

Garage DCV System Case Study: Mt. Diablo Plaza, Walnut Creek

Tridium Jace-controlled System Demonstrates Its Adaptability – and Robust Functionality

The Property

A Class A office complex owned by Rreef Property and managed by CB Richard Ellis (CBRE), Mt. Diablo Plaza is located in Walnut Creek's Central Business District.

The property houses a three-level, 300,000 square-foot parking garage. The upper level of the garage is above grade, and it is provided with a small amount of natural ventilation. The ground level and lower (below-grade) level of the garage are fully enclosed, with the exception of an entrance/exit on each level. In total, the garage can accommodate up to 811 vehicles.

The Challenge

There are nine (9) axial fan exhaust motors – seven (7), 5-horsepower (HP) and two (2), 7.5-HP motors – dispersed throughout the garage. Prior to our retrofit, eight (8) of the fans were scheduled (via the building management system) to run intermittently throughout the business day – for a combined 2.8 hours a day, five (5) days per week. (One of the 7.5-HP motors was left in “off” mode as a means to reduce energy consumption.)

Our challenge was twofold: 1) Find a way to minimize the bill of material (BOM) while accounting for the need to incorporate variable frequency drives (VFDs) in our garage ventilation strategy/solution; and 2) Further reduce an already de minimis baseline of energy consumption resulting from the limited runtime of the garage fan motors.

Impact(s) of Code Changes on Garage Ventilation

Revisions to the California Energy Code (Title 24) require that commercial garages in properties with building occupants (residents, shoppers, employees, et al.) run their garage ventilation systems during building occupied hours.

For an office building such as Mt. Diablo Plaza, that correlates to a minimum runtime of 12 hours per day, five (5) days a week. This means that simply shutting off garage fans to avoid energy fees – and thus increase health and safety risks to building occupants – is no longer permitted in California. In addition, carbon monoxide (CO) sensors by themselves can no longer serve as the source of control for garage fans; meaning traditional “on/off” or “start/stop” CO sensor systems are now out of code.

Our sensor-based, demand-control ventilation (DCV) system for garages enables clients to meet the new code stipulation to continuously ventilate while significantly reducing energy consumption.

The Savings Opportunity – Both Energy & the BOM

NES determined the baseline energy consumption of the garage motors to be 28,000 kilowatt-hours (kWh) a year, with a correlating power demand of 33.9 kilowatts (kW), by measuring each garage fan motor's true power (kW) consumption, plus their voltage and current (amperage) output and actual (versus rated) power factor (PF).

Based on an electric utility rate of \$0.156/kWh and accounting for additional charges incurred by running the garage fans during peak demand periods each day, property management's annual cost to ventilate the Mt. Diablo Plaza garages amounted to \$4,400.



Mt. Diablo Plaza, Walnut Creek, CA

NES enabled Rreef / CBRE to adhere to California's new code requirements for commercial garage ventilation with a truly dynamic system. From providing real-time energy saving reports, to adjusting fan speeds from the chief engineer's desktop, the functionality it provides is noteworthy.

To account for the need to more than **quadruple** the garage fan runtimes – from 2.8 hours a day to 12 hours per day – our pre-installation calculations for peak kW and kWh savings approximated no less than a 78% reduction in consumption. Our calculations factored in daily traffic patterns in the Mt. Diablo Plaza garage, as well as its physical design and layout.

On-site inspection of the garage electrical system verified it was possible to reduce the total number of VFDs required to just two (2) by pairing a total of five (5), 5-HP motors on to one (1), 25-HP VFD and the remaining two (2), 5-HP motors with the two (2), 7.5-HP motors on to a second, 25-HP VFD, thereby enabling us to significantly reduce the retrofit bill of material (BOM).

The NES Solution & Results

NES worked the property’s management and engineering to design and then install a Tridium Jace-controlled system. The retrofit took place in December 2013.

Tridium Jace controllers significantly enhance operational functionality for building managers and engineers. Its Web-based interface provides the ability to remotely set and manage the garage ventilation system’s operating parameters, detect and troubleshoot sensor faults, etc., and it is compatible with building systems that utilize LonWorks®, Bacnet®, Modbus and many other communication protocols. It also distinguishes itself by its ability to interface with VFD technology to track real-time energy consumption and generate reports on energy consumption, system status and maintenance – a valuable asset in today’s energy conscious environment.

| Energy Use | Pre Installation | Post Installation | Savings | % Savings |
|---------------------------------|------------------|-------------------|-----------------|--------------|
| Total kWh | 28,000 | 3,000 | 25,000 | 89.2% |
| Total Cost @ \$0.156/kWh | \$ 4,400 | \$ 475 | \$ 3,925 | 89.2% |
| Total kW Demand | 33.9 | 1.2 | 32.7 | 96.6% |

Two week’s worth of post-installation energy consumption monitoring via the VFDs showed our garage DCV system will reduce the garage fan motors’ combined kWh consumption by more than 24,000 kWh a year – an 89.2% savings. Peak kW demand has been reduced by nearly 33.0 kW, which equates to a 96.6% savings.

Our Ventilation Strategy

NES “syncs” VFD technology with a proprietary, smart-control logic that detects and measures vehicle fumes and modulates fan motor speeds to prevent CO levels from exceeding 10 parts per million (ppm) for extended periods of time. The result is to enable property owners to continuously ventilate their garages in an energy efficient manner while ensuring the health and safety of building occupants and visitors.

About Nagle Energy Solutions (NES)

Nagle Energy Solutions, LLC (www.nagle-energy.com) is a manufacturer, distributor and installer of an innovative demand-control ventilation (DCV) system for commercial garages that reduces energy consumption by an average of 93%.

Our sales and service capabilities extend nationally and internationally.

NES digital controllers and peripherals are scalable and conform to several building management system (BMS) and energy management system (EMS) communication platforms, as well as monitor / report on energy consumption/savings.

Nagle Energy Solutions Contact: Frank Nagle (650) 854-1992 or frank@nagle-energy.com.