

Intelligent Demand Control Ventilation

Real-time Management of New and Legacy HVAC Systems



BENEFITS

- Reduced energy usage
- Improved customer comfort
- Lower maintenance
- Lower customer overhead costs
- Reduced installation costs
- Real-time alerts and alarms
- Reduced government agency compliance risk

Maintaining Indoor Air Quality (IAQ) in commercial buildings requires that significant outside (fresh) air be supplied according to building codes and industry standards. Most retail sites have HVAC systems set up statically to serve maximum occupancy levels. As buildings are rarely fully occupied, the HVAC system wastes energy heating, cooling, and dehumidifying this excess amount of outside air. In many applications, the HVAC fan is programmed to run 24/7, regardless of heating or cooling need, or occupancy levels, further wasting energy.

Demand Control Ventilation (DCV) systems vary the amount of outside air supplied into a commercial building based on occupancy. Older HVAC systems require an expensive damper retrofit, or total unit replacement in order to support DCV. Siemens' proprietary Intelligent DCV manages both new AND legacy HVAC systems in real-time to adjust the amount of outside air based on actual occupancy levels, to improve air quality in humid climates and eliminate wasted fan energy. The annual HVAC energy savings are significant: 15%+. Perhaps more importantly, IDCV can be installed at a far lower cost than retrofit or unit replacement.

Discussion

ANSI/ASHRAE 62.1-2004 provides the source requirements for DCV widely adopted by government agencies. For retail sales space, the outside air requirement is specified at 16 Cubic Feet per Minute (CFM) per person at full occupancy. Depending on the total air moving capacity, the HVAC contractor will set the outside air dampers on each rooftop HVAC unit (RTU) at an appropriate minimum setting to ensure compliance with the 16 CFM/person requirement. A space with rated occupancy of 100 people would require 1600 CFM of outside air be pumped into the space.

Without an actual occupancy measurement, standard compliance is only assured when the outside air mix is preset for 100% occupancy, as described above. In the case of "unoccupied" retail space, such as after store hours, the requirement for outside air is 0%. Energy Management Systems (EMS) therefore put all RTU fans in AUTO mode during "unoccupied" hours so that the fans run only if calling for heating or cooling.

During "occupied" hours existing DCV solutions provide a measure of occupancy, by measuring CO2 levels at each RTU, using a model defined in the ASHRAE document's Appendix D. This allows RTUs equipped with an economizer (or an add-on motorized damper) to close their outside damper below the aforementioned minimum down to 0%, yielding significant annual energy savings (up to 15%).

Additionally, many utilities recognize the positive impact of DCV on building energy use, so they promote the adoption of DCV by providing aggressive rebates based on delivered energy savings, further accelerating payback.

Limitations

However, there are several operational limitations with existing DCV systems:

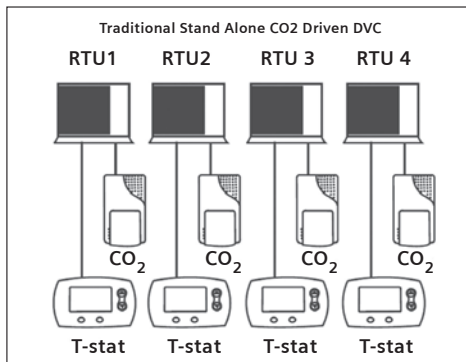
- Applicable only to newer RTUs equipped with economizers or added motorized dampers.
- Failing dampers can go unnoticed for months, impacting both air quality and energy use.
- No means to verify the ongoing performance of DCV from an air quality and energy use perspective.
- Managing compliance to ever changing health and safety standards is almost impossible.

The cost savings not realized in such DCV systems can be significant:

- Fans still run non-stop during occupied hours.
- Humidity levels may not be well-maintained.
- Indoor Air Quality may actually be compromised.
- Higher RTU maintenance costs.

Intelligent DCV (IDCV)

While still implementing DCV based on CO₂ input, Siemens Intelligent DCV option addresses the above limitations, while capturing additional cost savings and reducing operational risks.

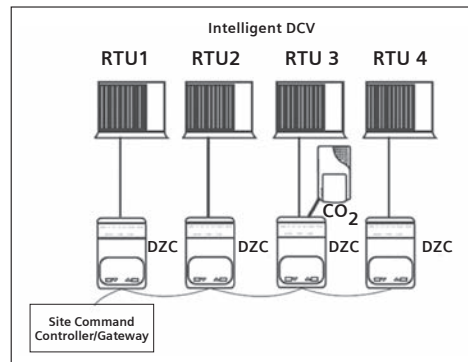


Each RTU in a traditional DCV approach operates in a stand-alone fashion, without above-site monitoring

The Site Controls™ platform monitors CO₂ globally, and applies a sophisticated control algorithm to all RTUs in the building, including older units built without an economizer or motorized outside air damper.

For RTUs without an economizer, fans are switched between AUTO and ON modes to control the CO₂ level in compliance with the ASHRAE standards. The Site Controls platform also controls all RTU fans in a coordinated fashion to reduce peak loads and while still circulating air in the store to ensure customer and employee comfort. Newer, economizer-equipped RTUs with a dedicated CO₂ sensor are also controlled by Site Controls, which integrates their local CO₂ measurements into the control algorithm.

Siemens' centralized data center logs and monitors all customer sites in real-time. By utilizing the Site Controls platform, the customer's energy and facilities managers can control all enterprise level functions including IDCV operation. Advanced query and trending algorithms allow the customer to deal with changing compliance standards, rapidly and remotely without a site visit to adjust dampers, or troubleshoot individual RTU



Siemens' Intelligent DCV offers a unified approach for greater savings and customer comfort

performance. Based on energy costs and seasonal occupancy projections the customer can tune building-wide IDCV to specific local or regional needs.

Implementing IDCV by controlling fan run times in older rooftop equipment, and when available, also controlling economizer and damper settings in newer units delivers superior energy performance, improved IAQ levels, extended useful equipment life and lower operational risk. Superior dehumidification is another useful outcome with IDCV: running RTUs in an alternating fashion at their most efficient cooling capacity will result in lower building humidity levels than autonomous HVAC operation.

Cost Justification

To quantify the superior savings, without considering the impact of compliance, (or non-compliance) costs, a cost/payback analysis must consider the following:

- Cost avoidance by using existing legacy RTUs
- Fan energy savings ~ (300W/ton) x (runtime)
- Increased Mean Time Between Failure (MTBF) of RTUs
- Units without economizers require no additional or complex thermostat to RTU wiring.
- Lower MTTR of economizers
- High rebates available
- Reduced customer staff to oversee DCV

Bottom Line

Siemens Site Controls EMS with the IDCV option provides superior savings and ROI through reduced installation costs, RTU capital investments, maintenance costs, customer overhead costs and energy usage. By above-site monitoring, alerting and alarming, performance and government agency compliance risks are reduced.