

MODERN Materials Handling

Keeping warehouses warm

Gas-fired and electric heating systems are well suited to keeping the temperature inside the four walls just right.

By Megan McCoy, Assistant Editor

As the outdoor temperature drops, the need for heaters inside the warehouse rises. But not all heating requirements are the same. In some cases, the entire warehouse needs to be heated, while other times a specific area is sufficient. There are also issues of costs, ventilation, and heater placement relative to other equipment. Fortunately, gas-fired and electric heaters, the two most common types, offer a range of cost and performance profiles suited to various warehouse conditions and size.

Heating with gas

Natural gas- and propane-fired heating systems are popular in warehouses because each heater provides a lot of heat for the gas and energy consumed, resulting in lower operating costs compared to electric heaters. The two basic types available are indirect- and direct-fired systems, each offering various designs. Options with indirect-fired designs include unit heaters and air-rotation heating systems. The choices with direct-fired systems are **high-temperature rise space heaters**, low-temper-



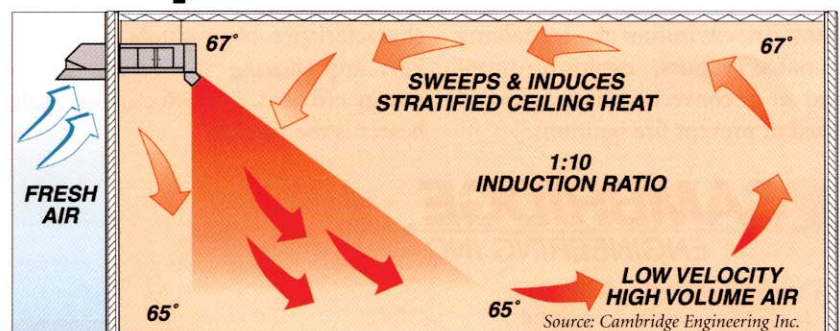
A direct-fired gas space heater installed through the wall near the ceiling is constructed of a gas burner and blower. This arrangement delivers high levels of heat using a minimal amount of air from outside the warehouse.

ature rise make-up air heaters, air recirculation heaters, and low-intensity tube-style infrared (radiant) heaters.

Indirect-fired systems heat and recirculate only the indoor air, but they use a heat exchanger and a flue, which reduce energy efficiency because heat and energy escape through the flue. Unit heaters suspended from the ceiling or air-rotation heaters mounted on the floor are most suitable for small warehouses that have few dock doors and minimal ventilation requirements.

Direct-fired systems, available as space air units or infrared heaters, do not use an exchanger or flue so all heat is delivered to the warehouse instead of being lost through a flue. As a result, this type of heater offers greater energy efficiency than indirect-fired systems. Direct-fired air heating systems are best for large warehouses with multiple dock doors and ventilation needs. Infrared heaters are best for heating specific areas in a warehouse with infrequently opened dock doors and minimal ventilation requirements.

How a space heater warms a warehouse



High velocity air blown from a high-temperature rise space heater induces floor to ceiling air movement within the building by drawing existing, low temperature indoor air into the warmer air discharged from the heater. One cubic foot of air from the space heater induces 10 times the cubic feet of indoor air per minute, resulting in an even temperature throughout the warehouse.

Indirect-fired unit heaters offer optimal performance and low installation costs for warehouses of less than 10,000 square feet but entail high operating costs based on gas consumption. These systems re-circulate the existing air only, rather than mixing inside air with air from outside the warehouse. Therefore, if used in warehouses where equipment releases high levels of exhaust, the heater should be used in conjunction with a direct-fired make-up air system, which provides ventilation by drawing in outside air.

Of the two indirect-fired systems, air rotation systems are more effective than unit heaters for heating larger warehouses due to a higher heating efficiency. However, this heater must be operated constantly to rotate the air 1-1/2 to 2-1/2 times per hour, resulting in high gas costs. Since the system also must incorporate large powered fans to prevent warm air stratification near the ceiling, high electrical costs are typical.

Among the direct-fired air heaters, the high-temperature rise space heater is the most cost and energy efficient. The system uses a gas burner and blower to heat outdoor air up to 160 degrees. Its high outlet air velocity also draws inward the existing air in a warehouse and replaces it with fresh air, resulting in improved indoor air quality. The combined effect of this high temperature and high air velocity, known as an induced rotating air effect, is an even distribution of warmed air throughout a warehouse. Space heaters require the least amount of gas consumption and maintenance of all gas-fired systems.

Direct-fired make-up air heaters similarly use 100 percent outside air, drawing it into a building and heating it as high as

120 degrees. This heater is best suited for warehouses that must remove large amounts of air from the building. As a space heater, it costs more to operate than other direct-fired heaters because of its large design and blower.

Direct-fired air re-circulation heaters are most suitable for warehouses using mechanical exhaust systems throughout the year. These systems heat up to 80 percent circulated air from inside the warehouse and 20 percent air from outside to maintain a fixed positive static pressure inside the warehouse.

Low-intensity tube-style infrared heaters have a gas-fired burner on one end of a long steel tube and a suction fan on the opposite end. This construction ensures that, after ignition, hot gas is drawn through the tube and reflectors direct the heat to the warehouse floor. This heater style is ideally suited to heating specific areas or zones in a warehouse and offers low gas consumption. However, installation and maintenance costs for large warehouses are high since many gas burners are required to distribute heat throughout the entire building. Warehouses that use infrared heaters must be properly ventilated and should use air curtains at open dock doors.

Electric heating systems

An alternative to gas heating systems, electric heaters are inexpensive to install compared to gas-fired systems but typically more expensive to operate due to the relative cost of electricity to gas. The three types of electric heaters offered are convection, forced air and radiant. In environments containing flammable vapors, explosion-proof forced air or convection heaters should be used to prevent fire ignitions.

Convection heaters with electrical heating elements use natural air circulation to transfer heat to the surrounding air. As heated air is released from this system, gravity causes the lighter warm air to rise and be replaced by cooler air, which then enters the bottom of the heater. For large warehouses, these heaters depend on ceiling or portable fans to thoroughly circulate the heated air around an enclosed area. Because these systems must heat an entire space before warming the people within it, convection heaters are most suitable for small warehouses or specific areas such as entryways including docks.

Forced-air blower systems integrate a fan with the heater to create air circulation. More compact than convection heaters, these systems can be installed as horizontal or vertical units and mounted on ceilings or walls to direct and distribute heat over long distances. The variety of configurations and mounting capabilities enables forced-air heaters to be used for primary as well as supplementary heating applications.

Radiant heaters use infrared energy transmitted through electromagnetic waves to directly heat objects or people rather than the surrounding air. As a safe, clean and low-maintenance form of heating, electric infrared heating systems do not have parts or motors to repair and air filters to replace, and will not emit any byproducts of combustion.

The types of heating systems are as plentiful as the applications for which they are constructed. Selecting a system to best suit the requirements and characteristics of a warehouse is the key; appreciating the results of an energy efficient, cost effective and safe heater is the benefit.



Cambridge Engineering, Inc.

17825 Chesterfield Airport Rd.

Chesterfield, MO 63005

Phone: 800-899-1989

Fax: 636-530-6133

email: info@cambridge-eng.com

website: www.cambridge-eng.com