

Total Heat vs. 100% Outside Air Systems

Rupp's Total Heat System is the most efficient way to heat and ventilate a wide variety of applications. From big box warehouse and manufacturing facilities to service garages, the Total Heat System offers a comprehensive approach to thermal comfort. As the "system" in Total Heat Systems, implies, the Total Heat System can be designed to include three major Rupp 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 Rupp's Total Heat System 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, Rupp's Total Heat System 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, Total Heat System units 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 envelope¹, and ensures the system continuously introduces fresh air as per ASHRAE 62.1 ventilation codes. During normal operation, the Total Heat System recirculates the design 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 Total Heat System's 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*