a great extent.

Construction



Typical heaters are made of below listed parts.

1. Terminal Enclosures : The Design of terminal enclosure changes based on the area of installation (safe or hazardous) Marathon flameproof heaters are certified to install in hazardous area Zone 1 & 2 , Gas group IIC, IP66 The Terminal enclosure is designed to protect the terminals of the individual elements from external impact, such as dust, moisture etc and to facilitate the connection of Incoming power supply to the heater bundle. The enclosure can be flameproof construction, in case the heater is installed in hazardous area.

2. Heater Bundle : Consist of No. of U Pin heating elements adequately supported by set of Baffles & Tie rods, designed to deliver the specified temperature at outlet by maintaining the element temperature & pressure drop within the safe limits.

Heating elements can be fixed to heater flange by means of standoff sleeve pipes with brazing or by direct welding or by means of threaded couplings.

Heat duty of a bundle can be divided in to many sub groups (banks) based on process conditions. This will help in better control as flexibility in the operation.

3. Temperature Sensors : The Heater bundle will have Element skin temperature sensors for monitoring and regulating the Element skin temperature within the limits. The Unit may also need additional sensors such as Tube sheet Temperature Sensor, Terminal Box Sensor, vessel Body temperature sensor and process fluid Temperature sensors

based on case to case. The Sensors used for the system will be certified in accordance with the area of installation.

The Temperature sensors are Typically RTD or Thermocouples. A simple heater bundle can also be controlled using Thermostat protection for skin & process temperature.

If the Operation pressure is High, It is recommended to have a PSV (Pressure safety Valve) installed within the Heater Vessel as an additional safety measure.

4. Control Panel : Heater controls Panel are designed to monitor & control the operations of the heater bundle also to ensure the safety of the equipment and operations.

The control logic can be either ON/OFF (contactor) or regulated (Thyristor) or combination of both in a single panel.

The control panels can be installed in both safe area & hazardous area by following respective design guidelines & certification requirements.

The Control Panels are provided with various indication systems such as Power ON, Heater ON OFF, Trip, High Temperature etc for comfortable handling of the process. The Temperatures of Elements, Process fluid & other areas (with sensors) are displayed on the Panel for better monitoring & awareness.

Control Panel will also have safety interlocks such as high element temperature, Earth fault, process over temperature etc along with Emergency stop access for the safe operation and control.

Technical Specifications

Rating	From 0.1 kW to 5000kW (Max) in Single Bundle or combination
Design Temperature	-40 deg C to 650 degree C
Design Pressure	Upto 350 bar(g)
Element outer sheath	SS , Alloy 600 series, Alloy 800 series, Hastelloy, Titanium, copper etc
Heating Elements:	Mineral filled insulated Heating Elements or Tubular heating Elements with Ni-Cr (80-20) as heating Coil and suitable outer sheaths.
Terminal Enclosure*:	As required (Weather proof or Flameproof).
Control System	Thermostat control / Contactor control / Thyristor control / combination
Protections & control:	Element Skin Temperature controls process temperature control Earth leakage protection. Overload current protection. Temperature class Protection (for Hazardous area only)
Installation:	Horizontal / Vertical / direct / indirect
Certification:	Will be provided based on Requirement. (U, U2, ATEX, IEC Ex, CCOE, etc)

Advantages

- Heaters can be used for quick heating of small volume storages as well as for heating large volumes with longer operational hours
- Widely used for heating high viscous fluids (Bitumen, HFO etc) and reduce the viscosity before pumping out
- Environment friendly design. No hazardous gas / smoke/ emission from the system.
- Precision Temperature control
- Can be accommodated in small foot prints.
- Custom designed to meet specifications.
- Highly energy efficient and provide maximum dielectric strength.
- Compatible with standard industry piping and safety standards.
- Reliable design
- Easy to operate and maintenance friendly
- Energy Saving.
- No need to drain the tank for any repair / replacements in case of indirect Immersion Heaters.

Application

- At large Storage Tanks for pre heating of thick fluids.
- Oil Heating (crude, Thermic fluids, and other Process fluids etc in storage tanks)
- Water heating applications & vaporizer System.
- For reducing the viscosity of the fluid and make it suitable for pumping out.
- Steam Boilers.
- Oil cooling systems & compression packages
- Edible oil heating for food industries.

Industries We Serve

- Oil & gas facilities.
- Refinery & petrochemicals
- Crude oil, Bitumen & other oil storage facilities.
- Aluminum plants & Auxiliary Units
- Power plants
- Food & beverages
- Chemical & fertilizers
- Water treatment facilities
- OEM's (compressor, skids, boilers etc)
- Nuclear & defense
- Steel plants & auxiliary units for oil heating in storage
- R&D