CAPTIVEAIRE

TECHNICAL BULLETIN

Recirculating Direct Fired Heaters vs. Air Turnover Systems

December 17, 2024

CaptiveAire's Direct Fired Recirculating Heaters:

CaptiveAire's direct fired recirculating heaters are the most efficient way to heat and ventilate a wide variety of applications. From big box warehouse and manufacturing facilities to service garages, recirculating direct fired heaters are a comprehensive approach to thermal comfort. A system including CaptiveAire's direct fired recirculating heaters can be designed to include three major products and technologies:

1. Pressure controlled recirculating direct fired heaters
2. Gravity vents
3. HVLS fans

Each of these components offers a distinct advantage over competing heating systems. This paper will compare the use of recirculating direct fired heaters to the use of air turnover units.

First, direct fired burners offer 100% efficiency, transferring all the heat released from the fuel into the space. The use of recirculating direct fired heaters further increases seasonal efficiency by continuously recirculating up to 80% of indoor air. Capturing naturally stratified air near the ceiling allows the heater to recover internal heat gains and use them to temper the incoming outdoor air, saving fuel. Air turnover furnaces, on the other hand, are typically non-condensing indirect fired furnaces. This limits their efficiency to around 80-85%; meaning 15% of energy in the fuel is simply exhausted out the flue. This difference in efficiency also results in larger air turnover units to be required to heat the same space, increasing utility charges as well as reducing available floor space.

Next, recirculating direct fired heaters simultaneously modulate indoor and outdoor air dampers to maintain a slight positive pressure in the space. Positive pressurization ensures that infiltration and cold drafts are minimized, aids in preventing condensation at the building envelope[1], and ensures the system continuously introduces fresh air as per ASHRAE 62.1 ventilation codes. During normal operation, recirculating direct fired heaters recirculate the designed percentage of air. When a dock door opens, or an intermittent exhaust load occurs, the heater temporarily increases the amount of outside air used in order to make up lost pressure. The recirculating direct fired heaters fully modulating direct fired burner constantly meets the precise heating requirements of the space. While air turnover units control stratification in a similar manner to recirculating direct fired heaters, air turnover units fail to maintain pressure control. These units also typically do not introduce outside air, failing to provide ASHRAE 62.1 ventilation air. While air turnover heaters may respond to colder weather through increased firing rate, this comes at a cost due to lower efficiency.

Gravity vents offer a variety of benefits to the building environment. These vents aid in directing air movement as well as provide pressure relief. As air turnover heaters do not create a pressure gradient in the space, air movement is not controlled outside of natural air movement, usually in the form of infiltration and thermal stratification.

HVLS, or high volume low speed fans, are an efficient and high performance solution to many challenges found in big box applications. These fans further increase occupant comfort during the heating season, circulate air throughout the space, reduce surface condensation, and offer cost effective evaporative cooling in the summer. Air turnover units perform a similar function, but at a much higher operating cost. HVLS fan's unique design moves more air for less energy, increasing the efficiency over air turnover units.



1. The Precast Concrete Institute. Designers Notebook: Mold

© 2024. CaptiveAire, Inc. All Rights Reserved