BOC Bulletin
A Newsletter for BOC Graduates, Enrollees and their Employers
SUMMER/FALL 2015

Teamwork at Its Best Yields Great Savings

Focusing on Particular Building Needs

New York is among the many states actively engaging BOC training. In particular, New York City continues to show great leadership with Mayor Michael Bloomberg's original sustainability plan, "PlaNYC 2020," which set the goal of reducing GHG emissions 30 percent by 2017, and today with Mayor Bill DeBlasio's "One City: Built to Last" plan, which seeks to reduce GHG emissions 80 percent by 2050.

BOC training has become a key tool for organizations both public and private to help them achieve these goals, and the City University of New York's (CUNY) Building Performance Lab (BPL) coordinates the BOC training efforts for the NYC region, customizing it to the specific needs of various client building types. The CUNY BPL has trained over 1,000 school facilities maintenance staff. Since 2009 over 2,500 New York City building maintenance technicians and engineers have become BOC certified through the CUNY BPL.

While BPL offers training to both companies/institutions and individual applicants interested in BOC's building energy efficiency techniques, about half of their training series classes are held at client sites so not only is the participant working on projects at his or her own facility, but training is geared to the particular needs of that building type.

One of the advantages to this approach is that it involves buy-in from the top down. "There is strong internal support for the training, which leads to a highly motivated staff," notes Daniella Leifer, the manager of training & compliance programs at the CUNY BPL. "It fosters a team mentality and the hands-on training at your own facility reinforces more direct energy efficiency concepts."

Rockefeller Research Laboratories at the MSK Manhattan complex.

A Case in Point

One institution where on-site training was held is Memorial Sloan Kettering Cancer Center's Manhattan campus (MSKCC). Leifer notes that MSKCC's General Manager of Plant Operations, Energy & Engineering Bob Berninger is an ardent supporter of BOC training and that he has "created a strong culture around BOC and energy management."

As a result, more than two-dozen facilities personnel have completed BOC Level I training, with a large number of those continuing on to complete Level II. Incoming hires are also encouraged to attend training and, when possible, they continue to hold training on-site.

The Efficacy of this Approach in Action: *A Heat Recovery Through Secondary Condenser Water/Chilled Water Cross-Over Project*

The team-building aspect of on-site BOC training was evident in a recent heat recovery project first designed and completed in the Rockefeller Research Laboratories (RRL) at the MSK Manhattan complex in early 2014.

The MSK Manhattan campus is located on the city block between York and 1st Avenues between 66th and 69th Streets East. The facility has ten buildings, eight within that superblock with the RRL directly across the street at 430 East 67th and the Zuckerman Research Center at 415 East 68th. Campus buildings have been variously constructed and added to since 1939 so there was a good chance that original engineering specifications still in place would give room for performance improvement and energy savings.

Such was the case at RRL. One of the newer campus buildings (built in 1986), RRL has over 327,000 square feet of space and includes eleven floors of laboratories and a twelfth floor vivarium. Due to the demands of a research center, the building is open 24/7, so the HVAC system operates 24/7.

During the process of maintaining/upgrading the cooling towers at RRL, the facilities staff had to find a way to temporarily support the secondary condenser served by the towers, temporarily cutting them out of operation to perform the upgrade. They installed a bypass line connecting the chiller water to the secondary condenser water during the upgrade so that the HVAC system operations were not disrupted.

Because this temporary measure proved an effective system adaptation, as RRL's Plant

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TEAMWORK *(Continued from page 1)*

Operations Supervisor Nilbert Sedillo observes, "We saw a window of opportunity here for potential energy savings, recovering heat that was previously being 'lost' in the colder months."

Thus the plant operations department came up with an idea of crossing-over the secondary condenser water loop to the chilled water loop to initiate a heat exchange process. As the department's project report explains it, this setup would recover the heat from the secondary condenser absorbed from the direct expansion (DX) units in the whole building, capturing previously "lost" heat. The heat is then redirected by circulating the heated secondary condenser water into the main air-handling units, resulting in suitable temperatures for maintaining comfort at the DX units and the conditioned research labs. They would simply be using rejected heat to maintain and condition the temperatures as needed at the DX units.

At RRL, the only system addition that had to be installed was the cross-over connection between the secondary condenser water riser and the chilled water riser. In the colder months when this bypass is operational – late fall through early spring – the cooling towers would be idled and the chiller would, effectively, become a conduit pipe. The system cannot be run this way in the warmer months because the building's condenser pipes are embedded, which would cause excess condensate development in walls, corridors, ceilings – too much to accommodate.

But in the six-to-seven months of the year where the cooling towers are taken offline, the savings are significant and have a ripple effect, not only in idling the towers, but also in the extra heat savings from the recovery, tower equipment maintenance savings, and chiller operation savings.

The system is far more complex in execution than can be detailed here. With the cross-campus connections, how it operates would depend on the outside air wet bulb (WB) temperatures. The system converts to a closed loop heat recovery system when ambient WB temperatures fall below 45 degrees.

Equipment Used	Dry Bulb: 30° F / Wet Bulb: 25° F	Dry Bulb: 40° F / Wet Bulb: 34° F
ORIGINAL SETUP	**BTU/HR USAGE**	**BTU/HR USAGE**
Secondary Condenser Pumps (3)	160,759	160,759
Primary Condenser Pumps (3)	80,380	80,380
Industrial Cooling Towers (2)	107,173	107,173
Chilled Water Pumps - cooling coil freeze protection (3)	167,457	167,457
AHU Pre-Heat Coil - steam (3)	13,000,000	8,666,667
TOTAL BTU/HR USAGE	**13,515,769**	**9,182,435**
MODIFIED SETUP		
Chilled Water Pumps - cooling coil freeze protection (3)	234,440	234,440
AHU Pre-Heat Coil - steam (3)	6,500,000	6,500,000
TOTAL BTU/HR USAGE	**6,734,440**	**6,734,440**
SAVINGS of BTU/HR	**6,781,328**	**2,447,995**
% SAVINGS	**50.2%**	**26.7%**

This chart illustrates the modification to the system set up and the estimated annual energy savings the modified set up can achieve. Estimates are based on use over the past two years against 20 years of historic usage data and factor in the weather conditions that permit the modified set up to be online (cooler temps, less humidity – mid-fall to mid-spring).

When ambient temperatures go above 45 WB, the system becomes part of main campus chilled water system. Implementation required monitoring, and controlling via the automated controls. The operations staff is integral to deciding which system is most efficient for the conditions. Documenting a huge amount of data was necessary to ensure that the correct parameters were set to meet the demands of the 24/7 research laboratories.

This close monitoring and system tweaking led to more savings. As Manager of Plant Operations Garrette Gordon explains, "When determining how to get the correct water pressures needed to the farthest point for the labs, we discovered that all these years, by following the original engineering specs we were significantly over-pumping. We were running 10 PSI and 600-800 GPM for the cold walk-in boxes but, after measured ramping down, we found we only required 4-5 PSI and 250-300 gallons." This adjustment also took a lot of wear and tear out of the system, as well as saving water and energy costs. The controls include pumps with VFD's, GPM flow monitoring sensors, and system differential pressure sensors to maintain optimum efficiency.

Having used RRL as a test case, the team is ready to implement the "cross-over" concept in the rest of the campus buildings. While the concept remains constant, implementation will not be. For example, RRL required only the bypass structure since there was already a plate and frame set up in place. Other buildings may need this upgrade and more. Each circumstance will be different and parameters will be measured and modified but the ultimate savings are significant.

Working Together Towards Efficiency Goals

Sedillo and Gordon engineered the structure of the system, with the team gathering vital data 24/7 and providing observations of their own to achieve the optimal parameters. "All members of the team have credit for this project. Doing this for the first time, it was so critical that we have no margin of error, especially at a research facility where people are doing critical and valuable work," says Sedillo.

As Gordon explains, "Our general manager was very instrumental in getting us BOC training. What it did was bring everyone on the same page to save energy, giving them the practical knowledge of how to do it, such as examining trend reports and data and looking for anomalies to see if something is not calibrated correctly or just not working, as well as the confidence to contribute. You're part of the team."

A special thanks is due to Plant Operation Supervisor Nilbert Sedillo, whose (far more) detailed documentation of the heat recovery project provides the technical descriptions and the estimated savings calculations contained in this article.

Team members participating in this project included: Luis Vazquez, Brian McAvoy, Russell Preston, Gary Sights, Benita Perez, Jakub Poplawski, Michael Spencer, Daniel Donovan, Christopher Carey, John O'Malley, David Brown, Dachang Liang, Wayne Thomas, David Torres, Richard Farrell.

BOC Grads Making a Difference

Working with Multiple Challenges

James Van Coney
Electronic Industrial Controls Mechanic
Audie L. Murphy Memorial VA Hospital
San Antonio, Texas

James Van Coney has been involved with facilities maintenance since he started working for the Department of Veterans Affairs (DVA) and Department of Defense (DoD) in 1989. Now in San Antonio at the Audie L. Murphy Memorial VA Hospital, his fourth posting with the DVA/DoD, he is working as an electronic industrial controls mechanic and is thus tasked with bringing building systems controls as up-to-date as possible.

Van Coney had taken various training courses throughout his career and had read about BOC, but had not been in areas that offered it until he worked at Naval Base Everett in Everett, Washington, where he took the training in 2011. "The training was a huge help to me because when I started in the field at a navy post, I had worked mostly in the utility operations side so didn't have the overall picture of individual buildings and the different types and challenges they presented," he explains.

> *"I got my certification and applied what I'd learned and, according to the energy manager and the resource efficiency manager at the naval base, we would not have achieved the award without the information I was able to provide due to my training."*
>
> *– James Van Coney*

The base earned a 2011 FEMP (Federal Energy Management Program) Energy and Water Conservation award, a distinction given to only 30-35 facilities worldwide yearly. "I got my BOC certification and applied what I'd learned and, according to the energy manager and the resource efficiency manager at the naval base, we would not have achieved the award without the information I was able to provide due to my training."

Armed with this new, broader understanding of how to address building management, Van Coney went to the San Antonio VA hospital. The facility is over 1.1 million square feet – three separate wings each with seven stories – and is an older building that has been remodeled and has also added building space since the original construction in 1972. Because of this, the challenges are varied and, in some ways, peculiar to the timing of the remodels/add-ons. The original designs did not take energy efficiency into account and used a system of, he estimates, at least 140 air handlers of various types and sizes throughout the building, rather than a more central setup. "There's energy waste in the sheer number of units," he notes.

Much of the building's designs included interstitial spaces, which contain all mechanicals in between floors – yet another challenge – and probably accounts for the large number of air handlers.

Van Coney opted to tackle it in sections. The first challenge was the seventh floor oncology wards, where there were some offices but mostly patient care rooms, with total floor space of about 10,000 square feet. He replaced outdated pneumatic controls with direct digitals. There were two air handlers and 20 rooms with reheat coils in the space. He replaced original actuators with analog ones and installed DDC controllers, allowing for programmable set points for both room and supply air temperatures.

Previously, if there had been a temperature complaint it was addressed directly by maintenance staff. With the new set up, Van Coney says that work orders have gone down considerably. There are far fewer complaints and even when there are, "My co-workers don't even have to go there. They can just fix it from the front end by adjusting the set point."

The lack of trend data makes quantifying energy savings difficult. Intuitively, Van Coney knows the savings are there because "it has to save when the chill water and steam valves are no longer fighting each other – especially in the winter." With the San Antonio climate – mostly hot and humid except for a couple of the winter months – another issue is condensation. "The older pneumatic systems were just overfeeding the coils, working a lot harder. There was condensation everywhere!" While this still occurs, the situation is far better than before, and not having to haul wet/dry vacuums up to address excess water so frequently saves a lot of time.

At this point for Van Coney, it is more about occupant comfort and maintenance-related savings, but he hopes to gradually convert to more sophisticated systems that can pinpoint energy improvements as well.

Van Coney is working his way down that wing of the building and just finished doing the same thing on the sixth floor – a cardiac/cath area. This installation is more localized, with in-room controls in most rooms because these are direct patient areas. Each floor will exhibit its own needs and challenges, and Van Coney will root out the best options, adjusting the systems to the site.

Texas does now offer BOC training through Austin-based SPEER (the South-central Partnership for Energy Efficiency as a Resource). SPEER is a regional organization that aims to accelerate the adoption of advanced building systems and energy efficient products and services in Texas and Oklahoma. Van Coney is hoping to get his colleagues interested in a Level I course going and, perhaps eventually, get a Level II for interested Level I grads going. Van Coney and SPEER created a proposal to his management to train selected colleagues. Van Coney has also reached out to facility managers at local hospitals about the training and hopes to get Kelly Herbert of SPEER an opportunity to speak to the San Antonio Association of Building Engineers to encourage participation

Chipping Away to Conserve

Alethea Cariddi
Sustainability Coordinator
University of New England
Biddeford & Portland, Maine

BOC grad Alethea Cariddi, sustainability coordinator at the University of New England (UNE) since 2008, earned her BOC Level I certification in May of 2012 in a course hosted by Efficiency Maine.

"I enrolled in the training because I was doing a lot of work on energy efficiency projects with the HVAC crew at UNE, and was writing grant proposals for funding," says Cariddi. "I thought that having a better background in building operations would make it easier to identify projects and write more effective proposals."

One such project was the extensive lighting retrofit initiated on both the Biddeford and Portland campuses. LEDs were installed in the campus gymnasiums, four parking lots, a

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BOC GRADS *(Continued from page 3)*

pool, many building exteriors, as well as five residence halls. Cariddi notes that the overall square footage of the campus properties is more than 1.3 million square feet and that the retrofit project covered almost 80 percent of this space, not including building exterior parking lights.

Previous lighting fixtures ranged from wall sconces to T8s to CFLs to halogens, with wattage levels spanning 13 to 1000 – an array requiring extensive work to determine best options. The lighting designer at Sebago Energy Conservation was instrumental in helping UNE determine the best alternatives for each space identified.

Since not all of the buildings are sub-metered, exact savings numbers cannot be determined, but the projected calculations, in which Cariddi and her colleagues are quite confident, estimate that savings for the updated lighting is about 637,000 kWh annually.

Working with Efficiency Maine, replacement options and cost/saving projections were laid out in detail. Incentives available from Efficiency Maine at that time also helped UNE reduce the initial capital cost of the project, bringing its payback to slightly over two years, nearly under half of what it would have been.

Cariddi's previous experience and education (formerly a school health coordinator with a master's in education, as well as an undergraduate degree in biology and environmental science) make her a natural for informational outreach to the school's community to spread the word about energy efficiency. Emails are regularly sent out with conservation tips, as well as reminders for seasonal adjustments people on campus can make to save energy. Many of these tips even come to her from BOC emails, she notes. Her office produces a half-page, double-sided tabletop informational card with efficiency tips. This usually comes out twice monthly and is strategically placed in cafeterias and eating areas – where people are likely to check them out.

Cariddi's interest in efficiency and sustainability goes beyond the UNE campus. She serves on the board of the US Green Building Council (USGBC) Maine chapter and has also been invited to speak at several green building and efficiency events in the state.

So what's next on the horizon? Through their newly-established Green Revolving Fund, and additional Efficiency Maine incentives, they are again retrofitting inefficient lighting to LEDs at two residence halls on the Biddeford campus, which house over 475 students. This project, covering 168,813 square feet of space, is anticipated to save over 179,600 kWh annually, providing an additional 28 percent of kWh savings for the two lighting retrofit projects – over 835,000 kWh combined annually. Cariddi will also work closely with the facilities department to investigate direct digital controls for the Portland campus over the next several months.

Cariddi says that the BOC training helped her gain confidence in working with facilities crews as well as in calculating accurate savings numbers. She also observes that the program connected her with other building professionals in Maine and Efficiency Maine staff that "have provided me with insight into other potential projects and funding opportunities to improve the energy efficiency of our buildings."

Working with facilities and Efficiency Maine, Cariddi plans to keep chipping away to reduce energy use at UNE. It all comes together with community support and knowing your resources.

Occupant Behavioral Change Campaigns Work

Joseph Ashurst
Facilities Manager
University of Utah
Salt Lake City, Utah

Joseph Ashurst has been a facilities manager at the University of Utah in Salt Lake City since January 2012, after 12 years in the field. With degrees in both facilities management and business (MBA), he approaches his work with an eye to both efficient operations and potential cost savings.

Ashurst learned about BOC training a couple of years ago when he attended an informational luncheon hosted by the Intermountain Building Operators Association (IBOA). He had been thinking about possible efficiency measures to initiate at the university ("BOC-types of ideas") and says that learning about the program and its emphasis on efficient O&M solutions convinced him that it would provide good tools with which to address various issues at the campus.

Enrolling in BOC Level I in 2013, Ashurst says that, "It changed the way I was thinking about a lot of things." Local utility Rocky Mountain Power subsidized tuition and the university picked up the remaining balance. A total of six facilities staff completed the course.

Following the training, he implemented some of the "low hanging fruit" options that lighting provides. With this under his belt, he then turned his attention to HVAC which, depending on the building, can consume about six times the amount of energy used by lighting. He saw a good opportunity for significant improvement with operation of fume hoods in laboratory spaces.

The University of Utah has over 31,000 students and over 300 buildings on its campus, many of these scientific and medical research facilities. Ashurst happened on an article describing what other universities were doing about fume hoods in their research buildings. He and his colleagues in FM discussed possibilities and decided to get buy-in for a "Shut the Hood" campaign, a behavioral change initiative that would task building occupants with remembering to close fume hoods in the laboratories when not in use – a straightforward, sensible task that people simply don't usually think to do.

As a pilot project, the team decided to focus on the Sorensen Molecular Biology Building (SMBB), a 208,000 square foot facility housing 75 fume hoods. SMBB is open to users at all times. In some lab spaces, the minimum airflow to safely contain fumes (hoods closed) is as low as ~2,500 CFM, with maximum airflow when hoods were open as high as ~10,000 CFM. Ashurst notes several benefits that would result from using the hood efficiently:

1) **Reduced electrical usage (power to the fans)**

2) **Lighter filter loads (less air through the filters mean they last longer and flow better)**

3) **Less energy use to heat or cool the air (seasonally)**

4) **Improved air quality/safety.**

"The energy saving in heating and cooling is the main benefit, since airflow when the hood is shut is significantly lower than when it is fully open and it's the energy needed to heat and cool that air that is the significant waste," says Ashurst.

Before the campaign, Ashurst notes, an informal inspection of the 75 hoods showed about half were open at least halfway. The goal was not just to inform people of the energy savings, but to trigger people's behavior to habitually close them when not in use.

But how were they to effect that behavioral change? Education and buy-in. An internal meeting of the facilities department explained the purpose and logistics of the campaign and highlighted results achieved at other schools. Facilities then received a $5,000 budget from the university's Energy Management Department. The next, crucial step was to talk with head researchers in the building to get them on board. Their endorsement of the campaign would be a strong signal to their staff.

> *"The fact is that most people really had no idea that there was a connection between the fume hoods being open and energy consumption ... It's a multi-pronged approach to educate, remind, and trigger action that will be consistent and have results."*
>
> – *Joseph Ashurst*

The team worked to determine how they could encourage, on an ongoing basis, this simple act of closing an unused hood. They designed several visual "triggers" as reminders and placed them in strategic spots throughout the building. "It's good to shut the hood" stickers were put in place, many of which also illustrated that one fume hood could consume as much energy yearly as three-and-a-half houses. Larger posters were designed around LED real-time displays showing the CFM levels in lab areas (see picture on page 4). These were placed near elevators, where people would have a brief time to wait and read.

Next was a kick-off event, inviting all building occupants to get together for light refreshments and a discussion of the campaign's goals. "The fact is that most people really had no idea that there was a connection between the hoods being open and energy consumption," notes Ashurst. Once the situation was explained, and with backing of the key researchers, people were very willing to help.

"It's a multi-pronged approach to educate, remind, and trigger action that will be consistent and have results," says Ashurst.

And the results? Actual CFM pulled from all fume hoods dropped 6 percent after the program was completed. Prior to the program, only 46 percent or less of the hoods were observed to be "mostly-closed." That number jumped up to 64 percent. Similarly, while 40 percent of the hoods were observed to be "mostly open" prior to the program, that number dropped to 21 percent afterwards.

As their campaign web page notes (facilities.utah.edu/shutthehood.php), at CalTech's similar research lab centers, each fume hood costs $4,700 yearly to run and is closed only 9 percent of the time. With efficient usage, CalTech estimates a potential savings of $3,400 per year per hood. While SMBB's usage is not as extreme, the savings are still estimated to be significant, saving around $2,000 a month in the SMBB building alone.

Given the success of this pilot campaign, the university is currently rolling the fume hood program out to the rest of the applicable buildings. Spearheaded by Sustainability Manager Stephanie Dolmat-Connell, the program will target the ~1,000 VAV-equipped fume hoods on campus and the university is looking forward to achieving similar reductions.

In the meantime, Ashurst is on to other things. The exterior socket CFL lighting around SMBB has an outsourced maintenance contract – with some pretty hefty monthly costs, (over $11,000 in the last 12 months.). Ashurst reached out to the Energy Management Department to get a quote for replacement with LED lighting. "The total out-of-pocket cost to replace all the fixtures after our local utility's (RMP) rebate is about $15,490 which, when you factor in both the reduced maintenance costs and the reduced energy consumption, is a payback period of just over one year for three times the amount of light using one-third of the energy," he says with enthusiasm.

As the university's web site advises: Step one: Imagine. Step two: Do. There are always ways to accomplish goals, whether they are totally new or variations on existing options. Ashurst credits BOC training with helping to bring many of his ideas into a practical focus and plans to keep moving forward to increasingly efficient operations.

BOC Training Opens Door for Expanded Role

Bob Granger
Energy Optimization Program Manager.
Coldwater Board of Public Utilities
Coldwater, Michigan

Bob Granger was not in the facilities management field. He started his career as a service technician for an HVAC mechanical contractor, worked various jobs in construction, and in 1995, started his own company using this skill set. In 2010, he joined the Coldwater Board of Public Utilities (CBPU) in Coldwater, Michigan, as CBPU's Energy Optimization Program Manager. The CBPU offers the community a range of services including: electricity; water, sewer & wastewater treatment; cable, internet & phone; and garbage & recycling.

"My main responsibility was to promote and encourage energy efficiency projects with our commercial and industrial customers many of whom, at the time anyway, wouldn't really give me the time of day – they just didn't feel they had the time or funding to focus on energy efficiency," says Granger. CBPU had some funding available for energy efficiency education and a year or so into the new position, he attended the annual conference of the Midwest Energy Efficiency Alliance (BOC sponsor MEEA) in Chicago.

"I sat through a presentation discussing the BOC program and thought it would be perfect for our industrial and commercial customers," states Granger. With the funding, he decided to put on a Level I series in 2012, focusing on the largest twelve companies, figuring that if he could put their facilities managers through this program, the training would give them the most benefit and bang for the buck.

As he was putting the BOC course series together, Granger decided that he, too, would attend and saw it as a means to get more acquainted with CBPU customers' facilities personnel, and to better understand the various issues they faced at their specific facilities, a major motivational factor in his decision.

Granger also convinced maintenance staff member Dave Luce to attend the BOC course. Luce really took to the training and has since been promoted to supervisor for CBPU's new combined heat & power plant, which just came online and will be able to provide 13 megawatts of peak power generation.

"I think that when I was first trying to interest companies in energy optimization, many of them thought of utilities as something you just paid and not necessarily a part of the cost of the widget," Granger notes re his initial efforts. His liaison role is a much easier sell to customers exposed to BOC. "I think that offering BOC training is one of the best thing I've done in my five years here as energy optimization program manager."

One of the first things Granger looked at was the Henry L. Brown Municipal Building, which has about 30,000 square feet and was built 13-14 years ago. Having to examine the building as a subject for the first BOC project assignment, he noticed that the building's energy recovery ventilation systems were running 24/7, and was set up for maximum

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With this issue we present two new Q&A columns, one with a BOC sponsor and another with a BOC instructor, which detail the benefits each sees in training.

Q&A With Richard Donnelly of Efficiency Vermont

Why does Efficiency Vermont promote the BOC program and how long has it been a sponsor?

Efficiency Vermont been involved with the BOC program for nearly a decade because of the high value it provides our customers and subsequently our program. Advancing energy efficiency through facility management requires a high level of understanding complex building systems. The best way to get that knowledge is through a structured training on system operation, new technologies, and best practices in operations and maintenance. The BOC training environment takes a disciplined approach to all this and also provides a comfortable environment which encourages peer-to-peer sharing and networking.

How do you go about promoting the training to your commercial and institutional customers?

We have strong working relationships with our institutional partners. Folks like the Vermont Principals Association and the Vermont Superintendents Association School Energy Management Program help us spread the word. For our larger institutional and commercial customers, such as hospitals and universities, our key account managers promote BOC.

What benefits does BOC provide for your customers?

There are so many obvious benefits, especially in energy-intensive facilities such as hospitals or where there are hundreds if not thousands of energy users, such as in K-12 schools or colleges. Lower costs and lower maintenance are two of the biggest benefits. Having foundational knowledge of how things work and being empowered to solve problems is also a key benefit. One benefit that is often overlooked is how BOC provides a rare professional development opportunity for facility staff members. BOC graduates add new value to their organization as well as to their own resumes.

Is there anything else you'd like to add?

When I first joined Efficiency Vermont in 2009, I audited the courses as part of my orientation to the institutional market. As a sponsor, attending is a chance to listen to your customers and learn about the barriers they face in their work trying to manage a range of requests and expectations from the staff to the business manager. Today's facilities personnel face a wide array of competing priorities and demands and there is a premium on good energy management. BOC helps facility professionals solve the puzzles they face with the energy systems they manage. It provides a solid foundation of knowledge and training on relevant skills. BOC also fosters and enables a network of colleagues that help each other well after the training.

It is interesting that the biggest champions of BOC – sort of a "proof positive" – are the folks that have been through it and are in the position of managing staff. What they want in their staff is the same level of knowledge they received when they took the training so that they can then delegate key, critical tasks to staff – you're building a team with common knowledge and skills.

This discussion was with Richard Donnelly, Portfolio Manager, Strategy & Planning, at Efficiency Vermont.

Q&A With BOC Instructor Richard Jackson-Gistelli

How did you become involved with the building operations and maintenance profession?

I got into mechanical engineering because of the energy crisis in the early 1970's and have been in the field in some fashion since then, from project management to teaching to design and implementation of conservation programs. It's finally cool to be doing it – for 20 years it was kind of a hard sell!

When and how did you hear about BOC and how long have you been a BOC instructor?

I moved from California to Eugene in 1996 and started working with the public utilities. I've always loved teaching and asked at the local junior college about teaching a course in energy management. They saw the need and so were interested. That experience and my involvement with local utilities led me to cross paths with Stan Price of NEEC around the time when the program was first starting. To be honest I can't remember if they were looking for instructors or if I asked if they needed one, but I've been at it for many years. Currently I teach the energy auditing class (BOC 1002), but also taught the HVAC classes in the past.

What do you see as the challenges to facilities management in your particular field? To facilities management in general?

The disconnect between those that do the work and those making the decisions.

While saving energy has become more of a focus for companies in recent years, there was a long time where that just wasn't the case. Even now, while some of the participants in the BOC energy auditing class have access to energy cost information, some companies still have a hierarchy of information where this doesn't trickle down. That's unfortunate because while a facility operator can intuitively know he or she is saving energy, they can't quantify cost savings. Those numbers can often be a great catalyst to getting projects the go-ahead. There

shouldn't be a hierarchy – you want the people turning the wrenches to know what's going on. It's incentive to continue to do a good job. I'll bet you ten to one that those companies sharing savings numbers down the line are doing leaps and bounds better on energy conservation than those that do not. It feeds off itself.

There is also the fact that FM personnel are given responsibility without authority, which is an extension of this disconnect. They learn about the changes that need to be made and then can't make them. I tell them, hey, let me be the bad guy. They sent you to this class and I said this information is what you need.

We are starting to see that the more this stuff gets delivered from above but handed down, the better success rate. It's sort of a top-down approach where we say to companies, if you're sending facilities staff to training, it's a good idea to send an executive sponsor as well. Facilities management needs to be looked at as an investment in the company. In too many situations, when an FM department implements something that saves on energy costs, the savings doesn't go back into the department for more efficiency projects but just lowers the FM budget.

I tell students that they have to make a deal. When they do a great project and can show the savings, say you can do it again but you want 40 percent of the savings to reinvest to new projects.

There's also still a bit of a disconnect on the corporate side in promoting the efficiency changes that have been made. I was telling companies ten, twelve years ago, "You're doing a lot of great stuff – tell people about it!" And it's happening now. Green marketing is becoming a benefit to public image – shows corporate responsibility. It's not like I'm asking them to be altruistic or anything but it's now seen as a positive.

Are there any surprises for you when you teach BOC classes?

The biggest surprise is how much I learn. It's that type of work in a way – you're constantly honing what you do, always learning a little more. The structure of the classes is important and encourages networking and forming relationships that lead to sharing resources and information. The one surprise that is a little disappointing is that, as an instructor, I give my contact information out as a resource as well but not that many people take advantage of it.

Is there anything you have learned from your students?

Always learn stuff from my students. You always learn something though you might not know what it is. I get fascinated by corporate structure because I battle that. It's interesting to see the different work environments people face and the means they use to get something done in their particular situation – their tricks of the trade, so to speak.

Do you have any Building O&M tips you'd like to share?

TRACK WHAT YOU DO! Take advantage of utility data and learn how and why your building consumes energy. The more you understand how your building consumes energy, the better you're going to be able to optimize.

I like to go back to the basics – what I think of as my Trilogy of Conservation. First, does your building fulfill its function. Second, if it doesn't, fix it. Then, and only then, can you go to step three and ask if you can do it more efficiently, because if you don't have the first two conditions in place, you can't make sustainable changes. Consumption in and of itself is not the culprit. Consumption is natural and happens all the time. Wasteful consumption is the culprit.

What keeps you coming back?

Really, I just love it. I could talk about this all day!

Richard Jackson-Gistelli, PE, currently teaches energy auditing for BOC and has also taught the HVAC classes. He is a partner at Energy Smart Industrial, which is sponsored by local public utilities in Oregon, as well as the Bonneville Power Administration.

BOC GRADS *(Continued from page 5)*

occupancy load of about 200 people versus the normal occupancy of around 38. They installed VFD drives with digital control systems, as well as CO2 sensors, so that they could control ventilation based on occupancy demands. For example if they have a big council meeting, the system will ramp up to serve the greater demand, then adjust back down to serve the normal occupancy profile. Granger estimates that by adjusting the fan speed ratios to meet the buildings ventilation requirements, they have reduced the buildings annual electrical use by 30,000 kWh, saving the city over $3,000 each year.

A similar but more extensive improvement was made at the Coldwater Public Safety Building, where they replaced the existing chiller, boiler, and pneumatic control systems with a digital scroll chiller, modulating boilers, and a direct digital control (DDC) system. VFDs and high-efficiency motors were also installed on all pumps and air handlers, all for an estimated annual savings of $7,000 from reduced energy costs.

Granger sees the most positive result from BOC training from a facilities management perspective was that with his HVAC background, he could identify that the municipality's buildings control systems were totally inadequate. "I came away from it realizing that if you can't measure it, you can't manage it." He can now monitor and adjust as necessary many of the municipality's HVAC systems right from his desk.

Granger feels that BOC training helped him to realize just how much "you really need to consider all of the facility's equipment when maintaining and/or upgrading the facility." While they did use utility rebates wherever possible and they do look at the no-cost/low-cost options first, it isn't just energy cost saving that is considered. He maintains that energy savings and reduced maintenance costs are equally important.

Granger's role as CBPU's efficiency optimization liaison with commercial and industrial customers has recently expanded to include facility management for some of the municipality's buildings.

New projects are always on the docket and Granger, in his dual roles in what he considers to be a "community position," will both direct implementation of projects for the city as well as continue to assist the utility's customers with their energy efficiency efforts.

The following is four-part article from the May 2015 issue of Facility Maintenance Decisions covering the options managers face for roofing projects including:

PART 1 **Roofing Riddle: Repair, Replace or Recover?**

PART 2 **Accurate Repair History Vital When Making Roofing Decisions**

PART 3 **Factors to Consider in Roof Repair, Recover and Replace Decisions**

PART 4 **Important Factors for Managers to Consider in Roofing Dilemma**

Written by Eric Hasselbusch

1. Roofing Riddle: Repair, Replace or Recover?

Maintenance and engineering managers confronted with a problematic roof have a difficult decision to make. Is the best option to repair the existing roof, leave the existing roofs in place and install a new roof over it, or remove and replace the existing roof? The answer depends on several factors that managers must consider before making a decision.

The right decision can result in reduced risk to employees and operations, efficient use of funds, and long-term roof performance. Making the wrong decision, in addition to being stressful, can result in the opposite; premature roof failure, unplanned expenses, increased risk to employees and production, and possible building code violations.

How roofs fail

Roofs seldom fail suddenly, and few failures are major collapses. Failure generally occurs as a result of a series of small progressive events, including: general neglect and abuse; roof traffic that results in punctures and damage; changing weather conditions that create thermal stress at seams and flashing details; chemical contaminants that cause deterioration; and sunlight that delivers heat and ultraviolet (UV) light and cause roofing materials to deteriorate.

Maintenance crews can easily fail to notice these situations, allowing water to enter the roof system damaging insulation, roof decking and interior spaces. If the existing roof system includes a vapor barrier or has a second roof installed, water that enters the roof system might be trapped, damaging system components even though it is not leaking into the facility.

These situations can result in premature failure of the top roof. Although each system is different, they share deficiencies that can result in the need for repairs or potential failure: leaks, standing water, shrinkage, blisters, splits, punctures, wrinkles, protruding fasteners, and surface deterioration.

2. Accurate Repair History Vital When Making Roofing Decisions

A roof with a long repair history should be a red flag for a manager regarding the general health and potential service life of the roof, but without objective and accurate information on the roof's condition, it can be difficult for a manager to make a good decision. Two recent examples demonstrate the value of accurate roof condition information when considering roof repair, recover or replacement decisions.

In the first example, a manufacturer budgeted $500,000 to begin a phased recover or replacement project of a 100,000-square-foot roof section that required replacement. Before beginning the project, the company hired a firm to complete an objective roof evaluation and moisture scan to verify the initial recommendation. The evaluation revealed that most of the roof field was sound and that the insulation was dry. The roof did not require a recover or replacement.

Most of the leaks, as well as the perception of a potential roof failure, arose from a small number of failed flashings and seams. Crews identified the roof deficiencies and made repairs. With proper maintenance and repairs, the company could defer recovery or replacement costs for at least five years.

In the second example a Midwest school was preparing to replace a roof for $500,000 based on significant leak history and a supplier's recommendation. After completing an objective roof evaluation, followed by an infrared moisture scan to verify the presence of moisture throughout the system, the manager determined most of the roof system was dry and in good functional condition, with only minor deficiencies.

Most of the reported roof leaks were the result of adjacent conditions, such as leaking windows and walls. The school repaired the walls and windows for about $100,000 and reallocated the remaining $400,000 budgeted for replacement to other areas of the facility.

Fortunately, in these examples, managers recognized the need for objective information, and the roof leaks and damage did not result in premature roof failure or misspent funds. But in both cases, managers could have implemented a more proactive approach to managing their roof assets and as a result avoided spending time chasing leaks and spending money addressing interior damage.

Evaluating options

Before evaluating potential roofing options and making a decision on whether to repair, recover or replace, managers need to determine whether they have the information needed to properly evaluate these options. If not, they need to develop a plan to effectively evaluate the condition of the roof in question. One important first step is to gather historical information for each roof section related to these areas:

This edited article originally appeared in the May 2015 issue of Facility Maintenance Decisions and is reprinted with permission. For the complete version of this article, please visit the FacilitiesNet site at www.facilitiesnet.com and enter the search term "Roofing Riddle". The direct link is http://www.facilitiesnet.com/roofing/article/Roofing-Riddle-Repair-Replace-or-Recover-Facility-Management-Roofing-Feature--15858

Eric Hasselbusch is an account manager with Benchmark Inc., a roof and pavement consulting company with headquarters in Cedar Rapids, Iowa.

Also, you can earn 1 maintenance point towards your BOC renewal by taking a quiz on the material in this article at www.theBOC.info.

BOC Rolls Out New Website

If you have visited theboc.info lately, you will have noticed a refreshed look to the website. We recently updated the site look and layout, featuring a streamlined course finder, easier to find information and an improved blog. Head over to theboc.info to check out the new site! And don't forget to submit your quiz for reading this month's technical article while you are there!

Blended Learning Course Rollout

NEEC piloted its first online BOC class in May. Twenty-three students participated in the Efficient Lighting Fundamentals class by accessing self-paced multimedia lessons, completing assigned activities and interacting with other students via a discussion forum – using an online learning management system. Students also completed an in-facility project and participated in a live webinar presented by a BOC instructor. NEEC is gathering feedback from students and industry observers who participated in the pilot, which will help inform the next iteration of online teaching and learning resources.

Northwest Energy Efficiency Council (NEEC) Winner of Excellence Award in Print Media

The Northwest Energy Efficiency Council has been selected as a recipient of an APEX Award in the category Print Media - Education & Training by Communications Concepts.

APEX Awards are based on excellence in graphic design, editorial content and the ability to achieve overall communications excellence. APEX Awards of Excellence recognize exceptional entries in individual categories such as Print Media, Newsletters and Websites.

This is NEEC's first APEX award. The winning submittal was the textbook for the Building Operator Certification (BOC) program's 1008 class Operation & Maintenance Practices for Sustainable Buildings. The textbook was written by a group of Subject Matter Experts and NEEC staff. The content focuses on best practices building operators can employ for high performance buildings including exterior site issues, water efficiency, cleaning products, materials and supplies purchasing, energy, and indoor environmental quality to improve the performance of both existing buildings and newly-designed green buildings.

BOC's Manager of Training, Olga Gazman, stated "NEEC is honored to receive the APEX Excellence Award in recognition of the high quality of learning materials authored for the BOC program. NEEC works with subject matter experts and instructional designers to write innovative and academically sound text materials that summarize and integrate the disparate knowledge in sustainable, energy-efficient building practices. NEEC's textbook production leverages knowledge of the subject matter and of the classroom, evidencing awareness of current thinking in these fields."

Communications Concepts, Inc. advises publishing, PR and marketing professionals on best practices to improve their publications and communications programs.

King County Awarded Energy Facilities Connections' Innovations Award for partnership with NEEC's BOC Training

Just this past June, King County's Energy Task Force was selected as the winner of the Washington State University (WSU) Energy Program's Energy Facilities Connections' (EFC) Innovations Award. The award recognizes the County's achievement training and certifying its employees to improve the energy efficient operation of county buildings. The County's Energy Task Force worked in partnership with Puget Sound Energy and the NEEC to provide BOC® training and certification to county facilities and other personnel. The initiative supports the County's commitment to achieve long-term energy reductions. The EFC Innovations Award honors non-profit, tribal, or public organizations that implement results-oriented, innovative programs or projects that demonstrate cost-effective, significant and relevant impact on the populations they serve.

"NEEC is pleased to support King County's commitment to energy performance through better building operations" said Stan Price,

Dave Broustis, King County and Cynthia Putnam, NEEC accept the 2015 EFC Innovations Award.

Executive Director, NEEC. "Training and certification of building operators is a proven way to deliver money and energy savings for the County, and it also improves the comfort and productivity of building occupants."

A team of advisors was assembled to work with NEEC to customize the BOC training and instructional delivery to county energy management objectives and infrastructure. Savings resulting from other County resource efficiency projects was used to pay for the initiative.

Check out BOC's Technical Webinar Series!

The BOC program offers webinars, both live and recorded, to keep you informed on the dynamic field of facilities management. Learn practical solution to deal with the energy hogs in your building from leading industry experts, covering topics such as demand reduction, lighting, and indoor air quality. Register at the BOC web site (www.theBOC.info) and receive a link with log-in and password information. Successful completion of each webinar and its accompanying quiz earns you 1.5 points towards maintaining your BOC certification.

The final LIVE webinars offered in 2015 will be held from 11 AM to noon Pacific Standard Time. These sessions cover:

Diagnostic Tools Series:

- *Tool Kit Stories from BOC Graduates* (Thursday, September 17)
- *What's Your Favorite Diagnostic Tool?* (Thursday, October 22)

Available recorded 2015 webinars are:

- *Communicating with Your Boss*
- *Communicating with the Boss' Boss*
- *Communicating Energy Performance in Your Organization*
- *Communicating with Building Occupants*

New to BOC?

Register for a FREE Informational BOC Webcast:

BOC Informational Webcasts are for newcomers to the program. Learn about 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, starting at :

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

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

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

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

The next live broadcasts for 2015 are scheduled for **August 12th and September 16th.** Please note that pre-recorded webcasts can be downloaded from the BOC website 24/7

To sign up go to: **www.theBOC.info**

Maintaining Your Certification

To maintain BOC certification, graduates must accumulate points each year following a full calendar year after their certification. Level I maintenance requires five points each year and Level II requires ten. Points may be earned as follows:

- Continued employment in building operations ..... ***2 points/year***
- Continuing education in building operations..... ***1 point per hour of classroom time***
- Energy efficiency projects completed at your facility..... ***Up to 11 points/year***
- Membership in a building operations association ..... ***1 point/year***
- Offices held in membership associations..... ***2 points/year***
- Awards received for efficient building operations..... ***2 points/award***
- BOC newsletter tech article quiz (see page 8 for details) ..... ***1 point/passed quiz***
- Completion of an energy consumption benchmark for the previous twelve-month period using Energy Star® Portfolio Manager or alternative energy accounting tool ..... ***3 points/year***
- Enrollment in a BOC webinar and completion of its quiz (See webinar announcement on this page) ..... ***1.5 points/passed quiz***

BOC graduates whose certification expires March 31, 2016 should receive their applications via email and US mail the week of January 5th 2016. To complete the application, certificants will report maintenance points (Level I maintenance requires five points and Level II requires ten) and submit the maintenance application fee ($65 for either Level I or II).

Use our HELP Desk (1-877-850-4793), whose knowledgeable staff can address questions and assist with the maintenance application. ***The deadline for application submission is March 31, 2016.***

Are you a Current Credential Holder?

WIN FREE STUFF! – Twice a year, current credential-holders may enter a drawing to win merchandise such as BOC gear from our Shop, diagnostic tools, or reference manuals. Our next drawing for a BOC hat, mug or shirt is October 1st.

Congratulations to **Tim Peet** of Hinesburg Community School in Vermont, the winner of our April drawing!

Enter to win here:

https://www.surveymonkey.com/s/BOCFreeStuff

Another Benefit for BOC Certified Operators

BOC graduates who maintain their certification receive a ***discount off the BOC webinar series.*** Watch for details of new offerings at the BOC website (www.theBOC.info)

Find a BOC Training in your area

When such a high value is placed on energy efficiency, knowing how to run your building at its optimal performance is an essential skill set for building operators. Join the growing number of facilities professionals that recognize the value of BOC certification, both for their facilities and for their own career paths.

BOC Level I Certification

The Level I series comprises 74 hours of training and project work in building systems maintenance. There are six core courses, complemented by one supplemental class, which is selected by area program administrators to enhance the BOC training experience specific to their region of the country.

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 and register for a Level I or Level II training in your area, please visit the BOC website at www.theBOC.info.

Training is available in 36 states and the District of Columbia – and now even Ontario! Find a training near you!

National Conferences & Symposiums 2015

IFMA World Workplace 2015
Denver, Colorado • October 7-9, 2015
MORE INFO: www.ifma.org/events/

I2SL (formerly Labs21) 2015 Conference
San Diego, California • September 21-23, 2015
MORE INFO: www.i2sl.org

World Energy Engineering Conference 2015
Orlando, Florida • Sept. 30 – Oct. 2, 2015
MORE INFO: www.energycongress.com

Building Operating Management's NFMT Orlando 2015
Orlando, Florida • October 27-28, 2015
MORE INFO: www.nfmt.com/vegas/

GreenBuild International Conference & Expo
Washington, DC • November 18-20, 2015
MORE INFO: www.greenbuildexpo.org

Midwest Energy Solutions (MES) Conference
Chicago, Illinois • February 26-28, 2016
MORE INFO: www.meeaconference.org

Trade shows, conferences, and symposiums are a great way of keeping up with trends in the industry. Attendance is also another way to earn certification maintenance points, with one given per event attended.

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 maintenance. Check out the Education, Professional Development and Events Calendars at these sites.

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

BOC:
Building Operator Certification
Live and recorded seminars
www.theBOC.info/m-live-webinars.html

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

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

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

Energy University :
http://www2.schneider-electric.com/sites/corporate/en/products-services/training/energy-university/energy-university.page

a FREE, online, educational resource, offering more than 200 vendor-neutral courses on energy efficiency and data center topics to help you identify, implement, and monitor efficiency improvements within your organization.

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

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

PNNL:
Pacific Northwest National Laboratory
http://retuningtraining.labworks.org/training/lms/

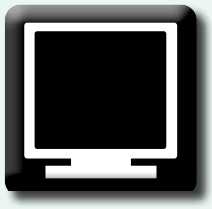
This interactive online class, Building Re-tuning, enables you to learn the initial steps involved in re-tuning a building controlled with a building automation system (BAS). Interactive exercises are included to provide you "hands-on" practice of the re-tuning process within a virtual building. Training takes about six hours to complete but does not have to be done in one sitting, and entitles you to six hours of CE credit.

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 brings you to a database of state incentives for renewables and efficiencies.

BOC:
You can also follow us on Facebook or visit our blog at the BOC website:

www.theBOC.info/blog



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FACEBOOK
www.facebook.com/thebocprogram

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Partners in the BOC program include: Canadian Institute for Energy Training, Energy Training Foundation (South Africa), Gwinnett Technical College, Intermountain Building Operators Association, Midwest Energy Efficiency Alliance, National Sustainable Structures Center at Pennsylvania College of Technology, New York State Energy Research & Development Authority, North Carolina Community College System, Northwest Water & Energy Education Institute, Northwest Energy Efficiency Council, Pellissippi State College, Sacramento Municipal Utility District, Santa Fe Community College, South Carolina Community College System BOC Consortium, South-Central Partnership for Energy Efficiency as a Resource, University of Hawaii – Maui College, and University of Hawaii – Manoa.

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