Schlumberger

Indirect Heating Systems

Heat process streams without direct flame contact

BENEFITS

- Simplified maintenance—The standard designs of indirect heaters employing NATCO* separation technology provide maximum heat transfer efficiency and operating simplicity. Burner equipment and process coils are easily accessible for inspection and maintenance.
- Economy—Maximum heat transfer efficiency and reduced fuel consumption are hallmarks of the pilot and burner designs.
- Safety enhancement—The heat transfer media provide constant heat for reliable unattended operation. Additional safety features are available on all models.
- Adaptability and dependability—A wide variety of standard and custom models is available with heater sizes from 50,000 to 50,000,000 Btu/h. These designs have been proved through hundreds of applications.

Schlumberger provides four types of indirect heaters employing NATCO separation technology. In each system, heat is liberated in a separate chamber and then transferred to the process stream through a medium such as water, water and glycol, steam, salt, or flue gas to deliver furnace output ratings ranging from 50,000 to 50,000,000 Btu/h.

The primary advantages of indirect heating are that the heat medium transfers heat evenly and the coil's inside wall temperature is lower than that of direct heaters, which reduces scaling, coking, and plugging.

Indirect heaters are widely applicable to the petroleum industry and in power generation and industrial systems. NATCO technology means that they operate reliably and efficiently in both standard and custom applications.

Water bath heater

Operating range

- To 10 million Btu/h and 180 degF

Applications

- Heating high-pressure gas, oil, or both in oilfield production
- Preventing hydrate formation by heating high-pressure gas from wellheads and main gas distribution stations prior to pressure reduction
- Heating natural gas at city gate stations from main gas pipelines
- Heating highly viscous oils to reduce pumping pressures and improve pumping efficiency
- Heating oil-producing well streams

In the water bath heater, the vessel is filled with water or a mixture of water and glycol. A fire tube and process coil are submerged in the bath, which transfers heat to the process stream in the coil. Typical heater sizes are shown in the table.

Water bath heaters.

Typical Water Bath Heater Sizes

Duty, Btu/h	Vessel Size, OD × Length
50,000	12¾ in × 3 ft 0 in
100,000	18 in × 5 ft 0 in
250,000	24 in × 7 ft 6 in
500,000	30 in × 10 ft 0 in
750,000	36 in × 12 ft 0 in
1,000,000	42 in × 15 ft 0 in
1,250,000	48 in × 15 ft 0 in
1,500,000	48 in × 17 ft 6 in
1,750,000	60 in × 15 ft 0 in
2,000,000	60 in × 17 ft 6 in
2,500,000	60 in × 20 ft 0 in
3,000,000	60 in × 22 ft 6 in
3,500,000	72 in × 22 ft 6 in
4,000,000	72 in × 25 ft 0 in
4,500,000	72 in × 30 ft 0 in
5,000,000	84 in × 22 ft 6 in
6,000,000	84 in × 30 ft 0 in
7,000,000	96 in × 30 ft 0 in
8,000,000	96 in × 30 ft 0 in
10,000,000	96 in × 30 ft 0 in

Indirect Heating Systems

Propane vaporizer

Operating range
- 250 to 10,000 galUS/h

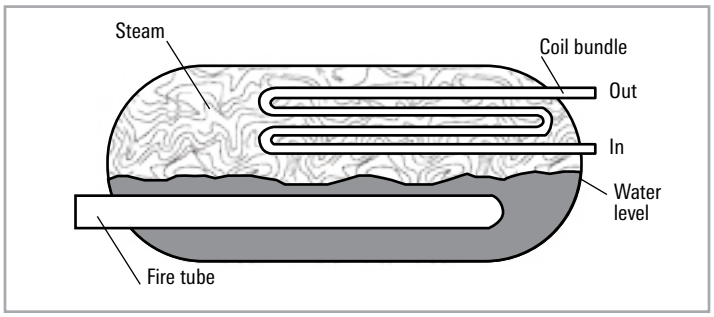
Applications
- Fuel provision

Schlumberger designs water bath heaters to vaporize light hydrocarbon liquids. These propane vaporizers provide industries and municipalities with a reliable, primary fuel source where natural gas is unavailable. They also supply fuel for standby or peak-shaving periods.

The process stream enters the coil bundle as a liquid, is vaporized, and then leaves the heater as a superheated vapor. The vaporizers meet Factory Mutual (FM), Factory Insurance Association (FIA), and OSHA standards as required. The vaporizing coils are ASME Code and National Board stamped.

Standard vaporizers range in size from 250 to 10,000 galUS/h.

Steam bath heater



Fire tube immersed in the steam bath heater's water bath, with the coil above the water level.

Operating range
- To 8 million Btu/h and 215 degF

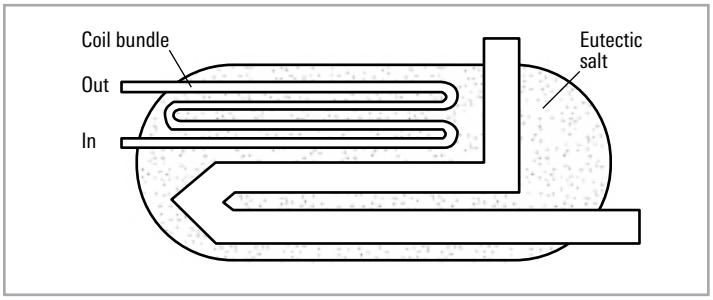
Applications
- Heating high-pressure gas, oil, or both in oilfield production
- Preventing hydrate formation by heating high-pressure gas from wellheads and main gas distribution stations prior to pressure reduction
- Heating natural gas at city gate stations from main gas pipelines
- Heating highly viscous oils to reduce pumping pressures and improve pumping efficiency
- Heating oil-producing well streams
- Low-pressure steam generating (without process coil)
- Maintaining flow temperatures for heavy hydrocarbons in storage

Typical Steam Bath Heater Sizes

Duty, Btu/h	Vessel Size, OD × Length
250,000	24 in × 7 ft 6 in
500,000	36 in × 7 ft 6 in
750,000	36 in × 10 ft 0 in
1,000,000	48 in × 10 ft 0 in
1,500,000	48 in × 12 ft 6 in
2,000,000	48 in × 15 ft 0 in
2,500,000	60 in × 15 ft 0 in
3,000,000	60 in × 20 ft 0 in
4,000,000	72 in × 22 ft 6 in
6,000,000	72 in × 24 ft 0 in
8,000,000	96 in × 24 ft 0 in

The steam bath heater is similar to the water bath heater, but only the fire tubes are immersed in a water bath. The process coil is located above the water level and is enveloped by saturated steam, which transfers heat to the process stream.

Salt bath heater



Salt bath heater filled with eutectic salt surrounding the coils. The fire tube is immersed in the steam bath heater's water bath, with the coil above the water level.

Operating range
- To 13.5 million Btu/h and 700 degF

Applications
- Regeneration gas service at high process temperatures
- Vaporization of hydrocarbon liquids in stabilization service

Salt bath heater vessels are filled with eutectic salt that melts at approximately 288 degF. High process outlet temperatures are attainable because of the high degradation temperature of the salt. The proven vessel designs with serpentine coils or multitubular coils for high rates and low pressure drop increase unit life for operating at high bath temperatures. Typical salt bath heater sizes are shown in the table.

Typical Salt Bath Heater Sizes

Duty, Btu/h	Vessel Size, OD × Length
150,000	18 in × 5 ft 0 in
200,000	24 in × 5 ft 0 in
300,000	24 in × 7 ft 6 in
400,000	24 in × 10 ft 0 in
500,000	30 in × 7 ft 6 in
750,000	30 in × 10 ft 0 in
1,000,000	36 in × 10 ft 0 in
1,500,000	36 in × 15 ft 0 in
1,750,000	42 in × 15 ft 0 in
2,000,000	42 in × 17 ft 6 in
2,250,000	48 in × 15 ft 0 in
2,500,000	48 in × 17 ft 6 in
3,250,000	54 in × 15 ft 0 in
4,000,000	60 in × 15 ft 0 in
4,500,000	60 in × 17 ft 6 in
5,250,000	60 in × 20 ft 0 in
5,750,000	72 in × 17 ft 6 in
6,500,000	72 in × 20 ft 0 in
7,500,000	84 in × 20 ft 0 in
10,800,000	84 in × 22 ft 6 in
13,500,000	96 in × 24 ft 0 in

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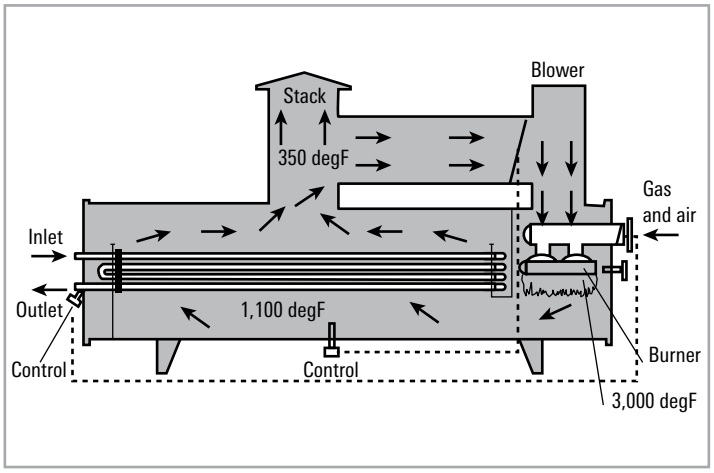
Indirect Heating Systems

NATCO CHF controlled-heat flux heater

NATCO CHF controlled-heat flux heater with 1,000-degF process outlet temperature capability.



Forced draft system of the NATCO CHF heater.

Operating range

- To 50 million Btu/h and 1,000 degF

Applications

- Heating regeneration gas for adsorption processes
- Vaporizing and superheating LNG and LPG
- Heating pipeline, crude oil, and oil-water emulsions
- Generating steam
- Pre- or postheating gas in conjunction with pressure reduction
- Heating fluids used in heat transfer systems
- Heating sensitive fluids or gases where close bulk-to-film temperatures are critical
- Providing combination waste-heat exchange with alternative source capability

The NATCO CHF* controlled-heat flux heater significantly advances indirect heating by employing a forced draft system in which the products of combustion act as the heat transfer medium. As shown in the cross section, the heat generation and heat transfer sections are separate.

Heat is transferred to the extended surface area of the coil bundle by means of forced convection. The flue gas circulates from the burner section, across the coil bundle, to the stack. Part of the flue gas is recirculated to the burner section from the stack, where it reduces the flame and flue gas temperatures, eliminating radiant heat transfer.

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