

## Total Heat vs. Air Turnover 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 air turnover units.

First, direct fired burners offer 100% efficiency, transferring all the heat released from the fuel into the space. 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. 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, 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 envelope<sup>1</sup>, 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 amount of outside air used 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 air turnover units control stratification in a similar manner to the Total Heat System, 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*