Garage DCV System Case Study: 655 Beach Street, S.F.

Garage Retrofit Reduces Entire Property's Annual Utility Bill by Nearly 10%

The Property

655 Beach Street is a four-story office building in the heart of San Francisco's Fisherman's Wharf district that serves as home to ***The American Academy of Ophthalmology (AAO).*** The property includes a three-level, below-grade parking garage that houses up to 160 vehicles. The garage is open from 7 a.m. to midnight seven (7) days a week, serving both AAO staff on weekdays and a constant stream of tourists throughout the week.

Daily garage occupancy and traffic is best described as "high volume." So much so that, according to AAO facilities management, the cost to ventilate the garage historically represented slightly more than 10% of the Academy's total, annual energy consumption.

655 Beach Street, S.F.

"Nagle Energy Solutions' measurement and calculation methodologies, project design and management ensured optimal – and accurate – results."

Lou Cuneo, Director of Facilities

The Savings Opportunity

The 655 Beach Street/AAO garage is ventilated 24 hours a day, seven (7) days a week by three (3) exhaust fans and one (1) supply fan totaling 28.5 horsepower (HP). Prior to Nagle Energy Solutions (NES) installing an innovative carbon monoxide (CO) sensor-based, demand-control ventilation (DCV) system, the garage fans consumed 146,926-kilowatt hours (kWh) and 16.8 peak kilowatts (kW) per year, which at a utility rate of $0.16/kWh, amounts to an annual cost of $23,508.

The Results

To establish an accurate, pre-installation baseline of energy consumption, NES measured the voltage, current, true power (kW) and power factor of each garage fan motor. This enabled us to correctly calculate the savings opportunity, which in turn allowed us to construct a reliable project quote with a well-defined payback period. Post installation, we verified the savings our system captured by conducting two weeks of data logging; again measuring voltage, current, true power (kW) and power factor at each garage fan motor, in this instance at one-minute intervals throughout the course of 24 hours each day.

The resulting energy savings proved to be exceptional. Our system, combined with NES's project design and ventilation strategy, delivered an annual energy savings of 140,661 kWh and reduced peak kW demand by 16.1 kW, representing a 95.7% reduction in both kWh consumption and peak kW demand.

Energy Use	Pre Installation	Post Installation	Savings	% Savings
Total kWh	146,926	6,265	140,661	95.7%
Total Cost @ $0.16/kWh	$ 23,508	$ 1,002	$ 22,506	95.7%
Total kW Demand	16.8	0.7	16.1	95.7%

We shared our findings and calculations with engineers for Pacific Gas & Electric (PG&E), who confirmed the energy savings attained by the NES system. As a result, the NES system has effectively reduced the AAO's annual garage ventilation costs to now represent less than one half of 1% – 0.43% – of its total annual energy consumption.

The AAO will now pay just $1,000 per year to ventilate its parking garage – an annual savings of approximately $22,500. The NES system will pay for itself in 18.6 months, not including a $14,200-plus rebate from PG&E.

Our Solution

Our garage DCV system utilizes a proprietary, smart-control logic that detects and measures vehicle fumes in the space and then modulates fan speeds to prevent CO levels from exceeding 10 parts per million (ppm) for extended periods of time.

655 Beach Street / AAO Summary	
Discount Rate	5.0%
Inflation Rate (2.4% over last 10 years)	2.4%
Annual Savings	$ 22,497
Utility Rebate	$ 14,260
Cost of Project Net of Rebate	$ 34,841
Payback Period In Months	18.58
NPV (before investment)	$ 277,749
NPV net of investment	$ 242,907
Minimum cash inflow	$ 302,618

By doing so, our system better ensures (vs. "on/off" CO sensor systems) the health and safety of building occupants and visitors by continually ventilating the garage while maximizing energy savings – by 85% to 95% (and beyond).

A unique and valuable component of the NES system is its use of variable frequency drives (VFDs) to modulate garage fan speed(s). NES programs the controller and the VFDs to run the garage fans at a baseline speed that consumes an average of less than 3% of the full-speed power draw of the fan motor.

Our system ensures the garage fans provide a reservoir of fresh air sufficient to handle moderate-to-significant peaks of vehicle activity.

Post-installation measurements by NES at verify that, upon detecting rising CO levels from vehicles, the garage fans promptly ramp to reduce CO concentrations and then just as quickly return to baseline operation – typically within four (4) minutes.

Tridium Jace Controller

NES worked the director of facilities at AAO to project design and install a Tridium JACE-controlled system. The Tridium Jace-based system significantly enhances 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.

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.

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