



Case Study



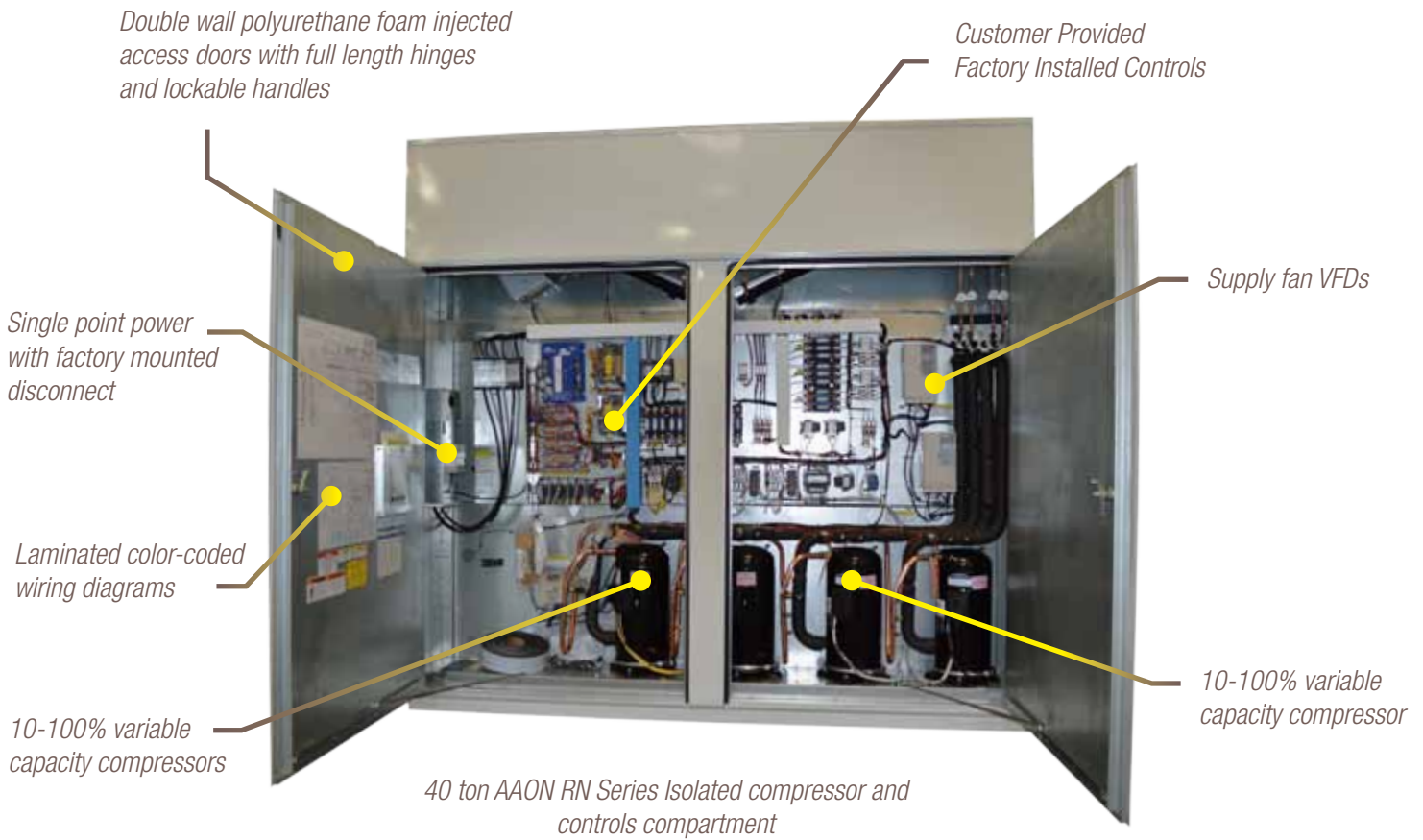
Dillard's Looking to Save Energy and Save Money

When the Dillard's department store in Naples, Florida reached the point where their rooftop HVAC equipment was in need of replacement, they decided to put energy savings as the primary goal. Dillard's had already completed some projects, such as LED lighting upgrades and an energy management systems upgrade, to reduce the overall energy consumption of the 180,000 square foot facility. With the HVAC equipment replacement, the goal was to save 20% operating costs over the 5 years after installation with an expected unit life of 25 years. Because this is a Gulf Coast application, they also needed a solution that could accomplish the energy

savings, while offering corrosion protection to extend the unit life. Tom Goetz, Senior Corporate Director of Technical Operations and Engineering, summed up their need by saying, "The primary reason for these units was to achieve a comfortable shopping environment with the lowest energy cost."



15 ton RN Series with E-Coated Coil



AAON and the Award Winning RN Series Rooftop Unit Solution

Dillard's had experience with AAON rooftop equipment using it on the majority of their department stores, but the equipment employed conventional HVAC technology such as on/off compressors and 2-speed supply fans. This was their chance to break the mold and aggressively pursue their energy savings goal. The choice was to use ten 40 ton RN Series rooftop units to condition the retail space and one 15 ton RN Series rooftop unit to condition the office space. Dillard's hopes of energy savings rested solely on the AAON RN Series ability to deliver.

Part Load Efficiency

Dillard's had ample experience working with on/off compressors, but knew they could not use them if they wanted to capture additional energy savings. Why? Standard on/off compressors operate at 100% capacity when there is any demand for cooling. During low load conditions, in order to avoid evaporator frosting, hot gas bypass may be required. With controls in place to ensure minimum compressor operating times, this can lead to the system consuming 100% of the energy to provide only a partial amount of the cooling, the equivalent of trading one dollar for fifty cents or less. This can result in a significant amount of energy waste and the system cannot precisely control the conditioned space temperature. Thus the system cannot properly provide shopper comfort.

Working with the AAON sales representative, Dillard's decided the solution was to use the 10-100% variable capacity scroll compressors and take advantage of the part load efficiency. "Specifying variable capacity scroll compressors on AAON equipment will save building energy costs. AAON has proven this time and time again over the last decade," stated Jim Peed, the AAON Sales Representative with Preferred Equipment Company.

Each of the RN Series rooftop units utilized variable capacity compressors on the lead refrigeration circuit. By doing this, Dillard's is able to maximize the part load efficiency by precisely matching the conditioned space load and tightly control the supply air temperature. A benefit of the variable capacity compressors is that they can quickly change capacity within 15 second intervals, as the demand requires it. This load matching capability resulted in dollar savings and put Dillard's in prime position to gain what they set out to accomplish.

Supply Fan Energy Savings

While the variable capacity compressors moved them closer to their energy savings goal, Dillard's needed more. This was not a problem for the AAON RN Series. Including variable frequency drives (VFDs) on the supply fans was the perfect solution to get Dillard's the rest of the way to their goal. Much like the variable capacity compressors, supply fan VFDs fully modulate fan speed in accordance with demand.

The Naples store had the variable capacity compressors modulate to maintain a constant supply air temperature and the supply fans speed up or slow down to maintain the space temperature setpoint of the conditioned space. This was done through a Dillard's developed control algorithm. "One of the things I like the

most with AAON is you can have your own controls installed. All the other top manufacturers have their controls and only allow a thermostat interface," said Goetz. This control algorithm contributed to Dillard's achieving its goal of energy savings.

By cutting fan speed in half, the required fan power reduces by a factor of 8 leading to significant dollar savings. This allows the supply fan motor to run at a more efficient duty point and increases energy savings. The recent improvements in VFD technology make this fan speed control far more reliable and readily available for all sizes of motors. "With over 100 drives now in operation on our stores, we have yet to see any failures," says Goetz. This reliability contributed to dollar savings since maintenance and repair costs are reduced over the life of the unit. By moving away from the traditional two-speed fan control, Dillard's was able to employ a reliable and energy efficient solution and allowed them to exceed their energy savings expectations.

Coastal Corrosion Protection

With energy savings firmly in grasp, the next step was a solution to corrosion protection of the rooftop equipment. With Naples, Florida being a coastal application, there is a much greater exposure to a highly corrosive salt



On the left is the original equipment and on the right is then new AAON equipment with corrosion resistant exterior paint.

water environment. The Gulf Coast has one of the highest atmospheric corrosion levels in the world and the highest in the United States. Along with the high concentrations of airborne salinity, there is year round high relative humidity that can cause exposed metal surfaces to corrode at an extremely fast rate.

To alleviate coil corrosion concerns, Dillard's chose to use polymer e-coated condenser coils on their RN Series rooftop units. The 6,000-hour salt spray tested complete coil coating protects the aluminum fin, copper tube condenser coils from the atmospheric corrosion that would normally shorten the lifespan of the coils. The standard paint, that AAON began using in 1996, provides the RN Series unit cabinet with corrosion protection. The 2,500-hour salt spray tested paint covers all panels and fasteners and leaves no exposed exterior



metal surfaces, rendering the corrosive atmosphere powerless. All told, Dillard's was able to address all previous concerns about corrosion leading Goetz to say, "...with regular cleaning and maintenance these units should easily last 25 years."

AAON Accomplishes the Task

With the Naples store, Dillard's aspired to start a trend with the HVAC needs of its chain of department stores by targeting energy savings and eliminating wasted dollars from their rooftop HVAC equipment. They also had to deal with unique environmental difficulties, in this case the highly corrosive atmosphere of the Gulf Coast. The proposed 20% savings with the Naples store was certainly a lofty goal, but five months after installation with a full peak cooling season behind them, Dillard's saw over a 23% decrease in electricity expense and a 20% reduction in kWh per square foot. They also saw over a 22% drop in peak kW demand because of the functionality of the variable capacity compressors and VFD controlled supply fans. With the help of AAON, not only did Dillard's exceed their expectations of energy savings, they were able to install rooftop HVAC equipment that will capture those savings for years to come in spite of the harsh coastal environment. Mission accomplished.



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