

# HCM HEATERS

HELICAL COIL HEATERS FOR MARINE VESSELS



**HEATEC**  
AN ASTEC COMPANY



**H**EATEC HCM heaters are thermal fluid heaters for use on marine vessels, such as barges, tankers and other workboats. They meet U.S. Coast Guard specifications. And they are certified by ABS (American Bureau of Shipping) when requested by the customer.

### Heaters that meet your needs

Our HCM heaters are available in both horizontal and vertical configurations. Several models are available in each configuration. Rated thermal outputs range from 1 to 20 million Btu per hour. All can be customized to meet your specific needs.

Although we make several other types of heaters, our helical coil heaters are the most popular. Their popularity comes from their simplicity, efficiency, low maintenance and relatively low cost.

### The special needs of marine use

We are fully aware that shipboard equipment is in a much more demanding environment than would be experienced in land-based facilities. That's why our

HCM heaters are designed to withstand the stresses produced by the constant pounding and vibration in normal operation. Moreover, they can take the punishment produced in ocean storms with 30 foot waves.

Our heaters can be designed to fit extremely limited space. Note photo above.

They are designed around a helical coil that we produce in our own shop. All of our helical coils meet ASME code.

*The coil in our HCM heater carries a 5-year warranty. No one else matches our warranty.*



Our HCM helical coil heaters approach the theoretical limits of thermal efficiency possible in fired 2-pass heaters. Their efficiencies range up to 85 percent LHV, depending upon fluid outlet temperature, fuel and options.

The importance of efficiency is readily seen by comparing how much fuel they use. Here's a comparison of fuel usage for heaters of various efficiencies:

Efficiency	gal/hour	gal/mo.	gal/year
50%	91	19,224	230,688
60%	76	16,200	194,400
70%	65	14,040	168,480
80%	57	12,096	145,152
85%	54	11,448	137,376

These usages are based on a 6-million Btu/hour heat load, operating 12 hours a day, 18 days a month, using No. 2 diesel fuel with a net (LHV) heating value of 132,000 Btu per gallon.

### PHOTOS LEFT PAGE

**McAsphalt barge.** A Heatec helical coil heater is installed below deck. It has been in use since 1991. A long-life coil is extremely important where gaining access for replacement is a major undertaking. The barge holds 7,000 metric tons (44,000 barrels) of liquid asphalt. The heater on the barge has an output of ten million Btu/hour and maintains the asphalt at about 300 degrees F. McAsphalt Industries Ltd., in Scarborough, Ontario, is a major distributor of asphalt products.

**PCS Phosphate Barge.** A Heatec helical coil heater HCM2010-30D is installed in a small compartment above deck on the barge shown here and on another PCS barge. They heat thermal fluid, which heats sulphur to maintain it at about 270 degrees F. Each has an output of 2 million Btu/hour. Their dual-wound coils enable thermal fluid to flow at a higher rate than with a single-wound coil. The Aurora, North Carolina Division of PCS Phosphate has several barges and tug boats.



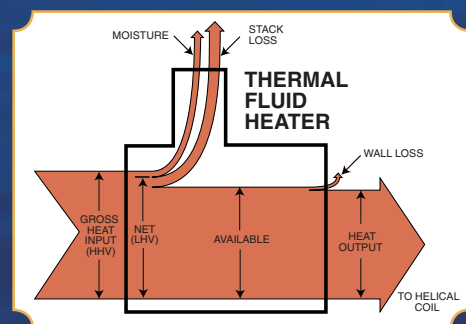
Our helical coil has a life expectancy much longer than its 5-year warranty. This is extremely important where gaining access for replacement is a major undertaking. Replacing the coil on a heater located below deck may require dismantling considerable overhead equipment and structures just for access. So longer coil life saves much more than the cost of a coil.

### Fuels

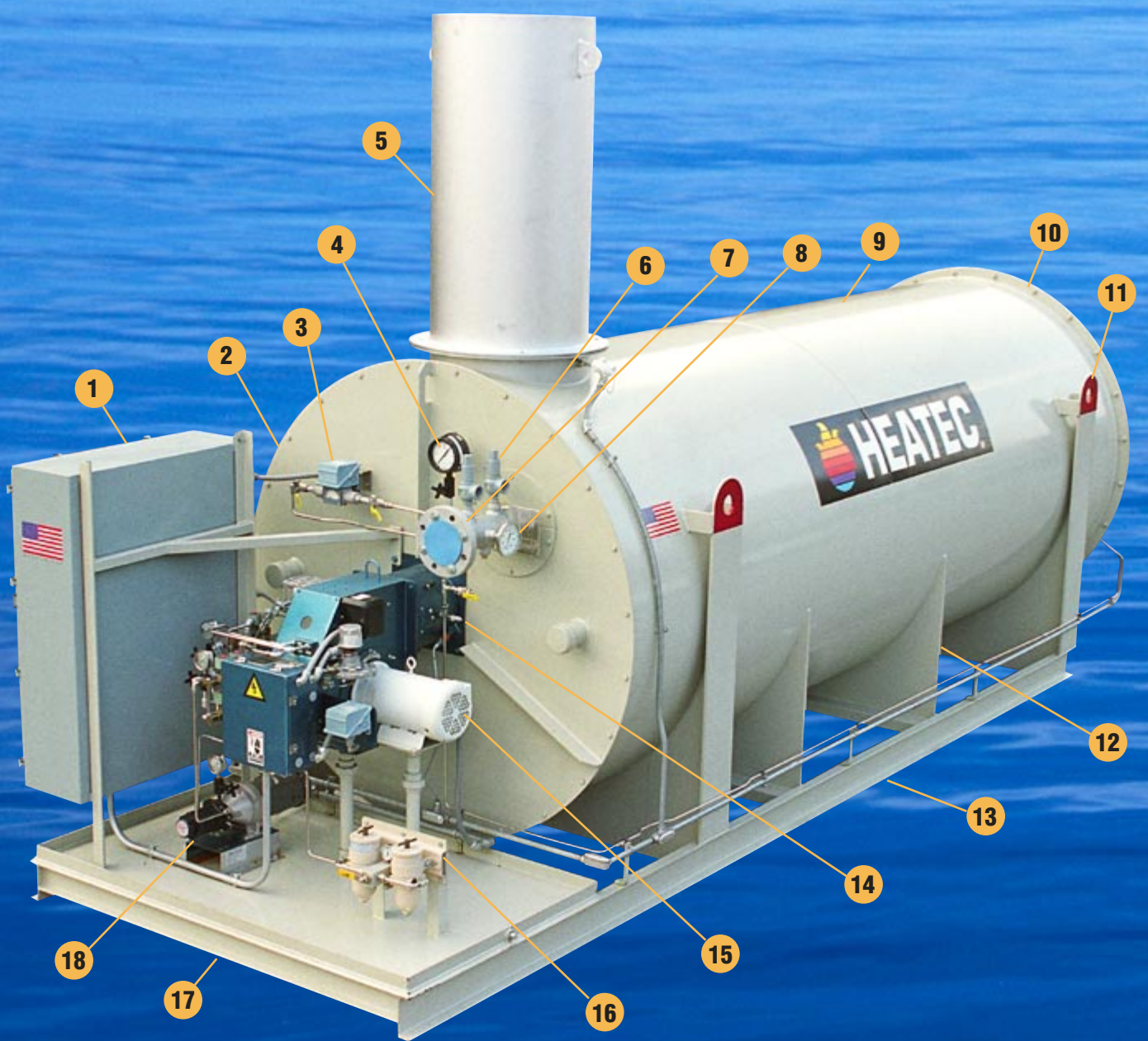
HCM heaters operate on diesel oil, the universal choice for marine use. They can be built to use other fuel oils, including heavy fuel oil. We usually include castable refractory lining in heaters that burn heavy fuel.

### High Efficiency Reduces Costs

A hallmark of our HCM helical coil heater is high efficiency. This conserves fuel to greatly reduce operating costs.



Efficiency is a measure of a heater's heat input vs. its heat output. (See diagram above.) The more of the input that ends up in the output, the higher the efficiency. It is theoretically impossible to reach 100 percent efficiency because there will always be some heat loss through moisture and through the shell

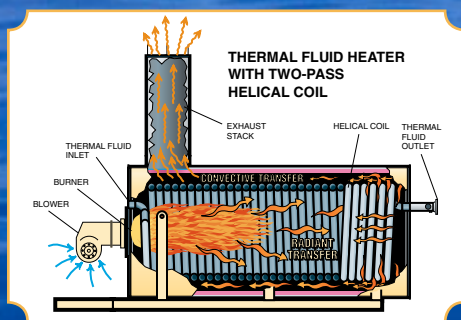


- 1** Electrical panel. Meets NEC and UL. Houses switches, controllers, status lights, motor starters and disconnect switch. All wiring is run in raceways. Wiring and terminals are numbered. All controls are prewired.
- 2** Burner end plate. Insulated with 5-inch ceramic fiber blanket.
- 3** Low flow (differential) switch.
- 4** Thermal fluid pressure gauge.
- 5** Exhaust stack.
- 6** Thermal fluid pressure relief valves.
- 7** Inlet connection for thermal fluid.
- 8** Inlet thermal fluid temperature gauge.
- 9** Heater shell. All-welded construction of 1/4 to 3/8-inch thick A-36 steelplate, depending on size of heater.
- 10** Heater shell end plate. Bolted to heater shell and insulated with 5-inch ceramic fiber blanket. Easily removed for access to heater coil. Has peep sight for inspection of coil and flame pattern. Larger heaters also include a manway.
- 11** One of four lifting eyes. Integral with shell support saddles.
- 12** Fabricated steel saddle. Two or more are used to support the heater depending on its size.
- 13** Rigid skid fabricated from structural steel channels (or I-beams).
- 14** Fully modulating burner with blower.
- 15** Combustion air motor.
- 16** Duplex fuel oil filters.
- 17** Skid extension for added support of fuel train and burner controls.
- 18** Fuel oil pump.

walls. However, the amount of heat absorbed by the coil and the amount lost through the shell can be controlled by careful design and construction.

### Design and Construction

We take special care to design our heaters for optimum geometry of the combustion chamber and the flux density of the helical coil. Thus, our coil has a large heat transfer surface area to provide much lower heat flux rates than those commonly used by others. And the coil diameter and length are sized to virtually eliminate flame impingement and provide optimum flame pattern. The diameter of pipe used for the coil is sized to provide an ideal fluid velocity of 7 to 11 feet per second.



Construction of our HCM helical coil heaters is illustrated in the drawing shown above. The heater has a steel cylindrical shell that houses a helical coil. Oversized stainless pads inside the shell support the coil leaving an annular space between the coil and the shell. The inner surface of the shell is covered with ceramic blanket insulation that has low thermal conductivity and low heat storage. It is coated with a hardener for longer life.

A burner mounts on one end of the shell and fires through the center axis of the coil. Its flame produces radiant energy that heats the inner side of the coil without impinging on its surfaces. Hot combustion gases turn outwards at the end of the coil. They double back into the annular space between the insulation and the exterior side of the coil, heating its outer surfaces by convection. The gases travel back the full length of the coil and then pass through the exhaust stack.

The hot helical coil heats the thermal fluid as it circulates through the coil. In turn, the hot fluid heats coils in storage compartments filled with asphalt, heavy fuel, sulphur or phosphates.

When an optional economizer is used, the exhaust gases preheat the thermal fluid, thereby increasing efficiency.

### Controls

Our electrical controls meet NEC and UL requirements. All controls are prewired.

The heater automatically maintains the operating temperature set by the operator. Accuracy is within a half percent of the set temperature. The heater maintains thermal fluid temperature at the heater's outlet up to 390 degrees F (depending on variables).

The heater has numerous safety features to ensure it always operates within prescribed limits. It will shut down automatically if an abnormal operating condition develops.

Limit switches and sensors ensure proper operation. They monitor the burner flame, thermal fluid temperature, exhaust gas temperature, flow of thermal fluid, fuel, and combustion air pressures.

### Flame Monitor

The heart of the heater control system is a flame monitor with an ultraviolet or infrared scanner. It employs solid-state electronics for reliability and long life.

The flame monitor senses the burner main flame and pilot. It purges the firing chamber before firing. It turns on the pilot for a pre-programmed period and allows the main fuel valve to open only when safe. It shuts off fuel if a flame is not present.



### Burner Controls

Modulating burner controls provide suitable turndown ratios. Full modulation allows the firing rate to closely match the heat demand. This conserves fuel, reduces temperature overshooting and eliminates constant on-off recycling.

### Control panels

Our marine heaters use NEMA 4 control panels, which protect against wind-blown dust and rain, splashing water and hose-directed water. They are UL approved. Wiring workmanship is meticulous and meets strict standards. All wires and terminals are labeled for easy identification of circuits. A laminated circuit diagram is furnished.



### Protection against rust and corrosion

Equipment longevity is achieved by using special protective coatings on all surfaces subject to rust and corrosion. Exterior surfaces of the heaters are first seal-welded and sand-blasted to bare metal. They are then coated with zinc primer. Finally they are sprayed with a finish coat of special corrosion-resisting paint designed for marine use.

### Maintenance

The heaters are easy to maintain. Components are easy to reach. Electrical controls, motors, and pumps are readily available from our large stock of parts. We can usually provide one-day shipment.

We use centrifugal pumps to circulate the thermal fluid. These pumps have mechanical seals. They are air cooled, eliminating the need for water cooling.

## Other things that enhance value

Here are some other things that enhance the value of our marine heaters:

- An expansion tank with internal baffles is usually an integral part of the heater. However, it can be mounted separately if clearance is limited.
- Bolt-on end covers permit replacement of helical coil without flame-cutting.
- Plated bolts and assembly hardware to resist rust and corrosion.
- Documentation furnished includes heater general arrangement, control wiring, piping and instrumentation, expansion tank arrangement, pump package arrangement, and component list.
- Electrical and electromechanical checkout before shipment.

## Startup and warranty

We offer startup service for our marine heaters. When you choose this service, our technician adjusts your heater for optimum performance after it is installed on your vessel. Heatec HCM heaters have a one-year limited warranty.

**The coil has a 5-year warranty.**

## Options

The most popular options are economizers, backup pumps and first-out annunciators.

The economizer recovers heat from the exhaust stack and transfers it to the thermal fluid for increased efficiency.

Numerous other options are available. Please call us to discuss your special needs.



This skid-mounted helical coil heater has a separate pump skid. Heaters and pumps are also furnished without skids.

## SPECIFICATIONS

BASIC MODEL	Btu/hour (millions)	Horizontal Heater			Flow Rate gpm	Coil Surface feet <sup>2</sup>	Pump hp	Net Weight (pounds)
		Length	Width	Height				
HCM-200	2	17'-0"	6'-7"	5'-3"	150	282	10	8700
HCM-300	3	19'-2"	8'-2"	5'-8"	225	282	15	11,500
HCM-400	4	18'-5"	9'-2"	6'-4"	300	423	20	16,300
HCM-500	5	21'-0"	9'-2"	6'-4"	325	569	20	18,900
HCM-600	6	21'-0"	9'-2"	6'-4"	425	569	25	20,600
HCM-800	8	24'-8"	9'-4"	7'-4"	600	855	30	28,000
HCM-1000	10	26'-9"	11'-10"	8'-6"	725	1129	40	34,500
HCM-1200	12	26'-9"	12'-0"	8'-6"	900	1129	50	39,400

Larger heaters up to 20 million Btu/hour are also available. Heights shown include expansion tank and pump, but do not include the stack. The height of the stack varies according to the vessel.

## The easy way

Getting a new marine heater doesn't have to be a difficult venture. Not if you get the right heater manufacturer. One that provides full service from start to finish.

Full service starts with someone that can design your heater for your specific needs. Then you need someone to build and pre-test it. You will need someone to install it. Someone will have to tune and calibrate it. Moreover, you'll need availability of parts and service for ensu-

ing years. All at a cost you can afford. In time to meet your schedules.

Wouldn't it be easy if the same people did all these things. This would eliminate bickering between parties as to who is responsible for what. What you need is a full service heater manufacturer.

Well, that's exactly what Heatec is. We handle the job from start to finish. We then provide support to keep your heater in tip-top shape. Affordable costs. On time.

It couldn't be easier.



**Asphalt Commander.** Three Heatec vertical heaters, directly behind the pilot house, maintain the tanker's cargo of 8 million gallons of liquid asphalt at 280 degrees F. Heatec designed, built and installed the heaters when the ship was converted from a U.S. Navy fuel tanker. The heaters provide 15 million Btu/hour each and heat thermal fluid circulating thru 22 miles of piping in 14 compartments.

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