BOC Bulletin

A Newsletter for BOC Graduates, Enrollees and their Employers

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No-Cost/Low-Cost Solutions at Schools:

Teaching Behavioral Patterns

In September 2009, the EPA issued a challenge to schools to improve energy efficiency in their buildings. According to the EPA press release on the challenge, annual energy costs for the country's K-12 schools is "nearly $8 billion – more than is spent on textbooks and computers combined." Reducing energy costs would obviously help to change that balance and channel the cost savings into education.

Jason Lee Middle School: *When the AC system failed, it triggered a series of changes because excessive cost of repairs necessitated a better solution. The mechanical maintenance team decided to install a new air-cooled chiller with high efficiency compressor, to replace the electric heating system boiler with high efficiency equipment and to update the kitchen walk-in cooler and freezer. The annual net savings for this project are calculated at just over $50,000.*

In the current economic climate, budgets everywhere are taking a hit. This means that the focus for energy saving techniques depends far more on no-cost/low-cost than capital expenditure options. The ability to work with a facility as it stands and have it operate at optimum functionality is a key element in tighter times. This is a guiding principle for BOC training and schools offer a great opportunity for teaching the benefits of no-cost/low-cost energy conservation techniques and for changing behavioral patterns to implement these techniques.

Let's examine two such public school systems, where both have successfully worked to save energy and to engage their communities in trying to achieve energy efficient practices.

Responding to a Pricing Crisis

A decade ago, the well-documented west coast energy crisis sparked a huge interest in energy savings. Skyrocketing prices in an area where energy costs had been traditionally cheap caused everyone to rethink energy usage and look for ways to save. It was during this energy crisis environment that, in 2001, George Bryant, who was at that time the facilities manager of the public schools system in Vancouver, Washington, was looking for a training program for his head custodians. He enlisted John Weber, assistant custodial maintenance crew leader, to investigate the BOC program, which he'd heard about through the Washington Association of Maintenance and Operations Administrators (WAMOA). They concluded it was a good fit for their situation.

Vancouver has thirty-five schools, as well as several associated activity and administration facilities. "George Bryant was a retired army person and definitely liked things to run efficiently," observes Weber. To that end, Bryant set aside money in 2001 to send the head custodians from all thirty-five schools to the training, with the goal of giving them a better understanding of all the pieces that make up building maintenance and operations. It was a shrewd move on his part.

The system is large enough that it has in-house professional staff – HVAC technicians, plumbers, electricians – which makes it possible to avoid outsourcing major projects, saving a lot of money. Weber says that by training the custodial staff to have a view of the big picture, "they are able to input work reports for the technicians that are accurate assessments of what is needed for a particular problem. This makes the technicians' jobs a lot easier." The awareness of the big picture fosters better communication and a sense of the custodial staff as a part of the O&M team.

Since efficiency measures have begun in 2001, the district has been able to save about $300,000 annually. Consumption has gone from 32 million kWh in 2001 to 26 million in 2009 – a 19% decrease. In the past, it was standard procedure for custodial staff to start the school's day by turn everything on. That view has certainly changed and a lot of Vancouver's school's initial savings came from "low hanging fruit" of common sense measures to change habits.

A great example of this low hanging fruit is phantom plug loads. Plug loads are anything plugged into a system – appliances, computers, printers, coffeemakers – the list goes on. Phantom plug loads are sneakier. Think about what is actually powering that clock in the coffeemaker or DVD or the computer that is left on overnight when no one is around. It's estimated that phantom loads can add as much as 20% to energy bills. The team also examined lighting and equipment scheduling,

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as well as the how weekend operation was handled, to see where changes could be made.

Use of the EPA's Portfolio Manager software has been invaluable to the effort. Tim North of the school system's mechanical maintenance department says that, "The program is by far a superior system with which a user can judge the ongoing performance of their building. It is a priority for us both as a tool and as a means of recognition for the buildings' staff and student efforts in utility savings."

In June of 2009, the Vancouver School Board also adopted policy regulation 3690: The Natural Resources Management and Conservation Program. The policy lays down specific guidelines and encourages involvement at all levels of the educational system. While many people were already on board with the program's suggestions, Weber says that confirming it as policy "kicked off a strong movement to involve students and district staff outside the maintenance department and establish "Green Teams" in every school, with students, teachers and administration all participating." Head custodians from each school are an integral part of each team and the program is quickly catching on at all the schools.

"I am so very proud of the contribution of our custodial maintenance people to the maintenance team as a whole," says John Weber, "especially because it is a team effort, which everyone pitching in and understanding their roles." The custodial team of the Vancouver Public School system is 100% BOC certified, with 37 BOC graduates on staff, five of which, including Weber, are level II certified.

Behavior Helps When Budgets Can't

Clear across the country in Rhode Island, Energy Manager Karen Verrengia of the Cranston Public Schools system sees things the same way: energy savings is a collaborative effort and everyone needs to participate. Cranston, too, adopted energy management guidelines and has these posted on the energy page of the school system's web site.

In late 2006 when Verrengia was hired to be the energy manager for the school system, she worked with the O&M staff in the city's 31 schools and painstakingly went through all of the buildings plans, identifying the locations and specifications of the various components of the HVAC, lighting and ventilation equipment. This was no small task with 1,755,082 square feet of building space, much of it old and most of its equipment outdated, if not antiquated. These floor plans were used as a tool

Paul Musco and Karen Verrengia of Cranston Public Schools.

to implement energy guidelines for equipment scheduling, one of the biggest energy savings measures in the "no-cost/low-cost" arsenal.

There was also the issue of knowing how to run the equipment properly, to its optimized efficiency. For example, the Westin Hills Middle School near the Cranston West High School complex had a pneumatic building control system from the 70s which was, at that time, state-of-the-art technology. Now, because of the rarity of the system, it is difficult to know how to run the pneumatic controls properly. Cranston, like Vancouver, is fortunate to have in-house professional staff and Paul Musco, the system's senior HVAC technician (and also a BOC grad) was tasked with figuring this out. He did his research, made his inquiries, and now has the controls running according to the original optimization specs. "With an old system like this, there's kind of a lost art to running it," says Musco. Verrengia agrees, "The old way, we were heating the whole neighborhood!"

Verrengia also tracked the energy use of all the system's buildings and spotted what she calls, "the $90,000 mistake" in 2007. Heating costs at one of the schools spiked during the years and she wanted to know why. Investigation revealed that the school's gas meter was actually broken and was giving errant readings. The school system eventually got a $90,000 credit.

The Cranston School District budget has not allowed for much investment in energy saving equipment so most of what has been done has had to fit into the no-to-low-cost package. While they have taken advantage of some of the rebate programs local utility National Grid has offered on lighting retrofits at a nine of the schools, there hasn't been much money for capital expenditure. So the focus has been on changing behavior. "It's a people program. You don't have control over price but you do have control over what you use and that's what we're going after," says Verrengia.

One of the associations they've been working with is the National Energy Education Development (NEED) which emphasizes educating students to teach other students. Verrengia explains, "Kids listen to other kids and we in Rhode Island are lucky to have one of the NEED people right here. Joanne Spaziano from NEED has been a real asset to our getting the message across to kids."

The savings in energy costs for the Cranston School System from December 2006 through August 2006 has been over $2 million, or about $61,000 per month. The efforts of all the O&M personnel, the students, teachers and administration were rewarded in the fall of 2009 when four of the city's 31 schools earned the ENERGY STAR label – the first schools ever to be so labeled in Rhode Island.

Efficiency: A Community Effort

School communities pull together to save money to better their educational system. Pulling together to reduce energy consumption means that more money is available for education and in Vancouver, Washington and Cranston, Rhode Island, as well as in many other school systems across the country, they get that.

Save Money with Best Practices and an Energy Inspection Checklist

With the economic downturn, many facility managers are facing very tight operation and maintenance budgets. Luckily, many facilities are sitting on multiple energy conservation opportunities that can save thousands of dollars per year with relatively little capital investment.

If capital expenditures at your facility for new HVAC mechanical equipment have been frozen or eliminated, one way to free up financial resources is to tune up existing HVAC equipment. Follow best maintenance practices and the increased operating efficiency will reduce energy consumption. Cumulative energy bill savings can then supplement the general budget.

While HVAC systems vary widely in terms of equipment and operational characteristics, the following checklist should generally apply to most main equipment types and energy waste areas:

Steam system checklist:

- **Insulation checks:** Loose or missing insulation costs thousands of dollars in extra fuel costs per heating season. Use a thermal imager to inspect system insulation and identify insufficient areas

- **Steam trap checks:** Steam traps remove condensate from heating and process equipment. If the traps fail open, valuable steam is lost. To spot a failed trap, use a non-contact thermal imager, infrared thermometer or a contact thermometer to compare the temperature of the trap to the pipe on either side of it. If you don't see a distinct temperature difference on either side of a steam trap, it may be failed and needs to be further investigated. Thermography and infrared thermometers hold obvious advantages for traps mounted in awkward areas. Normal temperature differences across steam traps are approximately 20 °F.

- **Check air temperatures in boiler room:** Proper combustion requires that the combustion air be between proper limits. Use a digital thermometer designed to measure ambient air temperatures and consider checking the carbon monoxide level in the boiler room, as well, to ensure safety.

- **Other:** In addition to the steps made above, also check the feed water temperature, fuel oil heater temperature, and other items such as lubricant. These checks may not only save energy but also costs due to equipment repair or failure.

Cooling system checklist:

- **Electrical checks:** Check compressor voltage and amperage to ensure that the motor is operating at manufacturer-recommended levels.

- **Temperature checks:** Check the temperatures of inlet and outlet air and water temperatures at heat exchangers to verify they are operating at their most efficient levels. Chilled water supply temperatures for most chilled water systems should be between 42 °F and 44 °F.

- **Pressure checks:** Use a digital multimeter with a pressure attachment to take the inlet and outlet pressures of shell and tube heat exchangers, to ensure the tubes are not fouled. Fouling will result in lower heat transfer and higher energy consumption at the compressor. Pressure drop across the heat exchanger (Delta P) may be anywhere from 5 psig to 25 psig and varies by manufacturer. Check refrigerant and pump pressures, as well, to ensure equipment is operating at baseline levels.

- **Cooling tower checks:** For cooling equipment to operate at its most efficient levels, the cooling tower must operate properly. Since cooling towers reject heat at a specific rate to the atmosphere, use a temperature/humidity meter to measure the outside air temperature and humidity and analyze cooling tower operation. Also measure the temperature of the condensing water supplied to the chiller. A common value is 85 °F.

Fan system checklist:

- **Electrical checks:** Measure the voltage and amperage of the fan motor and compare to nameplate conditions.

- **Temperature checks:** Check the following values at air handlers to ensure consistency with recommended values
  - Outside air temperature
  - Mixed air temperature
  - Return air temperature
  - Discharge or supply air temperature
  - Coil face discharge air temperatures
  - Space temperature sensors
  - Economizer and related dampers
  - Wet bulb temperature or relative humidity (RH) sensors

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Save Money *(Continued from page 3.)*

Take readings with a handheld temperature meter and compare them against those indicated by the control system to ensure accuracy. Sensor calibration should be an integral part of all maintenance programs.

- **Air pressure checks:** Check pressure drops across filter banks to ensure adequate air flow. Excessive pressure drops will cause higher than normal energy consumption. Measure air pressure drops across heating and cooling coils to ensure that the coils are clean. Measure the inlet and outlet air temperatures to ensure proper temperature rise or drop.

Lighting system checklist:

- **Electrical checks:** Thermography applications for lighting include ballast and breaker contact temperatures. Look for hotspots and compare values with baselines or previous temperature measurements for evaluation.
- **Illumination levels:** Use a light meter to measure footcandle or lumen levels. Where possible, reduce illumination levels to industry standards. Especially consider reducing illumination during seasons when more natural light is available.
- **Operational checks:** Set up a recording meter to sample illumination levels during a facility's unoccupied hours. This will help identify areas where the lights are left on inadvertently or unnecessarily.

Building automation system-checklist:

- **Energy consumption checks:** Use a power quality meter to evaluate your facility's voltage, current, and KWH energy consumption. If possible, log energy consumption over time on specific circuits, and by specific equipment and areas. Compare your hourly usage rate to your utility fee structure and adjust usage patterns out of high-demand, high-cost times of day. Also check control system supply voltages to ensure proper controller operation. Controller communication bus values may be checked to ensure the integrity of the communication wiring.
- **Control system:** Check all sensors and indicating thermometers for properly calibrated gauges. Check valve and damper actuators as well. Actuator problems can cause higher than normal heating and cooling usage and high energy bills. Actuator output voltages and current signals can be checked using a regular digital multimeter.
- **Temperature checks:** Check the temperatures of inlet and outlet air and water temperatures at heat exchangers to make sure that they are operating at their most efficient levels. For example, chilled water supply temperatures for most chilled water systems are between 42 °F and 44 °F.
- **Operational checks:** Log air temperature over time, over occupied and unoccupied schedules; identify areas left in the wrong temperature mode at night or on weekends, wasting energy.
- **Setpoint checks:** Check the accuracy of all temperature, pressure and humidity control setpoints by logging those values over time. Control inaccuracy may waste 1% of energy per degree of error.

This article was provided by the Fluke Corporation. More articles on the subject can be found at the company's web site: www.fluke.com/EnergyApps.

Also, this article is the basis for the BOC newsletter quiz, which is available to be taken online at www.theBOC.info

LED: Ready to Shine?

LED (light emitting diode) lighting has been around since the early sixties. It was expensive and, at the time, not especially bright so uses were mostly confined to TV remotes and car signal indicators. Since LEDs are actually semiconductor light sources, the improvement of semiconductors over the years has obviously had its effect, so that both efficiency and light output has increased substantially. Color range, too, has been expanded which also widens the options for use. The compact size of LEDs has made them a natural for mobile phones and laptops but within the past year, LEDs have been incorporated into televisions as well.

The "green" case for LED is well-known. They use a lot less energy and do not contain mercury (as do compact fluorescent bulbs). The savings in manpower hours is also a plus since they can have lifetimes anywhere from 25,000 to 100,000 hours. They are expensive to purchase, however, which gives consumers pause.

In a January 18, 2010 article in the Financial Times, an article cited a statistic from the US Department of Energy saying that, "Ninety percent of the power consumed for lighting produces heat rather than light." The fact that LEDs produce little or no heat (but, in a "con" to their many "pros" are affected adversely by heat) means an immediate improvement in energy conservation.

While costs have come down, LEDs are still more expensive at initial purchase than incandescent or compact fluorescent lighting. So, how to weigh the pros and cons? For a breakdown of the arguments, please check out the article, "Introduction to LED Lighting" (along with other informative articles) at the Seattle Lighting Design Lab web site: *www.lightingdesignlab.com/articles/LED_fund/intro_ledfund.*

BOC Grads Making a Difference

Cost Savings Finance System Overhaul in Branford, CT

BOC grad **Mark Deming, director of facilities** for the Branford School District in Connecticut, has been implementing many energy conservation projects since he first began working there in 2001. Deming's projects run the gamut of energy efficiency op portunities, from lighting retrofits to building a CCHP (combined cooling, heating and power) plant, to a photovoltaic installation. The result is that in a school district with nine buildings, six of which are schools, electricity use is half what it was at the beginning of the decade. He recently summarized the energy-saving activities that had been undertaken since 2001 and presented his results to the Branford School Board.

One of the most successful endeavors was an HVAC project at the Walsh Intermediate School (WIS). The WIS PACT agreement was worked out between the Branford School District and the Connecticut division of Trane. The HVAC system for the school was overhauled through a performance agreement providing a system upgrade costing $1.2 million to be paid over ten years, without any upfront capital, and with the understanding that the energy savings resulting from the changes would be significant enough to cover the yearly project financing payments. Completed in 2003, the first year savings exceeded the $120,984 guarantee\annual payment. Results from successive years were just as impressive:

- FY 2001-2002, WIS used 2,780,160 kWh
- FY 2008-2009, WIS used 1,253,758 kWh
- kWh avoidance: 1,526,402, an improve ment of 55%
- Cost avoidance in FY '08-'09 alone: $153,768
- Oil savings average 35-40K annually since FY '01'-02, est. 225,000 gallons total
- Actual payback/ ROI was 3.67 years

No surprise that with results like this, WIS earned the ENERGYSTAR® building label in 2007 and 2009.

Other projects Deming has promoted have included:

- the CCHP (combined cooling, heating and power) system with UTC/Carrier, the 265 kW micro-turbine and absorption chiller project at the Branford High School that produces approximately two-thirds of all power needed to operate the school and about 90% of all thermal load, with an efficiency of around 80-90%.
- new BMS (Building Management Systems) at two elementary schools in 2006, which have since yielded on average 17,000 gallons in fuel savings, and 40,000 kWh savings annually.
- a retro-commissioning project that identified 23 no-cost energy conservation measures, since implemented.
- an installation of dimmable LED lighting in both the BHS auditorium and library.
- deployment, with the tech department, of Syam software, which turns off computers when not in use, for which the Connecticut Energy Efficiency Fund (CEEF) provided a $27,000 incentive. Annual savings district-wide are projected at 166,000 kWh.
- participation in a demand load response program (aka, a peak rewards program) that resulted in receipt of over $10,000 in rebates as of the end of 2009.
- installation of sixteen waterless urinals at WIS, with a potential 40,000 gallon savings annually per urinal, along with installation of sensor faucets district-wide.
- a retrofit of 8,100 32-watt with 25-watt lamps, with an estimated payback of 1.36 years.

Deming put together a recent comparison of the impressive results of the various energy and water-saving measures by looking at usage from July to December 2008 versus usage from July to December 2009. (See chart below.)

In July of 2009, a 7-kW photovoltaic array was installed at Branford High School with funds provided by the Branford Clean Energy Task Force, not so much as a source of energy, but as a part of the teaching curriculum. As of October, the system had produced 3,458 kWh.

A view of the new CCHP system workings at Branford High School.

These are just a few of the many great energy saving projects going on in the Branford School District. Deming has more in mind, such as becoming a beta site for new LED technology by relighting the building exteriors and parking lots.

In 2001, the Branford School District consumed over 7 million kWh annually, and over 220,000 gallons of heating fuel. Today those figures are under 3.5 million kWh and less than 100,000 gallons of heating fuel. What is remarkable is that over that period, all but $120,000 of this work has been paid for with energy savings. The $120,000 represents the only additional taxpayer funds used – a modest average of about $17,150 per year. Each year, energy savings have been reinvested, which has enabled Deming to level-fund oil, natural gas, water and electric budget line items for the last seven out of ten years.

		2009	2008	% change
All Branford Schools	*Electric*	988,219.00	1,450,753.00 kWh	-31.0%
	Fuel Oil	4,084.40	12,314.60 gallons	-66.8%
	Natural Gas	71,508.96	70,511.68 ccf	+1.4%
	Water	2,494.00	5,110.00 ccf	-51.0%

Coping in the Aftermath of Nature's Wrath

Jeff Krohn

BOC graduate **Jeff Krohn, building & facilities manager** of the Cedar Rapids Public Library (CRPL) system in Iowa, had a great project to detail for his BOC certification renewal. The downtown library branch, a 24 year-old, two-story structure, had its original heating system, which was dated and very unreliable. When the system was replaced, the number of heat pumps was not only reduced from 71 to 68, but the energy efficiency ratio (EER) improved from an overall performance of 6.0 to an EER of 16.0 to 18.0, depending on the model used. The usage schedule was also tightened to reflect occupancy. The project resulted in decreased run times, better air flow, lower noise levels and a more comfortable environment for occupants, with more consistent control over humidity and temperature in the various zones of the building. Project work ran from December of 2007 until June of 2008.

Cedar Rapids Public Library, flood of June 2008.

But the success of the project was short-lived. On the 13th of that June, the Cedar River, estimated to crest at 24 feet, finally crested at over 30 feet above flood-stage. Over 25,000 people were evacuated as the city saw its homes, businesses and other buildings engulfed in the river's overflowing waters. The downtown branch was located just one block away from the river in an area where an estimated 1,300 blocks were underwater. Much of the collection was destroyed – books, magazines, the public access computers. The damage was so extensive that the 85,000 square-foot space was deemed contaminated.

But the library management team, librarians, aides, administration, facilities personnel and volunteers all came together immediately. After participating in the post-flood emergency activities, a satellite branch at the Westdale Mall with about 2,900 square-feet of space served in the traditional capacity of a lending library and a community resource, such as providing free internet access. Soon, three other small store fronts within the mall were attached to the library and in November of 2008, the library leased a 15,000 square foot area in the same mall, formerly occupied by an Osco branch.

"As soon as the ink was dry on the lease, we immediately began the formidable task of revising the store to fit the needs of the library," says Krohn. About two-thirds of the space had no insulation, but only bare metal stud walls. He goes on to detail the work done:

We sealed, insulated, and installed vapor barrier on all of the outside walls. We installed several hundred sheets of drywall for various offices, work rooms and meeting rooms within the new facility. To join adjacent rooms to the library, we cut openings and installed 3" by 6" steel headers. All of the primers, finish coats, and wood finishes used were latex products, avoiding oil-based finishes entirely. We also replaced any damaged ceiling tiles with insulated tiles, and cleaned and disinfected the HVAC units and all ducts to improve air quality and air flow. Lighting was a major concern in utilizing this area as a library. We converted all of the T-12 multi-lamp ceiling fixtures in the facility to brighter, longer-lasting and more efficient T-8 lamps. Also, hundreds of pounds of construction materials were recycled rather than sent to landfill.

Krohn took the BOC program in 2007, in one of the first classes to be held in the Midwest, and many of the principles he learned in the training are reflected in the choices made for the temporary library site – use of low VOC paints, checking for utility rebates, re-use of material. Recently, FEMA decided that the old downtown building was far too damaged to be renovated and will have to be razed. A new location will be chosen and the target for completion is in three years time. The library team is not yet sure where the new location will be but they are already planning that they will aim for LEED certification. Krohn will be heavily involved with overseeing the building of the new facility. He also believes that the BOC training will be a help for a number of reasons. "I've been in the business for over thirty years but when you're with people that are in different situations, it sometimes gives you an idea for your own facility. Not only is the training useful, but connections made end up being great resources, which is so useful when you're looking at something new or are suddenly put into an unfamiliar situation."

After about three and a half months, the initial library project at the mall was completed well under budget, at about $100,000 versus the $300,000 originally allotted. Krohn observes, "While the two other maintenance staff and I did a lot of the work, what amazed me was the level of participation from the library staff and volunteers."

Team Cedar Rapids was ultimately recognized with the Librarian of the Year award by Library Journal in 2009. It was the first time the award had been given to a group rather than an individual. The Library Journal quoted Cedar Rapids City Councilor Monica Vernon as saying, "The library is a beacon of hope." The journal bestowed the honor with the citation, "For that hope, that determination to recover and serve the people of Cedar Rapids, that courageous and effective effort to overcome disaster, the CRPL team wins a collective 2009 Librarian of the Year Award."

It takes more than books to make a library.

Big Savings When Adapting to Actual-time Usage

BOC grad **Noreen McKinley** is the **chief engineer** at the Marriott Santa Clara in California. With energy savings now recognized as very high on a budget priority list, the hotel's ownership wanted to implement some energy-saving measures. With two restaurants, room service and meeting room services, one of the areas under scrutiny was the kitchens.

Noreen McKinley

Kitchen fan hoods did not run 24/7, but were on a timer that was scheduled to run during main business hours of 4 a.m. to 11 p.m. Daily occupancy is varied and business volume for the Marriott Santa Clara can be anywhere from 40% - 100%. Running on a timer was not an adequate solution. Targeting the kitchen hoods, the decision was made to hone in on retrofitting the hotel's eleven kitchen hoods by installing variable frequency drives (VFD) with Intelli-hood keypads and hood-mounted optic sensors that would determine the exhaust air flow based on need.

Operation is simple. A keypad is used to turn on the fans and "its processor sends a speed reference signal to the VFD. Now the hoods think for themselves and only run as needed based on temperature and smoke from cooking," states McKinley. "If there are only a few smaller meetings, the need for food service is minimal. Fan speed adjusts automatically and run times are reduced, so less energy is used. The same goes for the restaurants."

Energy cost savings potential for the hotel are excellent. Annual utility costs for the fan hood operation before energy projects were implemented were estimated to be $108,842. Savings were calculated based on operating hours, estimated cooking loads, comparable utility rates and local climate data and estimated to be $43,857 per year – a 40.3% decrease in electrical usage, between the fan, heating and cooling savings. Net installed cost for all eleven retrofits, which included a utility rebate of $13,125 from Silicon Valley Power, was $66,153, which would mean a payback of 1.5 years. Environmental savings are estimated to be 189,904 pounds of CO_2 per year.

The Marriott Santa Clara has implemented several energy-saving projects, including installation of digital guest room energy controls, HVAC retrofits to energy conservation units, and retro-commissioning projects on lighting (retrofits) and EMS controls. With 795 rooms and at 474,629 square feet, 23.500 of which is meeting room space, the savings measures really add up.

Marriott has several BOC graduates in its ranks and when McKinley received information on the classes a few years ago, she decided to take the series. "I found it to be one of the most knowledgeable learning experiences I have had in a classroom setting. At that time, I had decided to send my department and they all could not say enough about the classes," she says.

Partners in Efficiency Progress

John Guthrie

At Grinnell Mutual Reinsurance in Grinnell, Iowa, BOC grad **John Guthrie** works as **building operations manager** for the company's headquarters, an office with two accompanying buildings totaling about 165,000 square feet. He is currently finishing work on a two-year project with utility provider Alliant Energy to convert the heating system in the main office building and the two associated buildings, which were using # 2 fuel oil and LP respectively, to natural gas. The project was quite extensive.

While the payback was on the long side, something had to be done with the old boilers since they had reached their operational lifespan. But with oil prices fluctuating wildly, issues managing deliveries, spending money about every three years to maintain the two 15,000 gallon fuel tanks and making sure the oil was up to standard during extended periods of little use, the decision involved more than just a simple payback assessment. Add to this the negative of fuel oil's high sulphur emissions, and it seemed to be time for a change to natural gas.

Grinnell Mutual is a half-mile south of the Alliant natural gas service area so a pipeline had to be installed, which represented about one-third of the project costs. In the spring of 2008, Alliant installed over 5,000 feet of two-inch coated steel pipe and 156 feet of three-quarter inch steel pipe, as well as three separate meters, one per building.

Guthrie and his team then set about the task of removing the old boilers for replacement. They were replaced with steel vertical fire tube package boilers with a water-backed combustion chamber equipped with high-efficiency turbulators. The heating system is closed-loop hydronic and the boilers were set up for redundancy to accommodate building requirements. Five Triad 900s and five Triad 300, which have efficiency ratings of 82.9% and 84.3% respectively, were selected as replacement units. "It was a real challenge to get the system up and running before the 2008 heating season," said Guthrie. "After installation we were able to achieve as high as 85.9% on the 300s and 88.5% on the 900s on our efficiency test." He is especially pleased with the new capability of the building energy automation system to control the boilers and stage them in a way to get peak efficiencies out of the system.

The old boilers in the main building had an efficiency rating of about 75%. For the improvement in boiler efficiency ratings, Grinnell Mutual received a rebate of $6,965 from Alliant for the first year of operation. The first heating season with the new boilers yielded a savings of 4,313 therms over the old fired boilers. Guthrie calculates the annual savings for the main building should be between $8,500 and $9,500, depending on weather conditions and natural gas prices. For the two other buildings, the savings will likely be between $500 and $1,000.

Payback is estimated at ten to fifteen years, but this doesn't include the increased reliability of the system and the easier access offered by natural gas. Also not in those calculations is the hugely significant reduction in emissions. "We look to save money and create efficiencies, " says Guthrie, "but we are also concerned with doing the right thing in terms of the environment, so that factors into our payback equations."

Grinnell Mutual also participates in Alliant's electric interruptible program (sometimes referred to as demand or peak power programs). Guthrie explains, "We have a 1000 KW generator that can power the entire facility. Usually in the summertime when demand is highest, we receive a call from Alliant asking us to go to generator power. For this, we receive interruptible credit that varies anywhere from $25,000 to $35,000 per year. This generator is also use in emergency situations like storms or power outages. As everyone knows, loss of power is costly to a company."

Since the company is constantly looking for ways to improve efficiency, working with utility provider Alliant Energy, Guthrie performed an energy audit on the three buildings. As it happened, Grinnell Mutual had already done quite a bit to achieve energy efficiency. Guthrie will be doing more as the budget permits. He is looking at possible lighting change outs. Going from 32-watt to 25-watt would save about $6 per fixture per year on a two bulb fixture with 4' lamps, and changing out U-bent fixtures to 2' F17T8 bulbs where feasible could save up to $12 a fixture. In the meantime, Guthrie will continue to help run the buildings as efficiently as possible and will keep and eye out for any new technologies. He views Alliant Energy as an ally in this, and why not? He found out about the BOC program from his Alliant account representative.

Raising Energy Efficiency Awareness

John C. Dold

A civil engineer, BOC graduate **John C. Dold, PE,** had ten years of experience in power plant design before he became municipal engineer and manager. For the past twenty-two years, he has worked in municipalities from small to large and with different forms of local governing bodies. He now works for the Town of Boxford, Massachusetts, as the **director of the Department of Public Works** (DPW) and is also the town's **facilities manager**. Boxford is a small town with a population of 9,000 people. There are twelve public buildings, some fairly new and some dating back to the mid-1800s.

Two are elementary schools and the rest are town administration and service buildings. All of the buildings are energy consumption challenges.

Budgets are tight in municipalities and Boxford is no exception. About a year and a half ago, Dold established the town's Energy Management Committee comprised of four town department heads, the elementary school facilities manager, and Dold as the committee chair. It took some time for committee members to familiarize themselves with the energy use issues in their respective buildings.

"Boxford is small community with a budget of $25 million per year. Generally, budget and personnel costs do not decrease, but if we can continue to improve energy efficiency, our hope is that these costs will decrease, and that will be a bright spot for the taxpayer."

In mid 2009, Boxford's electric and gas utility company, National Grid, was offering to pay half of the tuition costs for BOC training. Dold signed up. At the first training meeting in May of last year, the instructor introduced ENERGY STAR® Portfolio Manager, the free software offered online by the EPA ENERGY STAR® that tracks utility costs and usage trends in buildings. In June, the town hired a summer intern for Dold and he promptly put her to work gathering the information needed for the software data input – a year's worth of utility invoices, building measurements, occupancy information, and other pertinent data – everything needed to compare year-by-year information and determine likely areas of conservation. His intern then entered all the data into Portfolio Manager.

Dold highly values the software tool. "I cannot overstate how incredibly helpful Portfolio Manager has been. The bar graphs alone have been helpful to illustrate a point rather than handing out sheets of dry data and putting people to sleep. But the key factor for my committee has been the dollar-per-square-foot energy usage per building. This figure helps the various town board and committee members to understand where the town's energy dollars are being used. And now we are starting to be more aware of how we can save. The summer intern is gone, so the town finance director inputs the monthly data into Portfolio Manager. She has seen the benefits of the program."

Portfolio Manager zeroed in on the high energy usage buildings. A good example is the school administration building, built in the 1920's, which was shown to have the highest per square foot of energy use of all twelve municipal buildings. National Grid performed an energy audit and noted that a significant feature of the building was its eight-by-three-foot single paned windows, spaced every four feet around the building's perimeter. As town funds allow, the windows will be upgraded to thermal pane as an obvious energy-saving measure.

Only six months into being able to compare data, they know they are saving. Dold points out that, due to usage changes and electrical upgrades, the town hall's electricity bill for this past month was $2,100, which is a savings of $800 from the previous December. Employees were asked turn off unnecessary lights and shut down computers at end of the work day. Thermostat controls were locked into predetermined time and temperature ranges.

The town is also realizing savings from lighting upgrades implemented in the two elementary schools in the summer of 2009, where lighting was retrofitted with an estimated 500 T-8 fluorescent fixtures. Both schools are now eligible for EPA's ENERGY STAR® building label, for which the town is currently applying.

Dold is also looking into various grant opportunities. National Grid is offering to cover half the implementation costs to switch from manual thermostat controls to off-site computer control of HVAC systems. The town is also actively pursuing a municipal wind turbine program through the Massachusetts Technology Collaborative. Electricity produced from the turbine would enter into the utility's grid and the utility would then credit that production to the town's municipal buildings, paying the town for the extra electricity produced. This project will be presented to the Boxford voters at the May 2010 town meeting. The estimated return on investment for the wind turbine is five years. The town municipal buildings could be electricity-independent at that time. In addition to the wind turbine effort, a 2000-watt solar panel project was completed at one of the Boxford schools in the fall of 2009. Boxford has also committed to the EPA'S September 2009 challenge to reduce energy consumption by 10% over the next year.

Behavioral and attitude changes are critical as Boxford moves forward with its commitment to energy efficiency. "Boxford is small community with a budget of $25 million per year. Generally, budget and personnel costs do not decrease, but if we can continue to improve energy efficiency, our hope is that these costs will decrease, and that will be a bright spot for the taxpayer," says Dold.

Continuing Education Opportunities for Certification Renewal Credit

Below you will find listings for the web sites of various national organizations that offer continuing education courses that are applicable to annual BOC certification renewal. Check out the Education, Professional Development and Events Calendars at these sites

APPA:
The Association of Physical Plant Administrators
www.appa.org

BOMA:
Building Owners & Managers Association
www.boma.org/TrainingAndEducation/BEEP/

BOMI:
Building Owners & Managers Institute
www.bomi-edu.org

ENERGY STAR®:
Live web conferences, pre-recorded trainings, self-guided presentations
www.energystar.gov/index.cfm?c=business.bus_internet_presentations

FEMP:
Federal Energy Management Program Workshops & Conferences
www.eere.energy.gov/

GreenBuild:
US Green Building Council
www.usgbc.org

HVACR Education:
On-Line Learning for the HVACR Industry
www.hvacreducation.net/

IFMA:
International Facility Management Association
www.ifma.org

The International Facilities Management Association has several regional chapters, all of which can be accessed from the association's main web site address above. Be sure to check out the site for the variety of learning options available both online and via seminar.

Utility Energy Training Centers:
www.dsireusa.org

Your local utilities may offer energy education events and their sites are sources for training opportunities as well. Regional industry associations also offer a number of options for further education. The link above brings you to a database of state incentives for renewables and efficiencies.

BOC Instructor's Article Featured by BOMA

For the January/February 2010 edition of The BOMA Magazine, BOC instructor Ray Congdon, director of engineering for Group Health at CB Richard Ellis, has authored "Beyond the Boiler Room: Building Engineers are the Keystone to Energy Management Success." Congdon makes the case for building operator training, specifically BOC training, and reflects on the changing role of the facilities maintenance manager. "The days of the operator adjusting valves in the boiler room are history. Investing in training on the efficient maintenance and operation of their buildings must be a top priority for property professionals who want to succeed in this new direction."

This new direction will also have its financial benefits for building operators. A study by CareerBuilder.com recently listed facility managers as one of the Top 20 Fastest-growing Salaries in the U.S. for 2010. You can access this link at the BOC web site, www.theBOC.info, under News & Trends.

IFMA Seattle Continues its Support of BOC

Once again the Seattle Chapter of the International Facility Management Association (IFMA) has shown its consistent support of the BOC programs by contributing a $500 tuition stipend for an IFMA member (or employee) interested in BOC training in 2010.

In 2006, IFMA granted the BOC program status as an IFMA Approved Provider for the Facilities Management Professional (FMP) and the Certified Facility Manager (CFM) designations. We are pleased to accept and acknowledge this donation from the Seattle chapter and appreciate the continued support.

MEEA & IFMA Chapters Partner for One-day Seminar

BOC partner MEEA (Midwest Energy Efficiency Alliance) and the Eastern and Central Iowa Chapters of IFMA will be collaborating on a one-day seminar taking place in Iowa City, IA on April 16, 2010. The seminar will cover energy-efficient techniques for operating building systems and will provide continuing education credits for the CFM (Certified Facility Manager) designation awarded by IFMA.

For further information about the seminar, please contact Christina Pagnusat of MEEA at 312-784-7243.

Steady March towards ENERGY STAR® Benchmarking

Throughout the country there is a trend in both state and local government to require various levels of benchmarking audits for commercial buildings. Some of these policies are already in place and some have established time frames for future compliance. What is common to most of this legislation and efficiency promotion is that the EPA's ENERGY STAR Portfolio Manager, a major training tool of the BOC program, is the preferred benchmarking standard for data collection.

In California for example, as of the first of last year, all electric and gas utilities were required to provide energy consumption data to nonresidential building owners in a Portfolio Manager-compatible format. As of the first of this year, any sale of a building must disclose to the buyer the Portfolio Manager benchmarking data as part of the transaction.

In Chicago, the city is promoting the Chicago Green Office Challenge, a "friendly competition" among commercial property owners, operators and office tenants increase energy use awareness and to determine where there are efficiencies to be had. The city is offering training, recognition and media coverage and, in some cases, will help guide participants towards green building certification.

In Colorado, the city of Denver requires that any new constructions or major renovations of the city's public buildings are designed to be ENERGY STAR compliant and be benchmarked with Portfolio Manager.

These are just a few examples of the widespread move to mandating energy efficient facilities. States and municipalities countrywide are both requiring energy efficient standards and coming up with great ideas to incentivize building operators to become lean on energy use. To see more of what is happening on efficient facility management around the country, check out the ENERGY STAR link below:

http://www.energystar.gov/ia/business/government/State_Local_Govts_Leveraging_ES.pdf

BOC Training for BOMA Locals

BOC partnered with BOMA Seattle, BOMA Portland, and BetterBricks in 2009 to offer two BOC Level I courses for engineering staff in the office real estate and property management sectors. Each course was fully subscribed with a total of 40 BOMA building engineers attending. Participants completed 74 hours of training in energy efficient operational practices for lighting and HVAC systems and completed projects in their buildings focused on energy benchmarking, lighting surveys, and HVAC controls review. All are well on their way to identifying money saving opportunities in their properties in the range of $15,000 to $20,000 annually. BOC is looking for opportunities to partner with BOMA locals in other regions of the country. If you're a BOMA member and would like to know more, contact *bocinfo@theBOC.info*.

BOC National Expansion Continues with Georgia on Board!

The BOC is pleased to announce that Georgia is the latest addition to the roster of states offering BOC training. Georgia's BOC program will be administered by Gwinnett Technical College, with its first course starting in February of this year. The training is the first of its kind in the state, so interest will be strong. For more information, see the link below:

https://aceweb.gwinnetttech.edu/wconnect/CourseStatus.awp?~~103SEM1992A

BOC certification is now recognized in twenty-two states, from Maine to California, a strong and steady expansion that attests to the value of the training and credential.

BOC Welcomes the City University of New York (CUNY) as a BOC Approved Provider

Under NEEC's BOC Approved Provider program, CUNY's Building Performance Lab (BPL) became eligible in 2009 to offer courses that assist in completing the BOC credential. The BPL was established at the City University of New York, within the CUNY Institute for Urban Systems, with support from BOC partner NYSERDA (New York State Energy Research Development Authority). The Lab's mission is to establish Building Performance work as a "new normal" for building operations in New York City. The Lab promotes continuous improvement of building management processes, skills development, and the application of cutting-edge practices for monitoring of energy use, the indoor environment, and occupant satisfaction.

As of December 2009, eleven building engineers had earned the BOC credential following completion of BPL courses. For more information, visit the BPL website at *www.cunyurbansystems.org/pages/building-performance-lab/building-performance.php.*

Call for Feedback and Projects!

Our publication aims to highlight new technologies, relate success stories of graduates and get the word out about new ideas in the facilities management industry. We are open to suggestions: What would you, as readers, like to hear about?

All readers are encouraged to submit their thoughts on content they would like to see, technologies that spark their interest on which they'd like more information, or their own personnel successes as energy-efficient facilities personnel.

Please, submit your ideas to email address: **news@theBOC.info**. We'd love to hear from you.

FREE BOC WEBCAST

The BOC webcast allows you to conveniently view and listen to an overview of the program from the comfort of your office and ask any questions you may have about the training. All you need is a desktop browser and a telephone.

The presentation describes Level I and Level II course topics, schedules and certification requirements in detail. Listen in and find out who benefits by attending BOC training and how graduates are improving their facilities.

Informational webcasts last approximately one hour.

2010 Webcast dates:

March 3rd, June 22nd, Sept. 9th & Oct. 26th.

8:30AM - 9:30AM (PST)

9:30AM - 10:30AM (MST)

10:30AM - 11:30AM (CST)

11:30AM - 12:30PM (EST)

To sign up go to: www.theBOC.info

If that date is not convenient, the site also provides a prerecorded informational webcast.

BOC Goes to Edmonds Community College

Edmonds Community College in Washington State launched a new two-year Energy Management degree program that will give individuals the expertise to turn energy wasters into energy savers and the know-how to help make buildings more energy efficient. BOC training is a component of the program, which teaches skills suited for people currently working in the industry, seeking entry-level work in the field, or taking on new responsibilities in energy efficiency at their workplace. More information: *http://www.edcc.edu/energy/*

Check out BOC's Technical Webinar Series!

The BOC web site (www.theBOC.info) offers webinars, both live and prerecorded (available for viewing at your convenience). Register and receive a link, with log-in and password information. Successful completion of each webinar and its accompanying quiz earns you 1.5 hours of continuing education credit towards maintaining your BOC certification. Current prerecorded webinars available include.

- The IAQ Top Ten Fixes
- Lighting Retrofits: A Fresh Approach for 2009
- Morning Warm-up Strategies
- Boiler Tune-up
- Demand Control for Ventilation
- Using Data Loggers to Improve Building Performance

Live webinars offered in 2010 and are held from 10 AM to 11 AM Pacific Standard Time. This year's schedule is as follows:

- Top Four Energy Tune Up Opportunities – February 17th
- Energy Tune Up: Addressing Problems with Sensor Error and Simultaneous Heating & Cooling – March 18th
- Energy Tune Up: Optimizing Outside-Air Usage & Equipment Scheduling – July 21st
- Energy Tune Up: Measurement Tools for Building Energy Diagnostics – September 16th

Information on fees and registration is available at the BOC web site as above. A link to the webinar details can be accessed on the home page.

National Conferences & Symposiums 2010

International Summit on Health Facility Planning, Design & Construction

San Diego, California
March 14-17, 2010
More info: www.ashe.org/ashe/pdc/

National Facilities Management & Technology Conference/Expo

The Baltimore Convention Center
Baltimore, MD
March 16-18, 2010
More info: www.nfmt.com

This event also includes the Maintenance Solutions Expo, the GreenTech Conference/Expo and the Safe Building Expo.

Association of Energy Engineers (AEE) Conferences & Technology Expos

Globalcon 2010
Philadelphia, Pennsylvania
March 24-25, 2010

West Coast Energy Management Congress 2010/EMC
Seattle, Washington
June 15-16, 2010

World Energy Engineering Congress 2010/WEEC
Washington, DC
December 8-10, 2010
More info: www.aeecenter.org/Shows/

National School Plant Management Association – 15th Annual Conference

The Peabody Hotel
Little Rock, Arkansas
April 25-28, 2010
More info: www.nspma.org

BOMA 2010 International Conference & The Every Building Show

Long Beach Convention Center
Los Angeles, California
June 27-29, 2010
More info: www.boma.org

Labs 21 2010 Conferencement Association – 15th Annual Conference

Albuquerque Convention Center
Albuquerque, New Mexico
September 28-30, 2010
More info: www.labs21century.gov/conf

The annual three-day international conference has dozens of technical sessions highlighting new and innovative products designed to usher in the next generation of laboratories.

Facility Decisions Conference & Expo

Las Vegas Convention Center
Las Vegas, NV
October 5-6, 2010
More info: www.facilitydecisions.com

IFMA World Workplace 2010 Conference & Expo

Georgia World Congress Center
Atlanta, Georgia
October 27-29, 2010
More info: www.worldworkplace.org

Plan your attendance at World Workplace more efficiently by researching session topics online by track, knowledge level or session time.

BOC Graduate Numbers Continue to Grow!

As BOC expands across the country, the number of graduates grows as well, with over 8,000 nationwide. Graduates from this year and last hail from Idaho to Rhode Island, from Michigan to Kansas, and represent fields from education, government, manufacturing, health care and beyond – just about every sector you can name.

To see a listing of recent BOC graduates, please go to the national web site at www.theBOC.info, go to Graduate Profiles & Case Studies and click on the Recent Graduates PDF.

Find A BOC Training In Your Area

There are currently over eight-thousand BOC graduates throughout the country and that number will continue to grow because the need for educated facilities operations & maintenance personnel is stronger than ever. BOC training is offered in twenty-two states and that number continues to grow as well.

BOC Level I Certification

The Level I series comprises 74 hours of training and project work in building systems maintenance. Courses include: Building Systems Overview, HVAC Systems and Controls, Facility Electrical Systems, Indoor Air Quality, Operation & Maintenance Practices for Sustainable Buildings, Efficient Lighting Fundamental and Energy Conservation Techniques.

BOC Level II Certification

Level II has 61 hours of training and project work in equipment troubleshooting and maintenance. Courses include four core classes and two supplemental classes. The four core classes include: Preventive Maintenance & Troubleshooting Principles, Advanced Electrical Diagnostics, HVAC Troubleshooting & Maintenance, HVAC Controls and Optimization. See the website for supplemental class topics.

To find a Level I or Level II training in your area, please visit the BOC website at www.theBOC.info. On the main page, you will see "BOC® Around the USA" and just underneath that is a link to "FIND training near you." Click on the map and you will find detailed listings of course series available, with dates, locations and information on how to register.

Training is available from Maine to California!

BOC Certification Renewal

To maintain BOC certification, graduates must accumulate continuing education (CE) hours each year following a full calendar year after their graduation. Level I renewal requires five CE hours each year and Level II, ten. Hours may be earned as follows:

- **Continued employment in building operations**..... *2 hours / year*
- **Continuing education in building operations**.....*Actual hours of classroom time*
- **Energy efficiency projects completed at your facility**..... *Up to 11 hours / year*
- **Membership in a building operations membership association**.....*1 hour / year*
- **Offices held in membership associations**..... *2 hours / year*
- **Awards received for efficient building operations** .....*2 hours / award*
- **BOC newsletter quiz – based on the article on pages 3-4 of this newsletter, the quiz is available to take online at www.thBOC.info**.....*1 hour / passed quiz*
- **Completion of an energy consumption benchmark for the previous 12 month period using ENERGY STAR® Portfolio Manager or alternative energy accounting tool**.....*3 hours / year*
- **Enroll in a BOC webinar and complete its quiz *(see webinar announcement on page 8 for details)*** .....*1.5 hours / passed quiz*

You will be notified by mail when your certification is up for renewal (anniversary date appears on your wallet card). Once you have received a renewal notice, complete the application form and return it to NEEC. The renewal fee is $55 for Level I or Level II, or $85 for a "combo" renewal.

DEADLINE REMINDER

2009 BOC Grads

The 2010 renewal process will begin in the first week of January 2010. You will be sent an application at that time. The deadline for application submission is March 31, 2010, by which time you will need Continuing Education credit to renew your level of certification. See information above for details of renewal requirements for both Level I and Level II.

Building Operator Certification

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RETURN SERVICE REQUESTED

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