Hilton Bayfront
Guestroom HVAC Energy Management System Evaluation

Presented to:

SUNSTONE
HOTEL INVESTORS

Presented by:

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2) Summary of Analysis Performed

Willdan Energy Solutions performed a detailed study to compare the energy savings from implementing occupancy-based thermostats to control the fancoil units (FCU) providing space conditioning at the guestrooms. The guestrooms are currently served by a floor-mounted fancoil unit recessed within a wall in the guestroom near the building exterior and window. See Picture 1. Each FCU has a three (3) speed fan and chilled water coils for cooling and hot water coils for heating. The existing wall thermostat controls the fan speed whether the fancoil is operating in cooling or heating mode. See Picture 2.

Picture 1: Floor-mounted fancoil unit

Picture 2: Existing thermostat

In this study, the following thermostat control options and technologies were tested:

- Existing room thermostat (Inncom model E528)
- Telkonet room thermostat with ceiling mounted occupancy sensor
- Inncom occupancy based room thermostat with auxiliary door switch

Pictures of the tested technologies are shown below.

Picture 3: Telkonet Thermostat

Picture 4: Telkonet ceiling mounted occupancy sensor

Picture 5: Inncom Thermostat

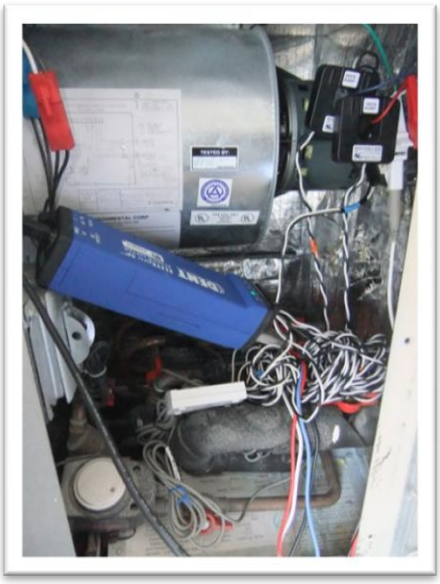
Picture 6: Inncom door switch

For each of the three options above, three guest rooms on identical orientations/exposures of the building were studied. The Hotel ensured that the tested rooms given priority for occupancy. The performance of the fancoil serving these guestrooms was tracked over a period of two (2) weeks. The following parameters were tracked:

- Fancoil fan energy use
- Chilled water cooling energy use
- Hot water heating energy use

Independent monitoring devices were installed at each guestroom fancoil unit to measure fan power at low speed, medium speed and high speed. Cooling chilled water supply and return temperature from each FCU was measured and recorded. Heating hot water supply and return temperatures for each FCU were also measured. To achieve this, a number of sensors with attached data loggers were installed in each FCU cabinet. See Picture 7 & 8.

Picture 7: FCU Fan Power Logger and Sensors



Picture 8: FCU Chilled & Hot Water Temp Logger and Sensors

The following data was monitored with the given intervals:

- Chilled water supply temperature every minute
- Chilled water return temperature every minute
- Hot water supply temperature every minute
- Hot water return temperature every minute
- Fan low speed current and voltage, every 30 seconds
- Fan medium speed current and voltage, every 30 seconds
- Fan high speed current and voltage, every 30 seconds

From this data, the energy use for cooling, heating and fan operation was calculated; results are summarized in the next section.

3) Hotel Occupancy During Test

To obtain actionable test data, Willdan instructed the Hotel reservation personnel to ensure that the none (9) rooms selected for this test were always rented and continuously occupied. This ensured that none of the rooms remained unrented and unoccupied and therefore would show significantly greater savings that the rented and occupied rooms. Keeping all the rooms rented during the period of the test ensured that the comparison utilized similar conditions across the various technologies.

During typical hotel operation, a percentage of the guestrooms are unoccupied and the energy savings that can be realized from having active occupancy based temperature controls in these rooms will be significant.

4) Utility Incentive Calculations

It is critical to note that the current incentive calculations for San Diego Gas and Electric are based on an established White Paper that quantified typical energy savings for occupancy based temperature controls in hotel guestrooms.

The energy use of the typical guestroom with no occupancy based thermostat controls will be similar to the energy usage numbers below as in this scenario, the HVAC system remains activated and maintaining an occupied space temperature setpoint.

However, the energy use of the guestrooms with occupancy based thermostats installed will be significantly lower, resulting in savings values that will be greater than shown in this study.

5) Test Results

Data from the two-week test was normalized to report energy savings for a one year period. It is important to note that the Hotel gave significant priority to selling the nine test rooms, thus realized energy and cost savings will be greater based on typical occupancy of 78% (as reported by Sunstone).

	Control	Telkonet	Inncom
Annual Fan Energy Use Per Room (kWh)	930	548	484
Annual Fan Energy Use All Rooms (kWh)	1,106,998	652,122	575,744
Annual Fan Energy Savings (kWh)	N/A	454,875	531,254
Annual Fan Energy Savings (%)	N/A	41.1%	48.0%
Annual Cooling Energy Use Per Room (kWh)	1,163	913	898
Annual Cooling Energy Use All Rooms (kWh)	1,384,483	1,085,993	1,068,643
Annual Cooling Energy Savings (kWh)	N/A	298,490	315,840
Annual Cooling Energy Savings (%)	N/A	21.6%	22.8%
Annual Heating Energy Use Per Room (Therms)	37	21	32
Annual Heating Energy Use All Rooms (Therms)	44,613	25,010	38,077
Annual Heating Energy Savings (Therms)	N/A	19,603	6,535
Annual Heating Energy Savings (%)	N/A	43.9%	14.6%
Total Electric Energy Savings (kWh)	N/A	753,365	891,584
Total Electric Energy Savings Per Room (kWh)	N/A	633	749
Total Natural Gas Savings (Therms)	N/A	19,603	6,535
Total Natural Gas Savings Per Room (Therms)	N/A	16.5	5.5
	N/A		
Total Electric Savings Cost ($)	N/A	$113,381	$134,183
Total Natural Gas Savings Cost ($)	N/A	$16,809	$5,604
Total Energy Cost Savings ($)	N/A	$130,191	$139,787
	N/A	31.5%	33.8%

1,190	Total Guest Rooms
$0.1505	Electricity Virtual Rate
$0.8575	Natural Gas Virtual Rate

The energy savings from installing each technology have been quantified for both electricity and natural gas, and are tabulated in the table above. The study shows that the technology can deliver an annual energy cost savings of over 31% for Telkonet and 33% for the Inncom system.

6) Product Comparison

	telkonet		INNCOM	
SYSTEM PROPOSED & TESTED	EcoAir SS6550, EcoView Ceiling Sensor, Zigbee Network		Wireless E529 X07 HVAC Control, Door Sensor, CI Network	
EQUIPMENT PHOTOS				
EQUIPMENT COMPARISON				
Customizable Display	YES		YES	
Night Occupancy Mode	YES		YES	
Built-in Occupancy Sensor	YES		YES	
Demand-Response Ready	YES		YES	
Electronic Door Lock Networking Capable	NO		YES	
Minibar Networking Capable	NO		YES	
QUANTITY (Per Proposal)	1200	Property has 1,190 guestrooms	1211	
GROSS PROPOSED COST	$497,444	w/ceiling mounted sensor	$540,372	w/door sensor
GROSS COST PER ROOM	$415		$446	
COST REDUCTIONS				
Estimated SDG&E Incentive[1]	($162,233)		($162,233)	
Buyback of Existing Thermostats	$0		($72,660)	
Additional Credit for Returned Thermostats	$0		($17,000)	
NET INSTALLED COST	$335,212		$288,479	
NET INSTALLED COST PER ROOM	$279		$238	
Test Rooms Control Rooms: 746 / 754 / 844	748 / 750 / 752		850 / 852 / 854	

[1] Incentive is estimated and subject to chage pending review and approval from the CPUC (California Public Utilities Commission)