



Siemens Dynamic VAV Optimization

1111 Broadway creates more efficient,
healthier building environment

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SIEMENS

Intelligently optimize your HVAC system with AI-powered strategy

DVO collects temperature and humidity data from throughout the building and learns how the system responds to changes in load. The AI engine continuously evaluates zone-level operating data and sends back static pressure and supply air temperature setpoints to your HVAC system.

Rising 24 stories above the Oakland City Center, 1111 Broadway serves a range of tenants, including prominent law firms, financial advisors, government agencies, and construction companies. The building's real estate services provider, CBRE, has long been on the forefront of creating "winning outcomes" for their clients, particularly in the areas of energy efficiency and customer relations.

So when the opportunity arose in 2019 to become a pilot site for Siemens Dynamic VAV Optimization (DVO), the engineering team was excited to participate. DVO is an HVAC optimization strategy that relies on a cloud-based, artificial intelligence (AI) powered algorithm to automatically control fan speed, supply temperature, and humidity levels for centralized air handling units (AHUs).

Understanding DVO modes of operation

Efficiently matching building demand with heating or cooling output has traditionally been too complex a problem for typical building automation system (BAS) controls to solve. But artificial intelligence and machine learning algorithms were invented for exactly these types of problems. Today, in buildings like 1111 Broadway, DVO integrates with the Siemens BAS to operate in three distinct modes:



Green Mode – Control AHU fan speed and supply temperature to dynamically adapt to occupants' comfort requirements, minimize energy consumption and costs, and reduce hot/cold calls. DVO helps enable energy savings that can continue to provide value.



Defense Mode – Establish environmental conditions, pursuant to ASHRAE recommendations, that may help minimize virus transmission while still operating within acceptable comfort bounds.



Decontamination Mode – Assist in accelerating the rate of decay for viruses by using elevated temperature during unoccupied periods.

Each mode of operation is configurable to optimize results for any building, based on its location, layout, hours of operation, and other factors.

Reducing energy costs and consumption was the initial goal for DVO

According to Chief Engineer Jason Sprague, the BAS at 1111 Broadway had been augmented over the years with code written by a number of people with various objectives. "We were struggling to achieve our energy efficiency goals, and we were spending a lot of time with Siemens technicians and programmers to decipher what was going on with the code."

By implementing DVO, however, Sprague explains that they were able to move the building optimization functions to the cloud, where the AI engine reviews all the zone data continuously. "We don't have to have someone programming the system anymore. DVO constantly determines the right strategy for static pressure and supply air temperature. It's dynamic and changes in real time. That's where the value comes in," he says.

Proven early results

15% HVAC energy saving

40% reduction in noncompliant zones

In fact, Sprague says that the engineering team at 1111 Broadway felt the impact of DVO quickly. “We had a reduction in comfort calls from our tenants, and when we did get them, it took less time for our engineers to handle them.” Additionally, DVO helped the building consume less energy. “We were saving more money on the energy bills, which helped us achieve a higher ENERGY STAR rating. So, we delivered a smaller carbon footprint and reduced operational costs overall,” he notes. Insights from the machine learning algorithm also helped identify malfunctioning equipment.

COVID-19 pandemic changes how we operate buildings

In the summer of 2020, in the midst of the COVID-19 pandemic in California, Sprague says the 1111 Broadway team was grateful to have already implemented DVO. Because guidance from ASHRAE and other industry experts reveal that the ways in which buildings operate can affect virus transmission, engineers like Sprague understand that strategies for keeping buildings as safe as possible must remain adaptable. One of those strategies, in alignment with ASHRAE, is to utilize “epidemic operating conditions,” which involve changes to building operations, including ventilation, filtration, humidity, and temperature settings to help assist in virus deactivation and suppress transmission.



“Because we were already running on the cloud-based solution, we were able to adapt very easily,” says Sprague. “Namely, we could switch through the modes of operation based on whether we needed to conserve energy, maximize outside air for health purposes, or reduce the half-life of an airborne virus.”

Then, one Monday, an occupant of 1111 Broadway revealed that they had tested positive for COVID-19. In response, the building operations team deployed DVO’s decontamination mode at 6pm, once the building was unoccupied, to heat up the building. The cycle ran for approximately nine hours, at which point outside air was used to cool the building back down. By 6am the next day, the building had been returned to comfortable temperature and humidity settings.



Decontamination mode uses heat to help accelerate virus inactivation

"You could see the zones heating up," says Sprague. "Operationally, we focused on the areas where the infected occupant had been, to warm it up the most efficient way to help reduce the virus half-life. It's an excellent strategy; not a cure-all, but a piece of the puzzle." At that point, an electrostatic cleaning crew arrived to complement the DVO Decontamination mode with disinfection and sanitization, making the building as safe as possible to reoccupy.

No additional cases were reported immediately following this incident. And by leveraging the AI-powered engine behind DVO, buildings like this one can achieve their decontamination goals while consuming a minimum amount of energy.

Since that first case, DVO decontamination mode has run at 1111 Broadway a few more times for testing and commissioning purposes. Looking toward the future, Sprague explains that decontamination mode can be deployed during flu season, in addition to mitigating the spread of COVID-19. "It's truly a value-add to any building. There's peace of mind there too, knowing you can easily and automatically follow guidance from ASHRAE or the CDC – something that would be really cumbersome if you tried to do it manually," he concludes.

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