Garage DCV System Case Study: Parc 55 Wyndham Hotel, S.F.

Digital "Variable Flow" System Proves Highly Adaptable In Achieving 93.5% Energy Savings

The Property

Just off San Francisco's Union Square, the Parc 55 Wyndham Hotel is a large (1,024 guest rooms), bustling facility. The hotel possesses a two-story, below-grade garage capable of accommodating up to 175 vehicles. Operated by ProPark, it is open 24 hours a day, seven (7) days a week, serving hotel guests, visitors and tourists alike.

Parc 55 Wyndham Hotel, San Francisco

Daily garage occupancy and traffic is best described as "high volume."

The Operational Challenge / Savings Opportunity

A 25-horspower (HP) exhaust-fan motor and a 20-HP supply fan motor power the hotel's garage ventilation system. Each is an older-model, two-speed, non-inverter duty motor, which the engineering staff had run on a 24/7 basis for years at their "low" speeds to minimize energy costs. Even then, the baseline of energy consumption – confirmed via power measurements – totaled nearly 137,500 kWh per year at a cost of more than $18,000 a year.

Our digital, demand-control ventilation (DCV) system for garages, plus our innovative and distinctive ventilation strategy, incorporate variable frequency drive (VFD) technology. VFDs are considered to be non-compliant with non-inverter-duty motors and, despite their age, hotel management did not want to have to replace its two garage-fan motors.

Our challenge, then, was twofold:

1. Modify our "variable flow" DCV system in a manner that would enable it to work efficiently with older, two-speed, non-inverter garage fan motors; ***and***

2. Maximize the energy savings opportunity and thereby minimize the payback period.

Baseline Energy Measurements & Savings Estimates

The operating hours for each fan motor amounted to 168 hours per week or 8,760 hour annually. To establish an accurate baseline of energy consumption, NES measured each garage fan motor's true power consumption, as well as the voltage and current (amperage) output and the actual power factor (PF) and motor load of each motor.

Our measurements showed that, with the motors running 24/7 at their "low" speeds, their combined, annual energy draw totaled 137,481 kilowatt hours (kWh), with a peak kilowatt (KW) demand equaling 15.69 kW. At a utility rate of $0.133/kWh, that meant Parc 55 Hotel management spent nearly $18,300 a year to ventilate its garage.

		Baseline Energy Usage				
	HP	Power Demand	hr/yr	kWh		Cost
GEF	25	8.11	8,760	71,034	$	9,448
GSF	20	7.59	8,760	66,447	$	8,837
		15.69		137,481	$	18,285

Furthermore, because VFDs are designed to sync with fan motors operating at 100% of capacity, i.e., their "high" speed, we rewired each motor to run at its "high" speed and measured kW, etc., once more. This, in turn, enabled us to calculate the obtainable energy savings with the motors running in conjunction with VFDs (post installation).

Even in commercial parking garages with high traffic volumes, NES can provide numerous examples of our system delivering a 95% kWh savings – and greater – while reducing peak kW demand by the same percentage. In garages where the daily traffic flow is de minimis, the NES garage DCV system has delivered kWh and peak KW demand savings as high as a 97%.

As such, based on our analysis of the physical design of the Parc 55 garage, as well as its occupancy / traffic trends, NES relied on a "benchmark" of 95% for calculating the ***obtainable*** kWh and peak kW savings. After accounting for gap between the garage fan motors running at the high versus low speeds, post retrofit, NES calculated an estimated energy savings of 90% for both kWh consumption and peak kW demand.

The NES Solution

NES worked the hotel's chief of engineering to design and then install a Tridium Jace-controlled system. 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.

To address the issue of non-inverter-duty motors not syncing well with VFD technology, NES deployed "dV/dt" filters at each of the respective VFDs. On average, dV/dt filter technology reduces the risk of non-inverter-duty motor failure by approximately 80%, according to technical advisors for Danfoss, which manufactures the VFDs that NES installs.

The Results

NES retrofitted the The Parc 55 garage ventilation system in February / March 2014, switching the respective garage exhaust motors to run 24/7 at high speed(s) to better "sync" with the respective VFDs.

Energy Use	Pre Installation	Post Installation	Savings	% Savings
Total kWh	137,481	8,953	128,528	93.5%
Total Cost @ $0.133/kWh	$ 18,285	$ 1,191	$ 17,094	93.5%
Total kW Demand	15.69	1.02	14.67	93.5%

Two week's worth of post-installation energy consumption monitoring / data logging showed our initial savings estimates to be short, as our garage DCV system actually reduced the motors' combined kWh consumption by more than 128,500 kWh a year – a 93.5% savings. Peak kW demand was reduced by 14.67 kW, which also equates to a 93.5% savings.

Moving forward, Parc 55 management's cost to ventilate its garage will drop from $1,524 to $99 per month or $8.25 per day, thus providing a minimum cash inflow in excess of $217,000 throughout the 15-year lifespan of our system.

Our measurement and verification methodologies were accepted and approved by the inspecting engineer for the regional utility, Pacific Gas & Electric, resulting in a rebate amounting to $11,749.

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% – with quantifiable savings as high as 97% achieved.

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 and report on energy consumption / savings.

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