Marathon
Tempsens

ENGINEERED SOLUTIONS FOR HEATING & SENSING

ISO 9001-2015

PROCESS HEATING SYSTEMS

For Hazardous and safe area installation

www.marathonheat.com

About the Company

MARATHON HEATER (INDIA) PVT. LTD is a part of **Tempsens** group which was established at Udaipur, INDIA. Today tempsens is one of the largest manufacturer of temperature sensors & heaters with world class manufacturing facilities in India, Germany and Indonesia.

Tempsens is an ISO 9001:2008 certified company with NABL Accredited Laboratory.

The company is involved into manufacturing of Thermocouples, RTDs, Thermowells, cables, Non-Contact Pyrometers, Heaters and Calibration Equipment etc. with Covered Area of 36,000 Sq. Ft.

MARATHON HEATER (INDIA) PVT. LTD Equipped with modern infrastructure, innovative technologies and a dedicated team of qualified Engineers, we have evolved over the past years to become one of the most trustworthy manufacturers of Industrial heating solutions. Marathon continues its constant endeavor of delivering solutions for critical and challenging process requirements.

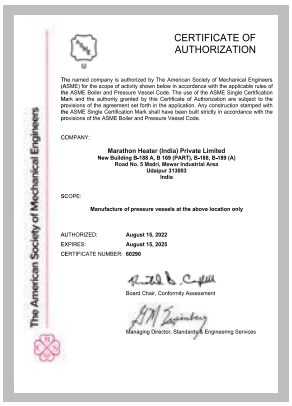
We are constantly looking for ways to improve not only our products but also maintain order processing, design process and product literature. Quality and customer satisfaction were and will always be our prime motto.

We design, develop and manufacture Electric Heaters (Electric heat exchanger) for various processes in the Oil and Gas Industry, Refinery, petrochemicals, power, chemical, Marine and various other industrial and process applications.

Our well experience Technical team also provides extensive support to privileged customers with Electric heaters required for Research and development purpose.

Marathon Heaters also manufactures Metallic Elements, high temperature furnaces, Industrial ovens, Temperature sensors as per customers required and international specifications.

Certificates



'U' Stamp Certified

'R' Stamp Certified

ATEX Certified

EAC Certified

IECEx Certified

UL Certified

ISO 45001-2018 Certified

Vision

To exceed the expectations of customers, employees and society where we operate has always been our top priority.

We are one of the leading thermal solution provider in the world. We are attempting every day challenging applications, Improving our facilities and products.

What makes a difference in our company is that we treat each detail with a lot of responsibility.

The Marathon Offer

Marathon is Worlds reputed brand of Electric heaters and heating Technology, which provides a wide range of technical solutions and products and service support for all kinds of heating applications.

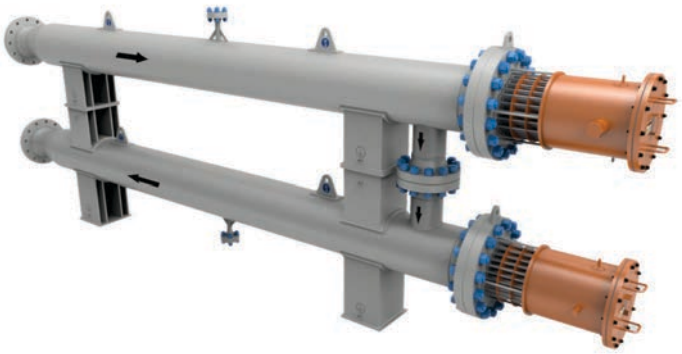
Marathon's Product range offers various types of highly engineered and technically proven Heaters solutions to fulfill wide range of applications and even to exceed your performance needs.

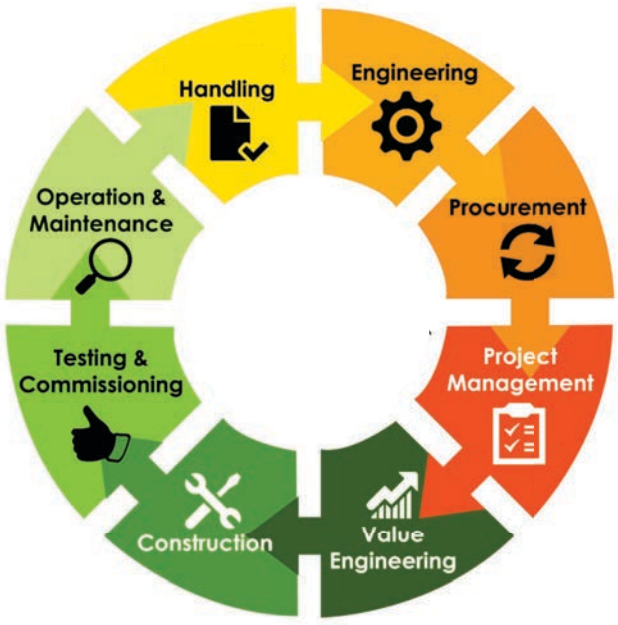
Products

Our product ranges are useful for both Process heating applications as well as Solid component using requirement.

Marathon Process heating systems or Electric heaters are widely used in Process heating application in Oil and Gas, refinery, Petro chemicals, Power, Marine, R & D and nuclear applications. Tailor made design as per customer's process requirements and in accordance with international standards also equipped with Thyristor control Panels gives a efficient performance and long life.

Marathon Metallic heating elements, bundle rod and furnaces are widely used by reputed customers globally for metal heating applications, Heat treatment process, glass industries, plastic heating etc.





Service

Marathon is a solution provider to its clients with its effective engineering of the products, effective project execution followed with excellent service Support. Our Well trained Engineers are available to support the various needs of customers on-line as well as site visits.

We also take pleasure in supporting the customers for the process evaluation, energy consumption, productivity and quality improvement programs.

Marathon provides extensive support in complete engineering, procurement, and supply and installation of the heating systems for any new project as well as replacement projects.

Many customers are benefitted by Marathons Service and support in replacing the gas-fired heating system or Shell and tube Heater with Process electric heating system

Electric Process Heaters

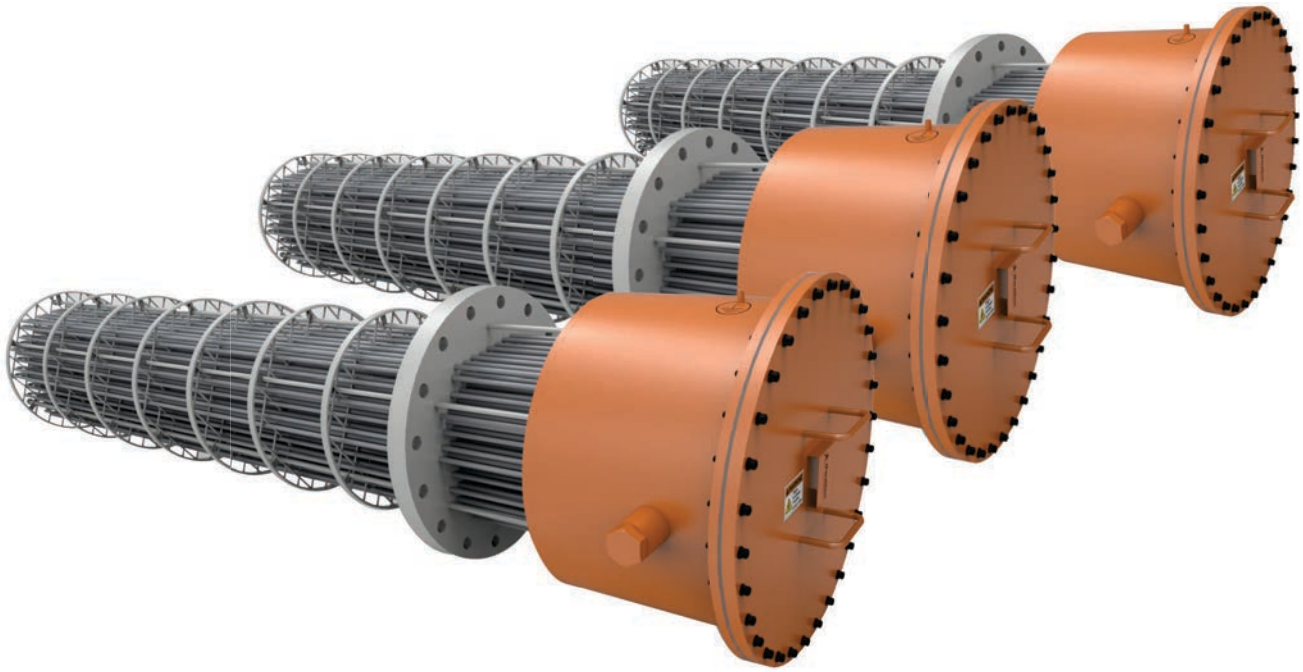
Electric process heaters, popularly known as tubular heaters or electric heat exchangers are very similar to shell and tube heat exchangers, except that fact that heating energy is provided by the electric power flowing inside the tubes or heating elements.

Multiple numbers of mineral filled sheathed heating elements (tubular heating elements) will be installed into Baffle plate assembly and inserted inside the pressure vessel.

Once energized, the electric energy converted into heat and transferred to the fluid which will flow through the vessel from inlet nozzle to outlet.

Marathon designs complete thermal process and strength of the vessel using proven Software.

For accurate control and safety, each heater will be controlled by a dedicated Thyristor control Panel. Marathon is also expertise in designing and supplying such panels as a part of complete Process heating system.



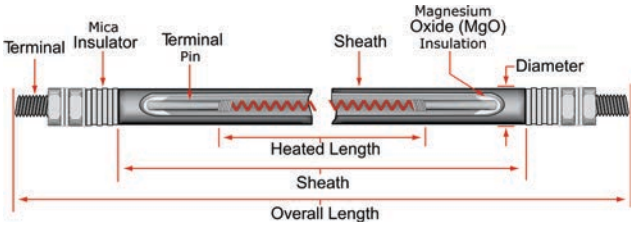
Tubular Heating Element

Tubular heating element consists of a resistant nickel chromium wire type 80/20 inserted into a protective metal tube (outer sheath) filled with high purity electro-melt Magnesium oxide (MgO). The assembly will be compacted by rolling/swaging process to ensure excellent heat transfer. Each edge of the sheathed component consists of a non-heating zone, where the electrical connection is made.

The electric heater is custom-made with a maximum length of 10500 mm, along with different diameters (8, 11, 12.50, 13.50& 16 mm).

Material of construction : Steel (ERW and seamless)

Stainless as per ASTM Grade 304/304L/310/316/316L/321 Alloys 600, 625, 640, 800, 825, 840



Heater Bundle – Construction

A complete heater bundle design and construction depends on various factors such as operation data, Process condition, Installation site condition, Standards and specifications, governing laws and regulations, certifications etc.

Marathon Heaters give high priority to ensure the proper design and selection of heater flange size and material by using proven design software Outcoming Results are also often verified and approved by depended consultants, notified bodies etc.

In general, a Heater bundle consists of

- Heater flange
- Heating Elements
- Baffle Plates and Tie Rods assembly
- Terminal Enclosure
- Temperature Protection sensors

Heating Element to Heater Flange Connection Types

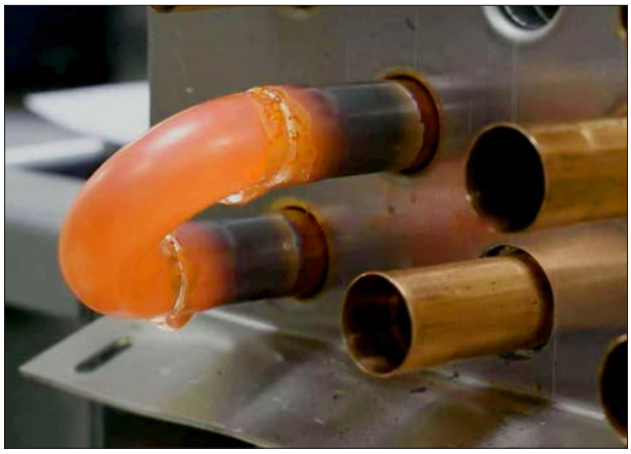
The heating elements are connected to the heater flange by several methods. Below illustrated are few highly recommended methods. It is important to select most desired method of connection based on the design recommendation and process requirements.

Stand Pipe Construction with Brazing

This is the traditional way in which tubular heaters are passed through seamless pipes welded to the main heater flange and Terminal box end plate.

The pressure sealing is done by means of brazing or welding between Sleeve pipe and heating elements. This method is suitable for non-critical application with low pressure/low temperature applications.

This method is not recommended for the hazardous area applications.



Bite Coupling of Heating Elements to Heater Flange

This Is the specialized design in which tubular heaters are connected to the heater flange by means of metallic ferrules and Nut assembly.

The pressure sealing is done by means of SS ferrule followed by Nuts tightening as per recommended torque.

This method is widely used for the construction of heaters in which welding/brazing are not recommended.

Direct Welding of Heating Elements to Heater Flange

Direct seal welding of the heating elements to heater flange is achieved by specially designed joint in accordance to the ASME standards.

The highly precise welding is carried out by qualified welders and evaluated by Third parties and consultants,

This is highly recommended for process heaters and hazardous gas heaters.

Baffle cage Assembly

The Main purpose of the baffle assembly in a heater bundle is to ensure the smooth heat transfer from heating element to process fluid within allowable pressure drop. At the same time the baffle cage also support the heating elements from sagging and other mechanical damages.

Marathon provides several varieties of baffle plate designs to choose. Best suited model will be selected based on various factors such as allowable pressure drop, element skin temperature etc.

Rod Type Baffles

Segmental Baffle Assembly.

Pressure Vessels

Pressure vessels in which electric heater bundle are mounted are generally designed and constructed in accordance with ASME Sec VIII div 1 or div 2 code. Marathon offers the heater vessels generally constructed from below materials

- **Carbon Steel :** SA106 / SA 516 Gr 60/ 70 / SA 105.
- **Low carbon Steel :** SA 333-6 / SA 350 LF2.
- **Stainless Steel :** ASTM SS304 /SS310 /SS316 /SS321.
- **Alloy Steel :** P11/Alloy 800/ Alloy 600 / Alloy 625.

Process Heater Applications

Marathon supplies Electric heaters to wide range of industrial segments for various process and applications. We are proud of our capability to supply some of below listed applications of yours.

Refinery & Petrochemicals

- Continuous catalyst Regeneration heater (CCR)
- Isomerization heaters
- Sulphur Recovery Unit (SRU) heaters
- Chlorination heaters
- Regeneration heaters
- Air heaters
- Reduction heaters
- Fuel gas heaters
- Seal gas heaters
- TEG re boilers heaters
- Mole sieve regenerator heaters
- Steam super heaters
- Methanol heaters
- Separation heaters
- Crude oil heaters
- KO drum heaters (Immersion and external)

Chemical Applications

- Air separation heaters
- Defrost heaters
- Bake out heaters
- Thawing heaters
- Hot oil re-circulation heaters
- Reactor start up heaters
- Catalyst circulation heaters
- Amine re-boilers
- Heat tracing
- Steam boilers & super heaters

Pharmaceutical & Cosmetics

- Hot oil heaters
- Line heaters
- Heat tracing
- Steam boilers and super heaters

Power generation & compression

- Fuel gas heaters
- Combustion air heaters
- Turbine house blowers
- Lube oil console heaters
- Anti-condensation heaters
- Energy dissipation units
- Heat tracing
- Fuel oil pre heaters
- ESP & Hopper Heaters
- Duct Heaters

Air separation Unit (ASU)

- Thawing heaters
- Reactor heaters
- Regeneration heaters
- Vaporizers
- Derime Heaters

OEM's

- Oil Immersion Heaters
- Water Immersion heaters
- Air heaters
- Vaporizer heaters
- Al. melting furnace heaters
- Diesel tank heaters
- Storage tank heaters

R & D applications

- Molten Sulphurheater
- Heavy oil Heaters
- Steam generation heater

Other Industries Served

- Nuclear
- Marine
- Aeronautical
- Rail Transportation

Continuous Catalytic Regeneration (CCR)

Continuous Catalytic Regeneration (CCR) is a Part of the process used in the production of petroleum and petrochemicals. The CCR process produces aromatics from naphthenic and paraffin, After being heated to reaction temperature 495 - 535°C (923 - 977°F), hydro-treated naphtha is merged with recycled hydrogen gas.

There are several applications in a CCR process that require the use of electric process heaters. Because the chemical reactions are endothermic (i.e. absorb heat), multiple heaters are required at various stages in order to increase the fluid temperature at the proper level and to achieve successful chemical reactions. The heater designs generally governed by licensor specifications such as UOP, axens etc.

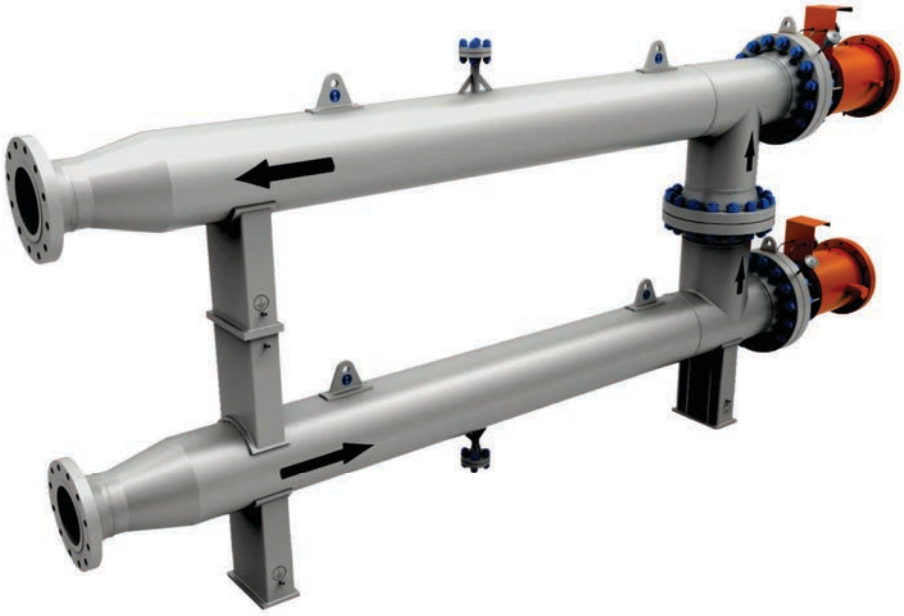
- **Material of Construction for CCR Package heaters**
- **Heating Elements :** Alloy 800 seamless tubes or SS 321 seamless Tubes.
- **Pressure Vessel :** P11 / SS304 /SS316/SS321
- **Certification :** ATEX Ex'd" (Flame proof) / ASME U stamp / any other based of regional requirements
- **Temperature Range :** Operating temperature range of 10°C - 600°C (50°F - 1112°F).
- **Heater Rating :** from 1 - 10000 kW.

Marathon's Design Speciality

- Marathon electric process heaters have compact design.
- Virtually 100% efficiency
- No risk of fouling that creates a need for frequent cleaning.
- Effectively controlled by well-designed Thyristor Control Panel.

There can be a number of reactors depending on process requirements. Some commonly known electric heaters for these reactors are:

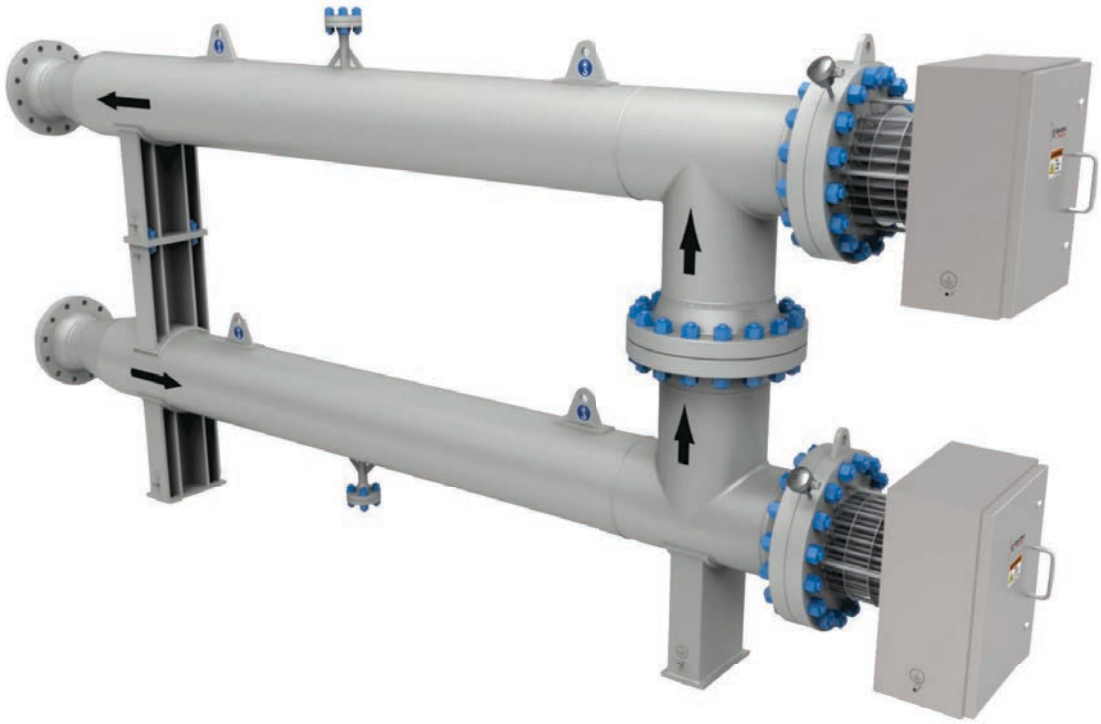
- Oxy-chlorination heater
- Calcination heater
- Burning step heater
- Catalyst reduction heater
- Catalyst hot H2 stripping heater



Isomerization Process Heaters

The isomerization process upgrades the octane number of light naphtha fractions and also simultaneously reduces benzene content by saturation of the benzene fraction. Isomerization complements catalytic reforming process (CCR) in upgrading the octane number of refinery naphtha streams.

The heater designs generally governed by licensor specifications such as UOP, axens or by international specifications.



Material of Construction

- **Heating Elements:** Alloy 800 seamless tubes or SS 321 seamless Tubes.
- **Pressure Vessel :** P11 / SS304 /SS316/SS321
- **Certification :** ATEX Ex'd" (Flame proof) / ASME U stamp / any other based of regional requirements
- **Temperature Range :** operating temperature range of 10°–600°C (50°– 1112°F).
- **Heater Rating :** from 1 - 10000 kW, (single or multi stage)

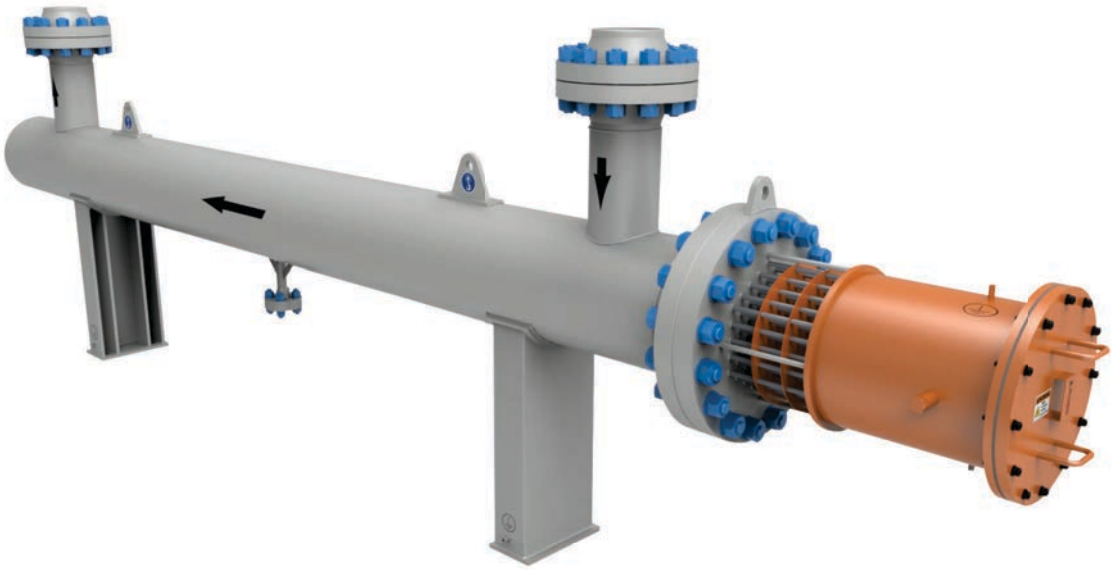
Marathon Design Specialty

- Marathon electric process heaters have compact design.
- Virtually 100% efficiency
- No risk of fouling that creates a need for frequent cleaning.
- Effectively controlled by well-designed Thyristor Control Panel.

Fuel Gas Heaters

Fuel gas is a mixture of methane, ethane, propane, butane and other hydrocarbons. Fuel gas is commonly used in theas an energy source for turbines and other heating purpose. Before the fuel gas is burned in the turbines it needs to be treated to ensure the removal of solid, liquid and gas contaminants. A fuel gas conditioning system commonly consists of a pre-heater and a super heater.

The pre-heater is used to prevent the formation of hydrate due to a pressure and temperature drop across the pressure regulator. Asuper heater is used to ensure that superheated gas enters the turbine at the correct temperature.



Material of Construction

- **Heating Elements :** SS316 /316L/321
- **Pressure Vessel :** Carbon steel / SS304 /SS316/SS321
- **Certification :** ATEX Ex'd" (Flame proof) / PED/ASME U stamp / any other based of regional requirements
- **Temperature Range :** operating temperature range of 1kW – 2000kW with up to 690V.

TEG Reboiler / Regeneration Heaters

TEG (TriethyleneGlycol) Reboiler heaters and Regeneration heaters are primarily designed and developed by Marathon for the specific applications in petrochemical industries to help in re-useof secondary materials. Reprocessing these secondary fluids/gas require the use of a regenerator. The regenerator heater thermally removes excess water or contaminants and returns the used secondary fluid /gas in a water-free, pure state, ready to be used state.

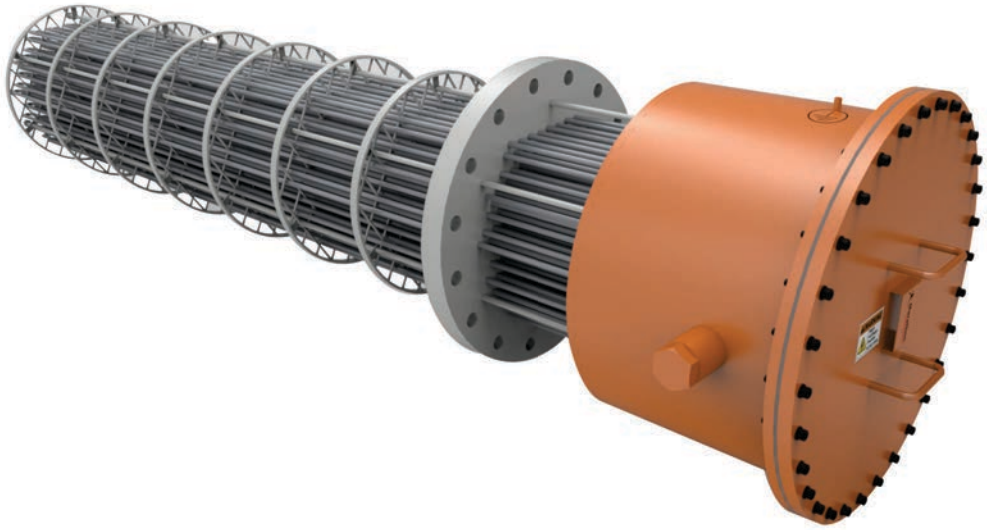
Some of the common applications are Triethylene Glycol, Amine gas treating etc.

Material of Construction

- **Heating Elements :** SS316 /316L/321
- **Pressure Vessel :** Carbon steel / SS304 /SS316/SS321
- **Certification :** ATEX Ex'd" (Flame proof) / PED/ASME U stamp / any other based of regional requirements
- **Temperature Range :** operating temperature range of 1kW – 2000kW with up to 690V.

Mole Sieve Regenerator Heaters

Molecular sieves are generally used in Oil & Gas and Refining applications, Steel industry and Air separation Units (ASU), to purify gas streams, as well as to separate and dry materials. A molecular (or mol) sieve is a filter that contain microscopic pores of precise size that adsorb specific gas or liquid molecules, but not larger molecules. The molecular sieve need to be “regenerated” to remove the adsorbed material and prepare the mol sieve for re-use. Heating a carrier gas, such as nitrogen, to high enough temperatures to reverse the absorption process, these heaters keep gas streams pure.



Material of Construction

- **Heating Elements :** SS316 / 316L / 321 / Alloy 800.
- **Pressure Vessel :** Carbon Steel / SS304 / SS316 / SS321
- **Certification :** ATEX Ex'd” (Flame proof) / PED/ASME U stamp / any other based of regional requirements
- **Temperature Range :** operating temperature range of 1kW - 2000kW with up to 690V.

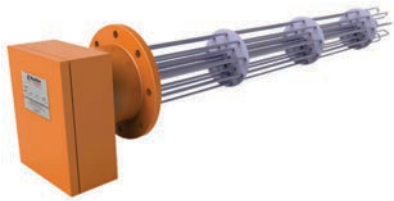
Immersion Heaters

Industrial immersion heaters are used widely in all kind of industrial applications such as chemicals, liquids, gases and food processing industries. The immersion heaters are also used in special applications in petrochemical industries such as Flare KO drum heating application and other heating applications in power as well as nuclear applications.

Immersion heaters are designed and constructed in various forms based on the application and mounting requirement. Some of the common types of immersion heaters are.

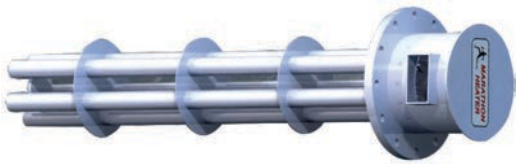
Direct Immersion heater:

The heater bundle will be directly mounted inside the Tanks & process fluid will be directly in contact with the process fluid.



Indirect Immersion Heater

The heating elements will be mounted inside the pockets welded to tube sheet. The heat from the elements transferred to the pocket tubes and in turn to the fluid. These kinds of heaters are used in large storage tank heaters, in which heater replacement can be done without draining the complete system.



L Shape Heater

In some critical process wherein the heater is required to be mounted vertically but also expected to cover maximum tank area horizontally or at bottom of the tank, the “L” shape heaters are best preferred design.

Air Duct Heaters

Electric tubular heating elements are commonly used to heat air in ducted systems primarily for air drying purposes in various industrial applications.

Duct or air heaters are used in heating ventilation and air-conditioning systems (HVAC) in residential and industrial complexes, as well as in hotels, airports and stadiums etc. for the purpose of maintaining temperatures. The same system is applied in offshore environments.

In industrial applications such as power plants and painting applications, the duct heaters are used for the applications which required hot air purging, or drying purposes.

Typical Applications for Duct or Air Heaters Include

- Comfort Air Heating
- Heating, Ventilation and Air Conditioning (HVAC)
- Drying
- Industrial Hot Air Generation

Typical industries include:

- Power plants
- Automotive
- Chemical
- Industrial and Residential Buildings
- Facilities for Onshore and Offshore Platforms

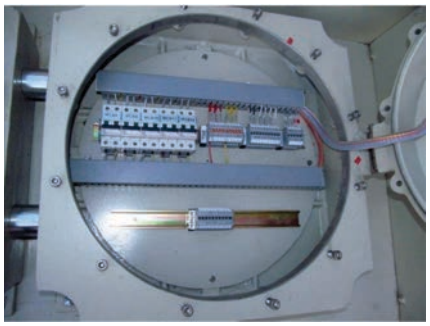
Control Panel

The performance of the Electric heaters are mainly depends on the well-designed control Panel. To meet the complex and stringent process control, Marathon is continuously working and developing the control Panels constructions to improve various performance and safety features.

Generally all the process heaters are accompanied with a Thyristor (SCR) control Panel. The large powers of the heaters are devided into multiple small banks for easy and effective control.

Features of standard control panel

- Panel indication lamps for
- Power ON/OFF
- Heater ON/OFF
- Element over temperature
- Tube sheet over temperature (for ATEX heaters)
- Panel Over temperature
- Earth leakage indication and relay
- Current&Voltage
- Annunciator (for fault indications)
- Controls
- Heater On /OFF
- Local /Remote
- Trip Reset
- Door mounted potentiometer
- Lamp test button
- Earth leakage reset
- Emergency shut down



Marathon Range of Products at Your Service

Heating Systems Products

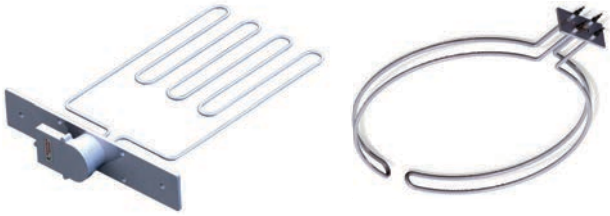
Tubular Element/Finned Heaters

Temperature Range : Upto 800°C
Sheath Material : SS304, SS316, Allow 800 etc.
Finns Material : GI, SS etc.

Screw Plug Immersion Heaters

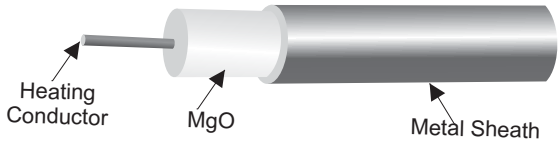
Temperature Range : Upto 800°C
Sheath Material : SS316, SS304, Alloy 800 etc.
Application : Heating Air, Water, Gases

Panel Type Heaters



Temperature Range : Upto 300°C
Sheath Material : SS321, Alloy 800 etc.
Application : ESP Hopper

Mineral Insulated Heating Cables



- Available in different sheath material - SS304, SS316, SS321, Alloy 600
- Cables are suitable for heating tanks, valves, pipes, pumps, tools and industrial process heating systems
- Available in different customized sizes and termination

Bundle Rod Heaters

Temperature Range : Upto 1100°C
Heating Element : NiCr 80:20, A1, AF etc.
Radiant Tube Material : HU, Alloy-600 etc. Customized Diameters and Length
Application Areas : Annealing Furnace, Spherodizing Furnace, Other Heat Treatment Furnaces

Silicon Carbide Heating Elements

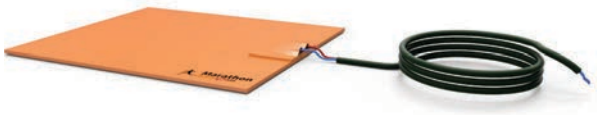
Temperature Range : Upto 1600°C
Heating Element : ceramic material with relatively high electrical conductivity
Application Areas : Aluminium Holding & Melting Furnace, Industrial Ovens, Glass feeder & Float Glass Line, Laboratory Furnaces

Marathon Range of Products at Your Service

High Watt Density Cartridge Heaters

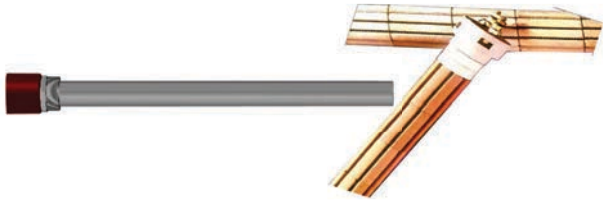
Temperature Range	:	Upto 600°C
Material	:	SS304, SS316, Incoloy
Configurations	:	Swaged in Leads, Crimped on Leads, Post Terminals, Right Angle Leads, Teflon Seal, Silicon Rubber Seal, Epoxy Seal, Swaged in Braid, Right Angle Stainless Steel Braid, SS Flexible Conduit, Hex head pipe fittings etc.

Flexible Heaters-Silicon rubber heater



- Temperature ange up to 250°C
- High Die Electric Strength, Flame Retardant, Non Toxic.
- Uniform heating, Adaptability, Long Life
- Good for heating drums, de-icing, vending machines, ATM's, aircrafts, cars, and maintaining a comfortable temperature in medical equipments - such as CAT scanners.

Ceramic Bobbin Heaters



Marathon make Ceramic Bobbin Heaters are fabricated from high temperature refractory insulators in various diameters and lengths for any voltage or wattage within manufacturing limits. These Bobbin Heaters consist of elements, which are exposed partially in air for better transmission of heat. Also, when it is inserted into a thermowell, it offers a large heated area to the liquid or semi-solid to be heated.

Ceramic & Mica Band Heaters

- Ceramic band heaters are medium-to-high temperature heaters that have 550°C as the maximum working temperature. These durable heaters can have optional in-built ceramic fiber jackets that make them energy efficient.
- High Temperature Oxidation Resistant Metal Sheath
- Highest grade mica provides excellent electrical insulation at high temperatures and is resistant to moisture.
- Clamping band is low thermal expansion stainless steel construction designed to maintain clamping pressure at elevated temperatures.

Industrial Infrared Heaters

- In addition to many different standard heaters Marathon also offers unlimited variations in the form of customized heater designs. If your requirements call for unique physical attributes, special wattage or voltage ratings, Marathon can create a heater to fit your unique application. Many times we are able to incorporate design enhancements at little or no added cost.

Marathon Range of Products at Your Service

Thermocouples

Type	:	R, S, B
Element Dia	:	0.30, 0.35, 0.4, 0.45, 0.5 mm Other sizes on request
Protection Sheath	:	Ceramic (C-799), 610, Inconel, Silicon Carbide, Platinum etc.
Configuration	:	Simplex/Duplex/Multipoint.
Special	:	• Hot Blast & Stove Dome Thermocouples • Tri Level Thermocouples • Crown Thermocouples

RTD

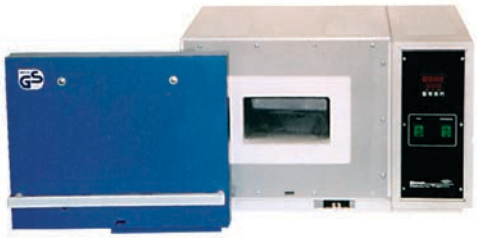
Type	:	Pt 100, 200, 500, 1000 etc.
Element size (MI)	:	Wire wound ceramic encapsulated, Wire wound glass encapsulated, Thin film ceramic encapsulated
Connection	:	2, 3, 4 Wire
Accuracy	:	Class A, B, ½, 1/3, 1/5, 1/10 DIN
Protection Sheath	:	SS304, SS321, SS316, SS310, Inconel 600/800, HRS 446, Hastalloy, Monel etc.
Configuration	:	Simplex/Duplex/Others

Furnaces

Tempsens manufactures equipments for temperature calibration. The test sensors are calibrated against master sensors in a stable temperature source.

The various temperature source for covering temperature sensor calibration are as under.

Ovens



Laboratory furnaces for universal applications. Easy operation, fast heating- and cooling cycles. Stainless steel housing for corrosive environments. Standard PID controller with 1 heating ramp.

ENGINEERED SOLUTIONS FOR HEATING & SENSING

Marathon
TempSens

ISO 9001-2015

MARATHON HEATER (I) PVT. LTD.

188A, B-169 (Part), B-188 & B-189 (A), Road No.-5, M.I.A.,
Madri, Udaipur, (Rajasthan.) INDIA 313 003
Ph.: +91 9351159988, +91 8003395150
E-mail: akhil@marathonheat.com, sales@marathonheat.com

www.marathonheat.com