Recirculating Direct Fired Heaters vs. 100% Outside Air Systems

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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 100% OA heaters.

First, direct fired heating offers 100% efficiency, transferring all the heat released from the fuel into the space. Unlike 100% OA heaters, 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.

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 outside air fraction 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 100% OA on-off heaters respond to colder temperatures by increasing firing rate, lack of pressure control and intermittent operation result in lower efficiency as well as cold drafts. 100% OA units only satisfy ASHRAE 62.1 requirements while the unit is turned on, providing no ventilation while heating set point is satisfied. This cycling operation also leads to stratification in the space, leading to wasted energy as hot air rises to the ceiling.

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 100% OA 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. HVLS fan's unique design moves more air for less energy, increasing building efficiency.



1. The Precast Concrete Institute. Designers Notebook: Mold

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