Garage DCV System Case Study: Golden Gateway Garage, San Francisco

NES System Limits Energy Consumption to Just 7% of Full Load Capacity at S.F. City Garage

The Property

Constructed in 1966 and owned by the City & County of San Francisco, the Golden Gateway Garage is one of three San Francisco-municipal garages to undergo substantial retrofitting in 2016, with the Sutter-Stockton Garage and Japan Center Garage completing the list.

The Golden Gateway Garage is a three-level, 345,000 square feet, enclosed parking facility in the heart of downtown San Francisco, subdivided in to East and West garages (each measuring 172,500 square feet). It can accommodate a total of 1,095 vehicles.

Mechanical design engineers for the San Francisco Public Works Department selected the Nagle Energy Solutions (NES) digital, demand-control ventilation (DCV) system as the "basis of design" for upgrading the mechanical ventilation systems at each of the three garages.

Golden Gateway Garage, San Francisco

The upgrade at Golden Gateway included the installation (by third-party vendors) of Huntair Fanwall® technology in conjunction with ABB variable frequency drive (VFD) technology. Tying it all together is the NES system, controlling the primary motor / VFD functions based on carbon monoxide (CO) concentrations in the garage.

The Operational Challenge / Energy Savings Opportunity

In all, 12 new Fanwall® units and four (4), new stand-alone garage ventilation motors were installed at Golden Gateway, possessing a combined total of 155.5 horsepower (HP). During the project design phase, San Francisco Public Works administrators and design engineers placed an emphasis on curtailing the significant amount of energy consumed by such a large ventilation system while running in accordance with the California Energy Code (Title 24) requirement to provide continuous, mechanical ventilation during garage-occupied hours.

In this instance, required garage-fan runtimes total 18 hours a day, Monday thru Friday, and 15 and 14 hours a day on Saturday and Sunday, respectively. That equates to 6,205 hours of runtime per year for each garage-fan motor.

Pre-installation calculations reflected Golden Gateway's new mechanical ventilation system consuming more than 719,000 kilowatt-hours (kWh) in the course of a calendar year, with a correlating annual peak kilowatt (kW) demand of more than 115 kW. The electric utility rate for the garage is $0.182/kWh, so with no means of ventilation control in place and at the calculated rate of kWh consumption, the annual cost to ventilate the garage would amount to more than $131,000 – not including or factoring in future utility rate increases.

Consumption	Without NES Controls	With NES TR100	$ Savings	% Savings
Total kWh	**719,079**	**50,336**	**668,744**	**93.0%**
Total Cost @ $0.182/kWh	**$ 131,092**	**$ 9,176**	**$ 121,915**	**93.0%**
Total kW Demand	**115.89**	**8.11**	**107.77**	**93.0%**

The NES Solution –

S.F. Public Works mechanical design engineers worked with NES to customize a garage DCV system to meet the operational and energy saving challenge(s). The NES digital TR100 Series system was selected based on its proven track record of success in optimizing operational efficiencies while minimizing energy consumption.

At Golden Gateway, the NES TR100 controller monitors carbon monoxide (CO) readings provided by 87 BACnet-communicating CO sensors installed every 5,000 square feet throughout the garage. As CO concentrations rise, the NES controller provides speed commands via variable frequency drives (VFDs) to the garage's exhaust and supply fan motors, increasing motor speeds in proportion to CO levels to quickly "push" concentrations back below predetermined set points – typically within four (4) minutes.

This approach, when deployed with proprietary NES controller sequencing, routinely captures kWh and peak kW demand savings in the range of 95% – and, in some instances, greater.

The Results

Real-time monitoring and data logging of post-installation energy consumption – a standard capability in each NES TR Series controller – shows the NES digital, garage DCV system is limiting the power (kW) consumption of the fan motors to just 7% of their combined full-speed power (kW) draw, which equates to a 93% savings in both kWh and peak kW demand.

The NES system also slashes – by 93% – energy costs which otherwise would have been incurred. Moving forward, the cost to ventilate the garage will amount to approximately $750 a month – versus $10,900 a month without the NES system – providing minimum cash inflow (from the savings) in excess of $1.8 million throughout the 15-year lifespan of the system.

The savings totals take into account:

a. Setting a daily "purge" schedule due traffic congestion in the garage between noon and 3 p.m. each weekday. NES system programming increases the speed of all 12 fan wall systems and four (4) stand-alone fan motors serving the garage from 25% to 50% of full motor capacity during that time span – for a total of 3 hours per day Monday thru Friday – delivering additional fresh air in to the garage and thereby holding carbon monoxide (CO) concentrations to a minimum during peak traffic times; and

b. Increasing the baseline fan speed of a fan wall system serving the dual purpose of ventilating the garage and an employee bathroom from 25% to 50% of full motor capacity.

Since commissioning the system in late July 2016, the rate or percentage of savings at Golden Gateway has remained at or on the plus side of 93%.

About Nagle Energy Solutions (NES)

Nagle Energy Solutions, LLC (www.nagle-energy.com) is a manufacturer, distributor and installer of an innovative and patented demand-control ventilation (DCV) system for commercial garages that reduces energy consumption by an average of 95% – with quantifiable savings as high as 97% achieved – all while leaving your garage fan motors running. Our sales and service capabilities extend nationally.

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