3 Energy Savings Case Studies

Change'Air Inc.
PRODUCTS AND SERVICES LTD.

Engineered Excellence for Greener Classrooms

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Study One:

Upgrade a classroom with a PIC programmable thermostat, C02 sensor damper control and an occupancy sensor and test the results for energy savings.

1. Upgraded Controls Used in The Test Site

PIC TD -1 fully programmable thermostat

Program and set temperatures locked with a manual occupied override and a small on board adjustment for set temperatures.

Telaire 8001 C02 controller

Commercial grade carbon dioxide sensor with gold plated optical sensor. The patented ABC (automatic background calibration) self calibration gives a 10 year life expectancy.

Honeywell occupancy sensor

Passive infrared occupancy sensor covers a 40 x 40 ft zone with a high reliability of operating conditions.

2. Details - Programming of The Thermostat

The thermostat was programmed with an occupied set temperature of 21C (70F) degrees (winter) and 23C (73F) degrees (summer). The unoccupied set temperature was 16C (60F) and 27 (80F) respectively.

The thermostat was programmed to precondition the classroom at 6:30am without ventilation and at 7:00am the system moved to an occupied state supplying ventilation and meeting occupied set points. At 9:00am the controller switched to look for a motion signal from the occupancy sensor. If a signal was detected then the cycle would continue in an occupied state. If no motion was detected the system would move to an unoccupied state until motion was detected.

The Telaire carbon dioxide device was programmed for demand control ventilation. The target rate is 800ppm of CO2 and the damper opened to 100% if levels rose to 1000ppm. The monitor/controller was active during all occupied periods.

3. Results

Site specifics: Fully monitored with power meters

Time period: December - March (110 days)

Energy Savings: Reduction in electrical consumption of 846 kWh

Comparison percentage: Savings of 14% in energy consumption compared to base line unit at this site

TEST HIGHLIGHTS

Thermostat programming achieved Energy Savings: Reduction in electrical consumption of 846 kWh

Comparison percentage: Savings of 14% in energy consumption compared to base line unit at this site.

Study Two:

Upgrade mechanical equipment and controls with occupancy, CO2 and energy recovery ventilation and test for energy savings.

1. Upgraded Controls Used in The Test Site

Telaire 8001 C02 controller

Commercial grade carbon dioxide sensor with gold plated optical sensor. The patented ABC (automatic background calibration) self calibration gives a 10 year life expectancy.

Honeywell occupancy sensor

Passive infrared occupancy sensor covers a 40 x 40 ft zone with a high reliability of operating conditions.

RERV energy recovery ventilator

Fixed plate energy recovery unit supplying fresh air to the unit as required by the CO2.

2. Results

Site specifics: Fully monitored with power meters

Time period: 2002 - 2007 (6 years)

Energy Savings: Average yearly reduction in electrical consumption of 7,927 kWh

Comparison percentage: Savings of 21% in energy consumption for the 40 months compared to previous 32 months before the changes were made.

3. Details -Chart of Power Consumption Before and After Upgrades

This customer installed Change'Air Energy Recovery Units, motion sensors and CO2 control in the summer of 2004, replacing an equivalent unit without recovery and standard scheduled controls. This chart documents the power consumption used from January 2002 to December 2007 and shows an average total cost reduction of 21% after upgrades were made.

Note: The unit design is electric heat and self contained packaged air conditioning.

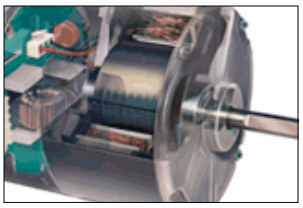
Power Consumption before upgrades

Power Consumption after upgrades

Bill Period	2002	2003	2004	2005	2006	2007
January	1,932	3,303	3,878	2,350	1,804	2,734
February	1,938	3,061	2,660	2,150	2,145	1,935
March	2,268	2,297	2,207	1,740	1,772	1,287
April	1,123	1,308	1,281	967	783	1,417
May	1,113	856	856	738	752	593
June	1,170	651	615	668	478	563
July	20	486	42	0	20	69
August	718	483	193	240	207	274
September	871	881	610	628	620	738
October	1,529	1,035	2,765	967	1,268	985
November	2,267	1,661	2,301	2,254	1,425	2,261
December	2,645	2,564	2,090	2,838	2,033	2,090
Sum $.08 per Kw	17,594 x $.08	18,586 x $.08	19,498 x $.08	15,540 x $.08	13,307 x $.08	14,946 x $.08
Total $ per Yr.	$1,407.52	$1,486.88	$ 1,559.84	$ 1,243.20	$1,064.56	$1,195.68

Study Three:

Upgrade a standard PSC supply fan motor with an ECM supply fan motor and test for energy savings.



1. Upgraded Parts Used in The Test Site

1/3 hp ECM motor

Supply fan was upgraded from a 1/3 hp PSC motor.

TEST NOTES

Conventional permanent split capacitor (PSC) motors become less efficient at the reduced speeds that are typically selected for fan powered applications. The ECM motor offers greater efficiency and results in excellent payback.

2. Results

Site specifics: Fully monitored with power meters

Time period: December - March (110 days)

Energy Savings: Reduction in electrical consumption of 789 kWh

Comparison percentage: Savings of 13.5% in energy consumption compared to base line unit at this site

Conclusions and Recommendations:

The Three Case Studies document sizable energy saving results with upgrades to fan and primary controls and fine tuning the programming of the thermostat sequence of operation function.

Change'Air also recommends the following proven energy saving tools for schools:

- **On demand lighting control**
- **Door switch control**
- **Regular preventative maintenance**

On demand lighting control requires the addition of a control panel to interface with the thermostat to allow the time schedules for the ventilation to enable and disable the light switches. Occupancy sensors enable the ventilation cycle and at the same time enable the light panel so that the lights will shut down during unoccupied periods even when the user wall switches for the lights have been left on. In a typical classroom the energy saving for adding on demand lighting control is approximately 5% on an annualized basis (advantages will vary depending on the efficiency of the lighting system and the current light usage patterns).

The addition of a **door switch control** offers two advantages to the control system. It can be used to disable the occupied or ventilation cycle when the door is standing ajar for an extended period and it can be used to give a security signal during unoccupied periods. In a typical classroom the energy saving for adding a door switch control is approximately 2% on an annualized basis.

A very important and often overlooked energy savings tool is **regular preventative maintenance.** Mechanical equipment becomes inefficient over time as coils clog up and fan wheels load with debris. An annual thorough cleaning by a qualified technician can not only increase efficiency saving energy but it can also reduce or eliminate costly and bothersome service calls during the heating and cooling season. In a typical classroom the energy saving for completing a preventative maintenance can range from 5%-35% depending on the condition and design of the equipment.

Change'Air

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Change'Air has built a reputation for engineering quality HVAC products for greener classrooms. Solving classroom heating, ventilation and air conditioning issues in a sustainable and environmentally friendly way is our goal. Making the process worry free is our guarantee.

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