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International Facility Management Association

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The quality of not being harmful to the environment or depleting natural resources,

given new purpose

DON'T MISS:

CARBON FOOTPRINT STANDARDS

A GUIDE TO LEDS

50

SPECIAL SECTION: WINDOW TO EFFICIENCY

High-performance windows and window films


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The quality of not being harmful to the environment or depleting natural resources, thereby supporting long-term ecological balance

THE SUSTAINABILITY ISSUE

2016 FM GUIDE TO EFFICIENCY, ENERGY AND REUSE

FEATURING

REUSE ON CAMPUS

PAGE 38

University surplus given new purpose

About 2 to 3 million megawatts hit our global coastlines daily

OCEAN MOTION:

PAGE 30

FROM BRINE TO TURBINE

ALSO INSIDE:
A school outfitted with recycled office furniture

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STEPS TO SUCCESSFULLY LEVERAGE COMBINED HEAT AND POWER

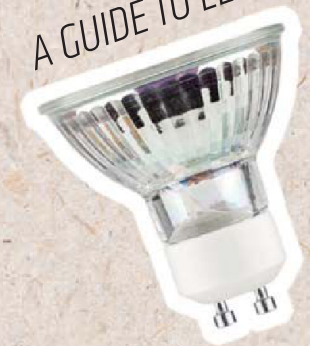
PAGE 50

DON'T MISS:

CARBON FOOTPRINT STANDARDS

A GUIDE TO LEDS

Because not all bulbs are created equal



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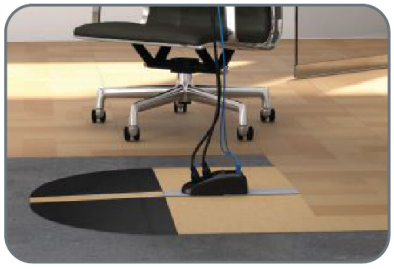

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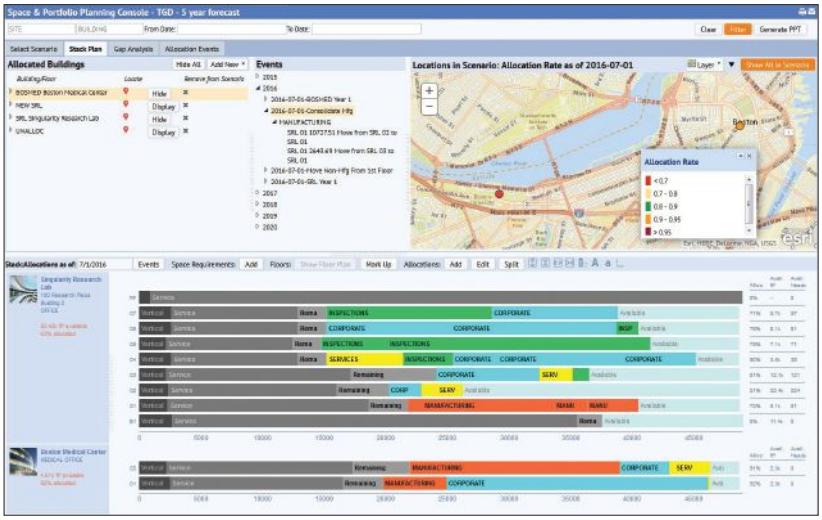

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ARCHIBUS

the SUSTAINABILITY issue

FEATURES

SPECIAL SECTION

Window to Efficiency

ON STANDARDS

SECTIONS

BEHIND THE COVER
With handwritten tidbits and a recycled paper background, this issue is meant to represent a notebook chock full of tips. This issue's "field guide" covers many facets of sustainability — from power gleaned from the ocean to how to find the right LEDs and the benefits of recycling a facility's furniture. Read on for great resources and insight on how to make your facility sustainable from every angle.

IFMA™ International Facility Management Association
Empowering Facility Professionals Worldwide

ABOUT IFMA IFMA is the world's largest and most widely recognized international association for facility management professionals, supporting 24,000 members in 104 countries. The association's members, represented in 135 chapters and 17 councils worldwide, manage more than 78 billion square feet of property and annually purchase more than US$526 billion in products and services. Formed in 1980, IFMA certifies professionals in facility management, conducts research, provides educational programs and produces World Workplace, the world's largest facility management conference and exposition. To join and follow IFMA's social media outlets online, visit the association's LinkedIn, Twitter, Facebook, YouTube and Flickr pages. For more information, visit the IFMA press room or www.ifma.org.

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The online version of FMJ features extra resources like videos, podcasts, white papers and more to enhance your reading experience. Click on the **FMJ Extra** icons that appear in the digital magazine to link to additional sources of information to learn more about topics covered by articles in this issue.

- **CASE STUDY:** "LED Lighting at Starbucks" to accompany "How to Choose the Right LEDs" **(p. 20)**
- **ARTICLE:** "All About Solid State Lighting" to accompany "How to Choose the Right LEDs" **(p. 20)**
- **CASE STUDY:** "Benefits of Reuse Case Study: Office Furniture" to accompany "Opportunities Wasted" **(p. 25)**
- **RESEARCH REPORT:** "Ocean Thermal Energy Conversion – Technology Brief" to accompany "Ocean Motion: From Brine to Turbine" **(p. 30)**
- **VIDEO:** "Sewage Heat Recovery" to accompany "Heat Recovery from Wastewater" **(p. 46)**
- **HOW-TO GUIDE:** "Sustainability How-to Guide: Carbon Footprint" to accompany "Carbon Footprint Standards: Why Should You Care?" **(p. 62)**
- **WHITE PAPER:** "Ultraviolet Germicidal Irradiation: Future Directions for Air Disinfection and Building Applications" to accompany "Fighting Infections, Costs with Ultraviolet Light" **(p. 82)**

The online publication includes **FMJ Extended**, a special section following the end of the print magazine that contains additional articles not available in print. Navigate in the digital edition to the articles listed below to read contributions from IFMA's FM Consultants Council and Environmental Stewardship, Utilities and Sustainability Strategic Advisory Group, and other extra content.

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FMJ CAN ALSO BE VIEWED ON MOBILE DEVICES.

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EDITOR'S COLUMN

ERIN SEVITZ
Editor
IFMA's FMJ magazine

SUSTAINABILITY – like FM – is a term with almost as wide a variety of definitions as there are people and organizations who subscribe to its philosophy.

To hear the FM community's take on the meaning of word, FMJ posed the question, "What does sustainability mean to you?" on IFMA's Online Community and social media outlets. The responses generated some great discussion around the topic – thank you to everyone who participated. Here are a few takeaways from the conversation:

Sustainability is...

"...a holistic view and systems thinking approach."
– Randall Niznick

"...using our resources wisely, efficiently and effectively."
– Doug VerBockel

"...a greater meaning than doing no harm."
– Kathy Thomas

"...understanding my consumption and what I can do to diversify and reduce it."
– Phil Russell

"...healthy, connected workspaces for occupants that improve quality of life."
– ChargeSpot

"...the dynamic process of development, improvement and progress in business conduct toward long-term goals."
– Juneid Kazi

While some looked at the concept from an organizational perspective, for others sustainability is clearly embedded at a personal level as well. This is important, as the world's population is predicted to increase by more than half to nearly 11 billion within the next hundred years (per a 2013 world population prospects report by the United Nations). Facility managers are ideally positioned to help us address the resource challenges we're likely to face as an outcome of this surge.

CELEBRATING FACILITY MANAGERS

July is a time of renewal for IFMA, as it marks the beginning of a new fiscal year. It also means that we have a new board of directors charged with steering the focus of the organization on behalf of the membership. Their names and titles are listed to the right, but you'll have the opportunity to get to know them a bit better in the September/October issue of FMJ, which will focus on the topic of leadership and the future of FM.

July is also significant within the FM community this year, as July 13 was designated by Global FM as World FM Day 2016. Each year, this occasion marks a chance to continue to expand public awareness of facility management, as well as to demonstrate appreciation for the valuable contributions of FM practitioners to the built environment and to business.

The celebrations around the world on the week of July 11-15 are indicative of the progress that has been made toward recognition of FM as a sector that optimizes facilities to create a safer, more sustainable world. While there is still some work to be done in this area, IFMA, in collaboration with the Royal Institution of Chartered Surveyors, is working diligently to ensure that you have the tools and knowledge you need to succeed. In fact, the future health of our planet may depend on it.

If you're interested in continuing the sustainability conversation, there are some thought-provoking educational sessions on this theme planned for IFMA's World Workplace Conference and Expo in San Diego this October – hope to see you there!

Erin

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CHAIR'S COLUMN

MAUREEN EHRENBERG, FRICS, CRE
Chair, Board of Directors

NO ROOM FOR WASTE IN FUTURE-FRIENDLY BUILDINGS

Facility management leadership must include the regenerative principles of the circular economy

Since the Industrial Revolution, economic growth has invariably also meant environmental degradation. Likewise the economic advantages we enjoy from our modern conveniences also cause often-destructive side effects. Economists track Gross Domestic Product, but they don't track the environmental impact found in its wake.

As facility management leaders, we are a part of this cycle and capable of changing it, while also delivering value to our clients and shareholders.

Throughout my career, environmental sustainability has always been part of the job at some level – especially during the last decade as sustainability has risen up the corporate agenda. Watching a recent National Geographic documentary series, Alexandra Cousteau's "Blue Planet," I realized that FM could do more to rein in destructive practices. Regulatory and operational compliance is part of our job, and we are on the front lines when the work performed inside facilities – whether industrial or office work – adds to the global waste stream and degrades the environment.

INFUSING FM WITH THE CIRCULAR ECONOMY MODEL

As the global population continues to grow, a new movement is afoot to replace the "take, make, dispose" economy with a more updated model. The World Economic Forum, with the Ellen MacArthur Foundation, is spreading the word about the "circular economy" concept in which everything old is made new again.[1]

It's a continuation of the dialogue that began with William McDonough and Michael Braungart's landmark book, "Cradle to Cradle: Remaking the Way We Make Things." The book charts a path toward minimizing the environmental impact of the built environment and leaving a lighter footprint.

Our profession is foundational to the "cradle to cradle" and circular ideals in delivering on the rich promise of sustainable building operations. FM practices can strive for facilities that are both restorative and regenerative, creating business value, environmental benefits and societal well-being. It's a lot to ask from a building – but it's possible.

This vision starts with thoughtful design and choice of construction materials and methodology, and continues into building operations – all factors considered in LEED, Green Globes, BREEAM and other building certifications.

New ideas can be put to work even in older buildings created long before "carbon footprint" became a household term. You might be surprised at what can be accomplished.

Take a look at some of the innovative, sustainable new cleaning products and interior build-out materials available for commercial buildings. Or consider the growing availability of alternative energy sources that can be brought even to legacy buildings.

Technology, from energy-saving smart building systems to sophisticated data and analytics platforms, advances progress toward sustainability. New online marketplaces make it feasible to recycle a surprisingly wide range of materials and items, and some entrepreneurs even find ways to repurpose what we normally would consider to be the waste products of industrial processes.

FM professionals have an opportunity to bring their facilities into the circular economy model – but we need to step outside our current sphere of influence to show leaders across our organizations how FM can help address this critical business issue. As concerns about sustainability continue to increase, let's seize this leadership opportunity[2] together.

1. www.ellenmacarthurfoundation.org/circular-economy
2. www.jllrealviews.com/economy/the-new-economic-forces-sculpting-real-estate

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PRESIDENT'S COLUMN

TONY KEANE, CAE
President and Chief Executive Officer

WE ARE IN THE MIDST OF INTERESTING TIMES AROUND THE WORLD.

The Union of European Football Associations' European Championship, preparing for the Rio Olympics, the U.S. political campaigns and the UK's vote to withdraw from the European Union are just a few of the events and activities touching our lives. At the same time, we also have some clouds hanging over all of our heads in terms of safety from terrorism, financial uncertainty and finding ways to ensure that we leave the Earth a better place for generations to come.

In a world where change is a constant, FM professionals must be prepared for anything. Accordingly, resilience and sustainability are foundational to effective facility management. This issue focuses on sustainability as both an essential tool and mindset for FMs. We hope that the articles you read will inspire you to think more strategically about your organization's resiliency plan and how you can increase the effectiveness of your sustainability initiatives to benefit the triple bottom line: people, profit and planet.

ACTING GLOBALLY

We recently participated in the final European Facility Management Conference (EFMC) jointly owned by IFMA and EuroFM. Moving forward, EuroFM has decided to offer an independent conference, and we are excited to share that in 2017 IFMA will be working with our European chapters to relaunch World Workplace Europe. This event will take on new life as it serves the European FM marketplace, professionals and IFMA members.

In planning international events like World Workplace Europe, we've found that there is a perception that IFMA is "North American." IFMA represents a global profession, based upon core competencies derived from the input of FM professionals from around the world. Our latest Global Job Task Analysis initiative represented feedback from FM practitioners in 60 different countries. While IFMA was founded in the United States and the majority of our staff are currently located in the U.S., our members span 104 countries, with chapters and alliance partners in 22 different countries.

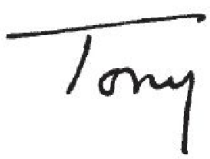
All organizations start somewhere, but their origins do not need to limit their futures. Mercedes-Benz, for example, is a global company with a German heritage. It operates facilities all over the world and manufactures quality products to meet the needs of many countries, yet it is still perceived as a German company. Similarly, IFMA's roots don't mean that we only represent the needs and practices of those in the U.S.

While IFMA may not have quite the same reach or presence as Mercedes-Benz, we already conduct business internationally, and our recent collaboration with the Royal Institution of Chartered Surveyors has only expanded our global footprint. This collaboration will benefit IFMA members around the world by increasing access to an infrastructure that can help support members and chapters, wherever they might be located.

When World Workplace Europe recommences in 2017, it will be an event designed specifically to serve the European marketplace and will be developed with significant input from our European members and chapter leadership. It will also incorporate global perspectives by leveraging the worldwide network of IFMA members. The same principle applies to our upcoming World Workplace Asia, India and Middle East conferences.

I would like to thank our IFMA Italia Chapter for co-hosting the EFMC conference in Milan; they did a magnificent job. I would also like to thank our chapter leaders in Austria, Italy, Sweden, Switzerland and Spain for productive meetings.

IFMA is a dynamic global association that is leading the way to enhance the application of facility management around the world. If your colleagues are not members of IFMA, please invite them to join and become part of the organization where the best in FM come together.



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WINNERS OF IFMA HONG KONG CHAPTER STUDENT COMPETITION

IFMA strongly promotes new talent in the FM industry, and the Hong Kong Chapter places much emphasis on professional development and FM education. To encourage students to better recognize the importance of their profession and plan for their career paths, the chapter held its first local student competition in 2011 with awards presented at IFMA's World Workplace Asia, which was held in Hong Kong that year.

IFMA Hong Kong is grateful for support from facility management and program leads from various educational institutions and supporting organizations that have developed the student competition into one of the chapter's anticipated annual events.

Awards for this year's inter-institutional FM project presentation competition were presented at the Integrate FM Conference on April 16, 2016. The jury panel included Ir Cr Dr. Charles Cheng from HKIE; Kenneth Wan from Cheung Kong; Patrick Siu from Henderson Land; Paul Sat from the Hong Kong Green Building Council; Samson Lee, current president of IFMA Hong Kong; and Jenny Yeung, past president of IFMA Hong Kong (2011-2013).

Nineteen students representing 10 teams from seven institutions entered the final round of the competition. All finalists received a one-year student membership to the Hong Kong Chapter of IFMA with full privileges to local events and access to IFMA's website, Knowledge Library, IFMA Foundation research materials, etc.

2016 WINNERS

PLATINUM AWARD OF OUTSTANDING PRESENTATION

"The Expected Change of the Waste Management in Hong Kong"

By **Vincent Cheung and Nancy Fan** of Caritas Bianchi College of Careers and Hong Kong Baptist University in the Property Management Environmental Science program led by Dr. Philip Wong.

GOLD AWARD OF OUTSTANDING PRESENTATION

"FM Cost Effectiveness in a Private Hospital"

By **Jing Zhang** of The Hong Kong Polytechnic University in the Master of Science in Facility Management program led by Dr. Joseph Lai.

SILVER AWARD OF OUTSTANDING PRESENTATION

"A Pilot Study of Energy Performance on a Hotel in Hong Kong"

By **Duncan Li** of The Hong Kong Polytechnic University in the Master of Science in Facility Management program led by Dr. Joseph Lai.

MERIT AWARD OF GOOD PERFORMANCE TEAMS

"Reuse Your Old Smartphone: Automatic Surveillance Camera (Application – iEye)"

By **Pok Man Leung** of The Open University of Hong Kong in the Bachelor of Computing (Hons) in Internet Technology program led by Dr. Keith Lee.

"Formulation of Space Revitalization Plan for the Informal Learning Space in Block Z of the Hong Kong Polytechnic University"

By **Vivian Cheng and Emily Lee** of The Hong Kong Polytechnic University in BSc (Hons) in Property Management program led by Stephen Wong.

"On the Way to Urban Sustainability: An Environmental and Historical Site Development and Management Proposal"

By **Holly Ho, Katie Yang and Winky Ngai** of The Chinese University of Hong Kong in Urban Studies Program led by Dr. Edward Yiu.

U.S. RESILIENCE BUILDING COALITION RELEASES PROGRESS REPORT, INTRODUCES SET OF RESILIENCE PRINCIPLES

The American Institute of Architects, National Institute of Building Sciences and 38 other leaders of America's design and construction industry, including IFMA, have released a report on progress made on the resilience front since the Resilience Building Coalition announced the Building Industry Statement on Resilience two years ago.

The Resilience Building Coalition also released a set of guiding principles to help the building industry adopt resilient design and policies. These include developing and advocating for codes and policies that advance resilience; developing "whole-systems resilient design" approaches for the built environment; and providing guidance, beyond the baseline life-safety codes, that recognizes the importance of fortifying property for individual and community resilience.

Since the initial signing, the coalition has added 19 new signatories. The report includes results from a survey of signatories about how their work has been impacted by the Building Industry Statement on Resilience.

Among the survey's major findings:

- A majority of signatories report that they have "become more aware of their unique role in achieving resilience" since committing to the statement, which has clearly catalyzed the integration of resilience goals into existing organizational frameworks.
- Almost 30 percent of respondents have seen an increase in resilience as a priority within their organizations.
- More than two-thirds of respondents listed high-performance buildings as an initiative they were most interested in advancing.
- More than half of the responding signatories have used the statement to "advance their organizational mission statement/values," as well as "provide support and/or validation for moving forward on organization initiatives." This shift in organizational priorities has led to concrete action.
- Respondents reported more than 40 initiatives they have begun that support the resilience focus areas committed to in the statement.

The report is an outgrowth of a landmark agreement made in May 2014, in which leaders of America's design and construction industry agreed to promote resilience in contemporary planning, building materials, design, construction and operational techniques as the solution for making the nation's aging infrastructure more safe and secure. The report is available at **http://bit.ly/1XgN9Jy.**

AASHE LAUNCHES VERSION 2.1 FOR THE SUSTAINABILITY TRACKING, ASSESSMENT AND RATING SYSTEM

The Association for the Advancement of Sustainability in Higher Education (AASHE) recently launched the latest version of the Sustainability Tracking, Assessment and Rating System (STARS) that features data auto-population, exemplary practice options and more. STARS is the most thoroughly vetted and extensively tested international sustainability framework for colleges and universities. STARS helps higher education sustainability leaders benchmark their sustainability achievements and support them in the creation of sustainability plans.

Some of the new features in STARS 2.1 include:

- A streamlined set of credits to reduce the amount of time it takes to complete a report
- Auto-calculated metrics (e.g., energy use per square foot) to make scoring more transparent and create useful data points for benchmarking
- A collaborative review and revision process to identify potential inconsistencies and correct them before a rating is awarded and the report is published. This AASHE staff-supported process is a benefit of paid participation in STARS and will help you make sure your report is complete and accurate before it is publicly available.

Although AASHE encourages every participant to upgrade to the new version and take advantage of all the new features included in STARS 2.1, all current STARS participants may choose to continue an existing submission under STARS 2.0 for a full year.

For more information about the STARS program, visit **stars.aashe.org.**

HAVE RELEVANT FM INDUSTRY NEWS TO SHARE?

Submit it to communications@ifma.org to be considered for inclusion in the Industry News section of FMJ.

EXPANDED NORTH AMERICAN SERVICES FOLLOWING PEST CONTROL COMPANY ACQUISITION

Following the acquisition of The Steritech Group, Inc. in October 2015, Rentokil North America is rebranding its North American pest control operations as Rentokil Steritech. The merger positions Rentokil Steritech as the third largest pest control firm in the United States. The company is the North American arm of Rentokil Initial, plc, the world's largest commercial pest control company operating in more than 60 countries around the globe. The expanded organization will now have increased national coverage, faster response times, and an even broader range of services available to customers.

The joining of Rentokil and Steritech creates an unparalleled wealth of technical expertise and resources to provide superior pest services to customers in North America. In the United States, Rentokil Steritech customers will be serviced by Rentokil's highly regarded regional brands J.C. Ehrlich, Presto-X and Western Exterminator, while Canadian pest control services will operate under the name Rentokil Steritech. In order to ensure consistency, all Rentokil Steritech entities will follow the same service protocols in order to provide uniform service to all North American customers.

As the two companies bring together operations, customers will now enjoy access to a wider range of innovative treatment methods, products, equipment and services. These include Rentokil's market-leading PestNetOnline online pest management system, an expanded offering of bird management services, mosquito and tick protection, fumigation, odor management, and bioremediation services and products.

The Steritech Brand Standards business, a leading provider of food safety and operational assessments designed to help businesses mitigate risk and drive top line sales, will continue to operate under the Steritech name.

Rentokil Steritech is a Corporate Sustaining Partner of IFMA that focuses on a technician/customer partnership to ensure the highest quality pest control service. For additional information, visit **www.rentokil-steritech.com** (U.S.) or **www.rentokil-steritech.ca** (Canada).

Photo © Jeffrey Totaro, 2015

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Saint-Gobain and Sodexo partner to enhance the quality of life in Saint-Gobain's new, state-of-the-art corporate headquarters in Malvern, Pennsylvania. This LEED® v3 Platinum building houses Saint-Gobain's extensive portfolio of building products and provides more than 800 employees with a healthy, comfortable, environmentally friendly and sustainable work environment.

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- Full-scope asset management and maintenance services that optimize Saint Gobain's capital plan and extends the life of assets
- A 11,925-square-foot café for employees and guests offering fresh, healthy menu items, along with seasonal outdoor dining, a full-time barista and catering services
- Closely monitoring operational and financial metrics and collecting employee feedback through technology tools such as FMiQ by Sodexo to drive continual improvement of the workplace experience

Since 1980, Sodexo has been working with Saint-Gobain to enhance the quality of life for employees, customers and communities at more than 200 sites around the world. We're proud to be part of their story.

"Sodexo's services perfectly align with Saint-Gobain's mission to develop innovative products that improve people's lives. This partnership enables us to design and deliver an environment that enhances the work experience for our valued employees and fuels innovation. Choosing Sodexo as our partner was a natural choice."

– John Crowe,
President and CEO of Saint-Gobain and CertainTeed Corporations

For more information about Saint-Gobain and Sodexo and how the companies partner to enhance quality of life, visit:
www.saint-gobain-northamerica.com | www.sodexoUSA.com

ISSA PARTNERS WITH HEALTHY SCHOOLS CAMPAIGN TO PROMOTE GREEN CLEANING IN THE U.S.

ISSA, the worldwide cleaning industry association, and Healthy Schools Campaign (HSC) have announced a five-year partnership that will promote the implementation of green cleaning in schools across the United States, including K-12 and universities. The effort is designed to establish a professional network of facility staff to improve how schools are cleaned in order to better protect student health and the environment.

In 2016, the initiative will include:

» **Green Clean Schools Leadership Institute.** The event will bring together top university and K-12 facility operators for a two-day training program focusing on management skills and developing green cleaning initiatives. The leadership institute will take place in Ellicott City, Maryland, USA, July 28-29, 2016.

» **Green Clean Schools Forum at ISSA/INTERCLEAN.** ISSA and HSC will host a two-day event during the ISSA/INTERCLEAN North America trade show. The forum will engage attendees on pressing topics related to green cleaning and guide them through the ISSA/INTERCLEAN experience. It will include educational workshops, networking opportunities with sponsors, and a guided tour of the show floor. The event will take place in Chicago, Illinois, USA, Oct. 25-28, 2016.

Healthy Schools Campaign is a nonprofit organization dedicated to making schools healthier places for all students. For more information, go to **www.healthyschoolscampaign.org.** To find out more about ISSA, visit **www.issa.com.**

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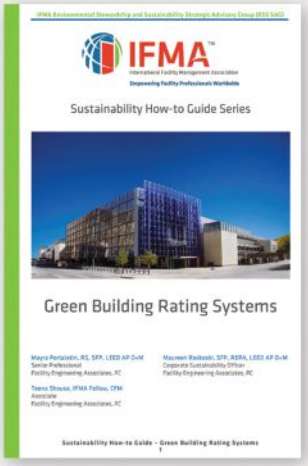

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Sept. 6-7, 2016 | Washington, D.C., USA | ifma.org/events/fm-events/advocacy-day

IFMA'S WORLD WORKPLACE CONFERENCE AND EXPO
Oct. 5-7, 2016 | San Diego, California, USA | worldworkplace.ifma.org

IFMA'S WORLD WORKPLACE ASIA CONFERENCE AND EXPO
Oct. 20-21, 2016 | Shanghai, China | worldworkplace.ifma.org/asia

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THE RIGHT LEDS

BY JODY CLOUD

Light-emitting diodes (LEDs) have the capacity to quickly decrease a building's energy usage. But simply installing this type of lamp doesn't guarantee that you're on your way to a smaller carbon footprint and lower utility bills. Not all LEDs are created equal, and the wrong LEDs may not be capable of providing the energy and financial savings you expect.

Just because a product is labeled as an LED lamp and carries certain certifications doesn't mean it will automatically last 50,000+ hours, give you between 50 and 90 percent energy savings or reduce your lighting maintenance costs to nearly zero. Almost every manufacturer makes these claims, but not every LED actually adheres to these standards.

How LEDs truly save energy

When something inside your building uses electricity, it affects your utility bill, increases your building's carbon footprint and ultimately harms the environment.

Right now, lighting accounts for approximately 19 percent of commercial sector electricity consumption, according to the U.S. Energy Information Administration. When quality LEDs are correctly installed in commercial or institutional buildings instead of fluorescents or high-intensity discharge lamps, you can expect lower:

- Operating costs
- Energy costs
- Replacement time and costs
- Heat emittance
- Facility cooling loads
- Risk of shock during replacement

In fact, the U.S. Department of Energy says that, if every American replaced just one conventional lamp with an LED lamp, the energy savings would light an estimated 2.5 million homes.

If you want to light your building with truly sustainable LEDs, here are some tips for spotting the real deal — the

LEDs that will deliver on long life, high energy savings and reduced maintenance requirements. When you find LED lamps that meet these requirements, you can be sure you're investing in a solution that will improve the sustainability of your building.

LOOK FOR QUALITY MATERIALS

Commercially available LEDs are made up of various components; LED performance is typically a result of the interactions between these different system components. From the type of lens used to the heat sink and the chips and power supplies that generate light, in order for an LED to function properly and provide acceptable light output, its components must be built to last. A lamp is only as good as its weakest link.

LED drivers are one example of how quality materials matter. As the heart of the lamp, the driver converts alternating current power into the direct current power needed by an LED to operate. An unreliable driver can render the entire LED defective. If the correct driver isn't used inside the lamp, the heat generated by the driver may be difficult to dissipate, ultimately causing the driver to fail. This is why you may see LEDs that flash or flicker — these are the early signs of driver failure.

The quality of the components used is what impacts LED driver performance. If poor-quality components are used to construct the driver, the LED may fail — and you'll have to spend additional money to buy a new lamp that was supposed to last for years.

Heat sinks, which provide heat dissipation to transfer heat away from the lamp's electrical components, are another example of the importance of quality materials. Active cooling (preferably aluminum or special polymer-based polycarbonate heat sinks) is a vital component of the LED and is the most efficient way to dissipate heat and preserve the life of the lamp. As a result, the LEDs that offer sufficient heat dissipation may weigh (and cost) a little more and last much longer.

LED chip performance comes down to material quality as well. A larger chip provides more light and good stability against current variations, but it costs more. Smaller LED chips provide less light and poorer stability.

Construction of the LED itself is also important when it comes to ensuring long-lasting performance. For example, if the lamp's paint or powder coating isn't applied well, there's a high chance that other components (the ones you can't see) were also cheap and thrown together quickly.

SEEK LOW TOXICITY LEVELS

Some LEDs have toxic components. A simple quick sniff may indicate whether the LEDs you have in mind make use of toxic products. (Hint: The lower-priced LEDs are typically the lamps with stronger odors, indicating high levels of lead, mercury or cadmium that surpass safety standards.)

SEARCH FOR ENVIRONMENTAL ADAPTABILITY FEATURES

LEDs that feature a reliable dust- and humidity-resistant design will last longer and require significantly less maintenance.

LED products are also available with extra low thermal protection, which means the lamps are protected against cracking due to very cold temperatures. The longer that the LED components are made to last, the longer you can expect quality light from the lighting system, and the more return you'll see on your investment.

ASK ABOUT LAMP TESTING

Question the manufacturer about its LED testing procedures. Some manufacturers fully test completed LED lamps before shipping.

Diligent manufacturers will place LED lamps and fixtures in a specially designed room for up to 10 days at a time and test them by repeatedly turning them on and off, and by leaving them on for extended periods of time. If a lamp is going to fail, it's likely to do so during this time. By properly testing LEDs, manufacturers can catch failures before any lamps are shipped to you.

SEARCH FOR VALID UL REGISTRATION NUMBERS

When an LED features an Underwriters Laboratories (UL) mark, it has been tested, inspected and validated for safety. But just because a product has the UL mark or number doesn't mean the mark is real. Some LEDs may carry a counterfeit UL mark, or a UL registration number that doesn't belong to that manufacturer or product. The UL number may not exist at all, or may belong to a product that was discontinued several years ago.

You can easily verify a UL mark by visiting the free UL Online Certifications Directory. It's wise to use this tool to confirm UL listings and classifications, as well as to learn about product safety standards.

LOOK UP DLC QUALIFICATION

Design Lights Consortium (DLC), a project of the Northeast Energy Efficiency Partnerships, is a non-profit organization created by the U.S. government to prevent LED lighting failure. After hearing numerous complaints from building owners and facility managers who were frustrated by investing in LEDs that failed far short of

NOT ALL LEDS ARE CREATED EQUAL.

implied warranty periods (as opposed to the 50,000+ hours promised), the Design Lights Consortium was created.

Commercial LED luminaires, retrofit kits, linear replacement lamps, E39 screw-base and other LED replacement lamps qualified by the Design Lights Consortium have been tested and evaluated to specific performance requirements. They are manufactured with high-quality components and held to such high standards that a five-year warranty is offered on the LED products as a symbol of their quality.

Is an LED retrofit right for your building?

Now that you can spot the LEDs that will deliver on their promise to save energy, how do you know if LEDs are right for your facility?

Ask yourself these questions, and think about the responses:

- Do I want to save more energy than I am right now?
- Do I want to stop replacing traditional lighting after several months, or two to three years?
- Do I want to stop investing in labor and resources to deal with consistent lamp replacement?

If you answered "yes" to one or more of these questions, then LEDs will likely provide what you need. LEDs can work for every building and every application, and upgrades can be completed in a few ways, depending on your current lighting system.

LAMP REPLACEMENT

Some lighting fixtures can be retrofitted by simply changing out the bulbs — swapping fluorescent tubes with LED tubes and removing the ballast and fluorescent lamp holders, for example. Many replacement applications now offer a popular plug-and-play option that can be installed into existing fixtures.

RETROFIT KIT

Another option is a retrofit kit, complete with LEDs and driver, which mounts directly into the existing luminaire housing. These retrofit kits allow you to keep your original fixtures and convert them to energy-saving LED fixtures.

FIXTURE REPLACEMENT

The last alternative is to replace the entire existing fixture with an LED fixture. If your lighting fixtures are completely enclosed, this may be the best route. LEDs shouldn't be installed in tightly enclosed fixtures unless they are approved for enclosed spaces. When heat can't dissipate from the LED's heat sink, premature lamp failure may result.

Do your part in making sure a new LED lighting system offers everything it promises by following the LED guidelines listed above. Reduced replacement time and costs, decreased facility cooling loads, lower risk of electrical shock during replacement and 50 to 90 percent savings on lighting energy are all possible with the right high-quality LEDs. **FMJ**

Jody Cloud is a lighting consultant who is officially certified to offer continuing education credits in LED lighting to members of the American Institute of Architects, the Building Owners and Managers Association, the American Hospital Association, the Professional Retail Store Maintenance Association and Community Associations Institute. He is also owner and founder of YES LED Lighting, as well as the author of the bestselling book "Say YES to LED Lighting." He can be reached at founder@yesledlighting.com or through his website, www.jodycloud.com.

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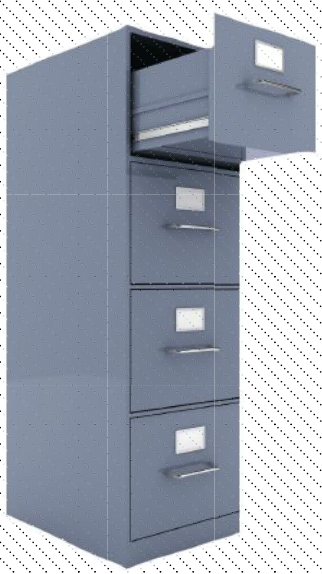

OPPORTUNITIES WASTED

Transforming decommissions into sustainability milestones

BY RICHARD BEAUMONT

It was a typical day when Darren Prather, principal at Christine Meikle School in Calgary, Alberta, Canada, received an email notifying him that he could save tens of thousands of dollars for the school. The email that Principal Prather received informed him and several other area non-profits that they were eligible to receive gently used office furniture and equipment, delivered directly to their facilities.

It was a particularly timely and serendipitous opportunity. His school, which serves students with a variety of developmental disabilities, was planning to transition into a larger facility. With more flexibility in his budget, Prather could offer additional support at the new location to his growing student body.

FMJ EXTRA
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Benefits of Reuse Case Study: Office Furniture

Business as usual means waste as usual.

More than a year earlier, energy delivery company Enbridge had embarked on a sustainable decommissioning of its downtown Calgary head office. In preparation for a large headquarters renovation, Enbridge's project team explored options for the decommission — the removal and disposal of existing furniture, fixtures and equipment, supplies, artwork, plants and more.

It became apparent that the potential for waste was enormous, and most of the waste would stem from perfectly safe and usable items. Because Enbridge is committed to sustainability in all of its operations, waste reduction became a priority, alongside meeting the project budget and timeline.

When Christine Meikle School opens its new doors in September 2016, it will be almost entirely furnished by Enbridge. Amazingly, would-be waste has tangible, lasting value for this special community.

"This is better furniture than we ever had," said Prather. "This donation will allow us to meet the furnishing needs of most of the new school, and the funds we'll save will help us better meet the needs of our students."

All told, Enbridge was able to reduce its waste output by 97 percent — equal to 304 metric tons — and generate more than CA$156,000 of in-kind community investments. It successfully engaged and aided organizations in its community and reduced its office footprint, all while meeting key operational goals.

The key to the project's success was in the approach. Facility managers who recognize the opportunities — and the hidden risks, including the potential for waste — can turn their next office decommission into a leading example of sustainability in the field.

Transforming office decommissions into sustainability milestones

FMs are often on the frontlines of office decommissions small and large, and they are increasingly playing a role in sustainable planning, supply-chain management and reporting.

As the professionals who influence both sustainability strategy and the day-to-day execution of workplace projects, FMs are uniquely positioned to bring better practices to the world of office decommissioning.

Set your sights on value

The typical decommission is all cost and no return — with the only result

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FMs are uniquely positioned to bring better practices to the world of office decommissioning.

being waste. When the cost of internal resources, labor, logistics and landfill fees are combined, it quickly becomes an expensive endeavor that provides no long-term value to the organization. However, if value recovery is built into the project plan, things will start to look different.

What if, for a comparable cost, businesses could complement their existing sustainability initiatives and help local schools, shelters and community centers and create good news stories around their renovation? It's an opportunity for real value where there would otherwise have been next to nothing.

This requires a rethinking of what waste really is and what it means to clear an office space.

Build sustainability into the plan

The only way that FMs can reduce waste, create value for their communities and meet their operational objectives is to build sustainability into the initial targets. This means taking decommissioning seriously and setting firm goals at the outset. When the clock winds down and the right suppliers aren't already at the table, waste becomes an inevitable result.

For example, it's easy to assume that furniture and equipment can be easily resold, recycled or donated and wait until the eleventh hour to plan the decommission, but this is a recipe for disaster. Very few buyers or non-profits, if any, can absorb entire floors of office equipment overnight.

Stay ahead and build the following into your plan:

- An accurate inventory of everything that has to be decommissioned
- Resale, donation and recycling plan and process
- Reliable vendors with outstanding track records
- Community partners that are engaged and properly prepared
- Troubleshooting and contingency planning to mitigate project delays

Last-minute planning can cause more than just waste: it can result in additional storage, labor and logistics costs, and even disrupt the entire timeline. The primary goal is always to clear the office space on time, whether it is 10,000 or 1 million square feet.

Develop an informed budget

FMs can engage experts to help their teams learn more about the cost variables and how to manage them. There are a variety of professional groups that deal with decommissions, including other FMs, architectural and design firms, sustainability firms, general contractors and commercial movers. By engaging other professionals, FMs (or FM teams) can learn more about the financial, social and environmental costs associated with different approaches.

Internal time and effort should also be factored into a budget. Some FM teams coordinate donations internally — first to staff and then to local non-profits. In seeking out the best solution, consider the team's time and effort. When furniture doesn't have resale value, it will pay to be prepared.

Leverage multiple disposition channels

Every organization prioritizes the resale of excess office furniture and equipment, and rightfully so. But when it is overemphasized, the grind of seeking a reliable, fair offer can often eat away at project lead time. When items can't be resold and the space needs to be cleared, the only option left is the landfill.

In today's saturated and unpredictable second-hand market, corporations and other large organizations need multiple ways to divert products and materials from the landfill. When multiple channels are combined, like asset resale, recycling and donation, businesses have the opportunity to recover value while also ensuring that usable products remain in use and any remaining materials are properly recycled.

Incorporate multiple stakeholders

A sustainable office decommission can produce value for different departments. Where an FM team might have only one objective, which limits the project potential, multiple stakeholders can exact more value from the effort. For organizations that have sustainability goals spread across their departments, this is an easy win.

Stakeholders that can benefit from a sustainable decommission include:

- Corporate real estate and facilities
- Human resource and change management
- Sustainability and corporate social responsibility
- Communications
- Finance and compliance
- Design and general contractors

Build relationships with experts

As with most facility and corporate real estate projects, FMs rely on vendors to deliver on time and budget. This means you should have ongoing relationships with reliable vendors across all of your office transitions.

It can be hard to confirm that a vendor is providing fair pricing or quality services without an existing relationship and proven track record. For instance, a vendor may say that they have repurposed or recycled trucks of items, but can they demonstrate how? Or, can the vendor be trusted not to mix up the inventory, cut electrical wires without asking or comply with site safety rules? An unknown vendor means an unknown amount of work and waste.

Measure and report the outcome

Office renovations and moves are routine events for large organizations. As leases end and office spaces become outdated, items are pushed out the back door. By setting the standard for decommission practices, FMs can streamline the process across their organizations as well as provide information into reuse and recovery rates across the company.

Progress in sustainability depends on reporting — it's how to benchmark and improve performance. Office decommission waste is greatly underreported, with few independent reports able to say just how much is sent to landfills each year.

Reporting is more than just metrics, too. It's about capturing the story for sharing best practices, seeking project awards and creating good public relations. Without reporting, no one knows the outcome — good or bad.

Final thoughts

Business as usual means waste as usual. Despite the inefficiencies, many FMs and their counterparts in corporate real estate put office decommissions on the backburner and hope for the best. Most companies — even those that champion sustainability and report mixed materials, paper, cardboard and e-waste recovery down to the pound — aren't even sure what their diversion rates are.

Office furniture waste is rampant. With the right plan, motivation and resources, FMs can be part of the solution — all while contributing value to their organizations. **FMJ**

Richard Beaumont is a social entrepreneur and sustainability advocate with experience in sales, marketing, operations and management. He is the vice president of strategic accounts of Green Standards, a firm committed to helping organizations reduce their furniture and equipment waste and benefit their communities.

FMJ EXTRA
CLICK TO READ:
Ocean Thermal Energy Conversion: Technology Brief

ocean motion

from brine to turbine

BY BILL CONLEY

The ocean has been described as poetry in motion. Like the sea, rhythm in poems is a pattern of recurrence — something that happens with regularity. The gentle swell of the waves can be likened to the easy, spontaneous grace of Elizabethan lyrics. The ocean can be violent like the tempestuous darkness of Shakespeare, serene like the verse of William Butler Yeats or as persistent as the persuasive undercurrent of proletarian poetry. Poetry uses the ethereal power of words to generate emotion. The ocean has a more mundane power that can be used to generate energy.

If Alfred Lloyd Noyes had written "The Sailor" instead of "The Highwayman" and focused on the inexorable power of the sea instead of undying love, he might have started thus:

The sun is an endless presence,
traversing across the sky

The moon is its faithful shadow,
eternally nearby

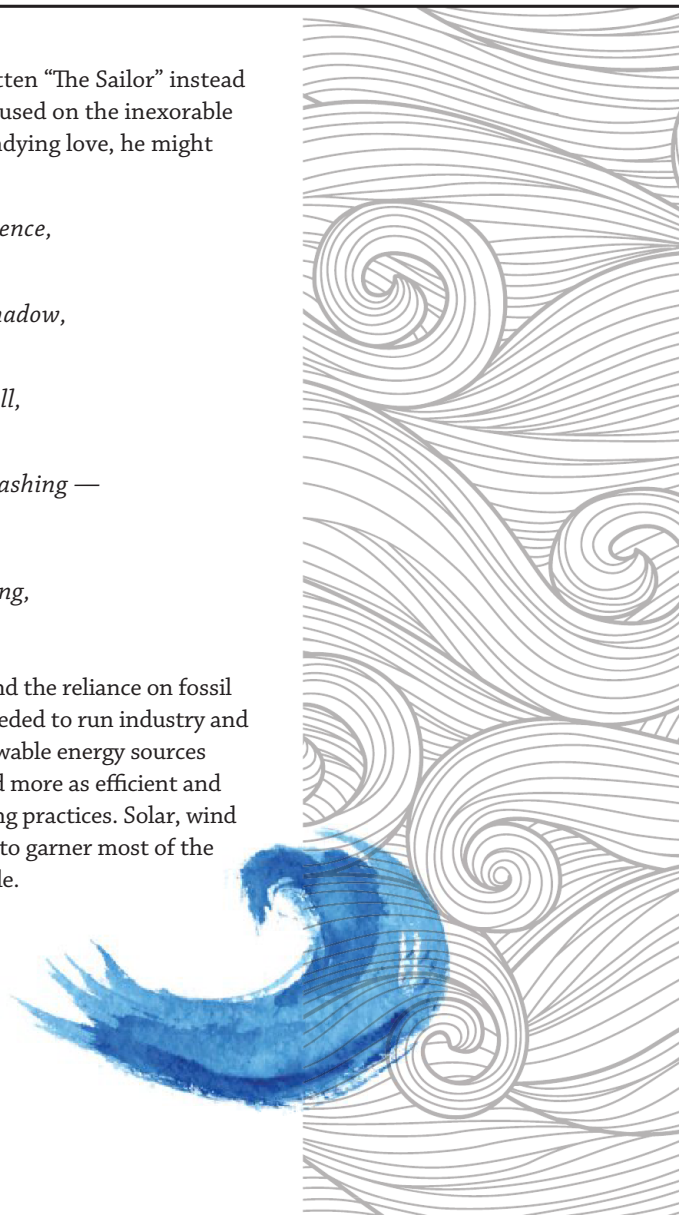
Islands rise and islands fall,
echoes of volcanic roar

And the oceans keep on crashing —

Crashing — crashing —

The oceans keep on crashing,
onto the waiting shore

As discussions about energy and the reliance on fossil fuels to generate the power needed to run industry and transportation continue, renewable energy sources are being brought up more and more as efficient and available alternatives to existing practices. Solar, wind and hydroelectric power seem to garner most of the attention as the most accessible.



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An area that has received short shrift to date is hydrokinetic energy; that which can be captured from the flowing water that occurs in ocean currents. Hydrokinetic energy resource potential is significant, particularly for wave energy, and it is a renewable resource which does not produce greenhouse gas emissions.

The International Energy Agency estimates that nearly half of the electricity needed to supply global demand will have to be derived from renewable energy sources by the year 2050. This would enable carbon dioxide emissions to be halved by then. This is the only way that significant and irreversible climate change impacts can be reduced.

Experts predict a 35 percent increase in demand for electricity by 2030. In practical terms that means an equivalent increase in demand of fossil fuels. However, fossil fuels contribute greatly to greenhouse gas emissions and are not renewable; and as demand grows, supplies are depleted exponentially. Coal and oil cannot be viewed as long-term solutions to energy needs, but the world has not yet fully embraced any or all renewable resources.

The development of marine energy needs to expand in coming years. It is believed that ocean energy technologies could start playing a sizeable role in the global electricity mix by the year 2030. As an example of the resources available to provide energy, the total power of waves breaking on the world's coastline is estimated to be 2 to 3 million megawatts. An average 4-foot, 10-second wave striking land puts out more than 35,000 horsepower, which converts to a wave energy density of about 65 megawatts per mile of shoreline.

An average **4-foot, 10-second wave** striking land puts out more than **35,000 horsepower,** which converts to a wave energy density of about **65 megawatts per mile of shoreline.**

Globally, ocean energies represent only about 1 percent of energy production from renewable sources. Technologies to exploit tidal range power are the most prominent to have reached commercialization stages. These involve high investment costs and some environmental impacts.

The La Rance Tidal Power Plant was commissioned in 1966 in France as the world's first tidal power station. For 45 years it was the largest tidal power station in the world by installed capacity at 240 megawatts. The South Korean Sihwa Lake Tidal Power Station surpassed it in 2011. This type of installation has remained relatively unique in the world, but is even now being reproduced at more limited capacities in countries such as Canada, China and Russia.

There are also further developments pending as several projects are being implemented in the United Kingdom. The European Ocean Energy Association estimates ocean power has the potential to generate 188 gigawatts by 2050 through the concerted efforts on the continent. This could satisfy 15 percent of electricity demand in Europe and, in some countries, up to 20 percent of national demand.

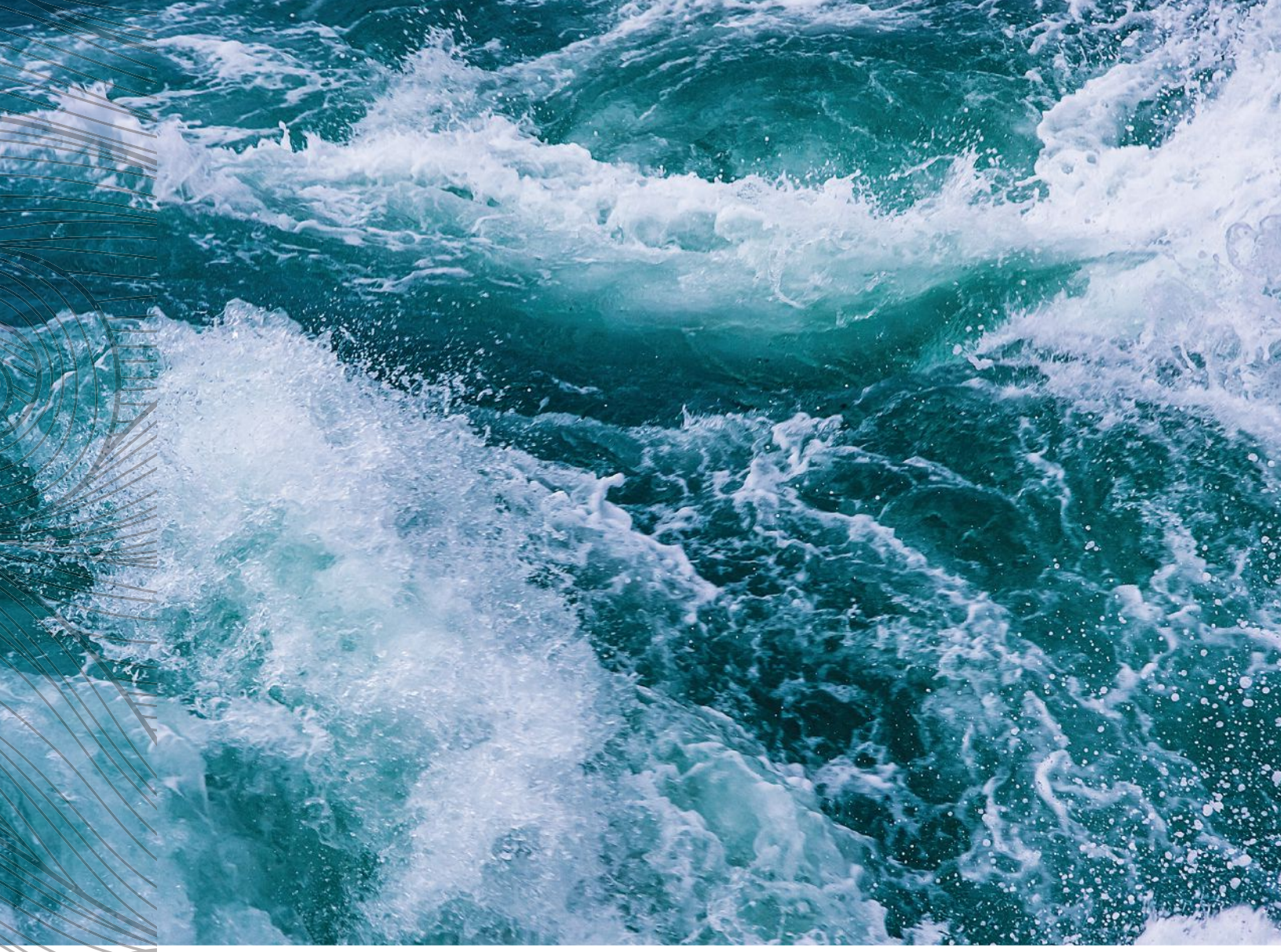
Generating technologies for deriving electrical power from the ocean include tidal power, wave power, ocean thermal energy conversion (OTEC), ocean currents, ocean winds and salinity gradients. Of these, the three most well-developed technologies are tidal power, wave power and ocean thermal energy conversion. Tidal power requires large tidal differences. OTEC is limited to tropical regions. Wave energy has a more general application, with potential along the coastlines.

A deeper dive

Tidal power or tidal energy is the only technology that draws on energy inherent in the orbital characteristics of the Earth-Moon system, and to a lesser extent in the Earth-Sun system. Tidal energy has been used since about the 11th century, when small dams were built along ocean estuaries and small streams. The tidal water behind these dams was used to turn water wheels to mill grains.

In order for tidal energy to work well, relatively large increases in tides are necessary; generally, this means an increase of at least 16 feet between low to high tide. The energy of tides is highly predictable but also highly localized, and the most suitable sites are those where ocean currents are exceptionally strong.

There are only a few places where this tide change occurs around the Earth, and some power plants are already operating based on this premise. For example, the Bay of Fundy in Canada has deployed a tidal stream turbine to take advantage of its dramatic tides. Turbines like this are utilized to convert the kinetic energy of ocean and tidal currents into electricity.



Wave power offers a large source of energy that can be transformed into electricity by a wave energy converter. Wave power is distinct from the diurnal flux of tidal power and the steady gyre of ocean currents. It is an irregular and oscillating low-frequency energy source that must be converted to a 60-Hertz frequency before it can be added to the electric utility grid. There are several processes available for converting wave energy, utilizing either fixed onshore devices or mobile devices at sea.

Wave energy conversion takes advantage of the ocean waves caused primarily by interaction of winds with the ocean surface. The energy in the waves comes from the movement of the ocean and the changing heights and speed of the swells. The kinetic energy — energy of motion — in waves is tremendous. Power is produced through electricity generators that are placed on the surface of the ocean. Energy output is determined by wave height, wave speed, wave length and water density.

As far back as the mid-1990s, there were more than 12 generic types of wave energy systems. Some systems extract energy from surface waves. Others extract energy from pressure fluctuations below the water surface or from the full wave. Some systems are fixed in position and let waves pass by them, while others follow the waves and move with them. Some systems concentrate and focus waves, which increases their height and their potential for conversion to electrical energy.

Although many wave energy devices have been invented, only a small proportion have been tested and evaluated. Furthermore, only a few have been tested at sea in ocean waves rather than in artificial wave tanks. To date there are only a handful of experimental wave generator plants in operation around the world.

Ocean thermal energy conversion technology relies on a temperature difference of at least 20 degrees Centigrade between warm surface water and cold

deep water. This means that tropical waters have the optimal conditions for its deployment. A great amount of thermal energy is stored in the world's oceans. Each day, the oceans absorb enough heat from the sun to equal the thermal energy contained in 250 billion barrels of oil.

Ocean thermal energy conversion systems convert this thermal energy into electricity. OTEC has the advantage of producing renewable energy on a continuous basis. However, the demands for systems-engineering competencies and enhanced industrial capacities related to the implementation of OTEC has limited the number of entities that can be seriously engaged in its development.

Salinity gradient energy is osmotic technology that utilizes the energy available from the difference in salt concentrations between freshwater and seawater. Such resources are found in large river estuaries and fjords. In the system, a semi-permeable membrane is utilized so that the salt concentrations can be equalized. This increases pressure in the seawater compartment. Improving this system and to enable further development hinges on the characteristics of the membrane, which need further optimization. In current deployments, these membranes generate only a few watts of energy per square meter.

Ocean current technology is still in its early stages of development. However, several tidal and in-stream current turbine applications are near commercialization. These devices take advantage of the daily tidal cycles in ocean environments near the shore, or steady water flow from freshwater rivers.

For ocean current energy to be utilized successfully at a commercial scale, a number of engineering and technical challenges need to be addressed. Equipment must be corrosion resistant due to salt's effect on metals. Marine growth that attaches to the underwater portions of the structure has the potential to foul up mechanisms, and the operators must avoid bubble formations (cavitation).

Because the logistics of maintenance are likely to be complex and the costs potentially high, system reliability is of particular importance. This technology is truly in its infancy. At present, no open-ocean current turbines are deployed in U.S. water.

Environmental impacts

While wave energy does not produce greenhouse gases or other atmospheric pollutants during electricity generation, emissions do arise from the stages of its construction, transportation and full life cycle. There are also potential impacts associated with the release and leakage of hydraulic fluids, lubricating oils and fluids, and anti-corrosion and biofouling paints and coatings, into the surrounding seas.

Marine mammals may be vulnerable to the floating structures, or the edifices may act as barriers to marine movement and migration, affecting the fauna and flora on the seabed. Most offshore wave energy devices are moored directly to the ocean floor and their mooring lines could pose a threat of entanglement for some marine life, especially larger whales.

As with other energy sources, wave energy has both environmental and economic implications which must be considered when planning a new installation. Many of the environmental problems associated with wave energy are similar to those experienced in offshore wind energy generation installations. The lessons learned from offshore oil production, wind power and other ocean-based industries can provide critical information that can lead to a mitigation of the impact of wave energy on the environment.

Going with the flow

Time and the tide wait for no one. But while time is irretrievably lost, the tide keeps coming back. Although there are costs and challenges to fully taking advantage of ocean power, time is passing by. The milestone years of 2030 and

The wave of the future is here; it always has been.

Rife with energy and boundless potential it hammers with insistency at doorsteps around the world.

2050 are looming closer on the horizon. Industry must take a deep breath and dive into the concept of long-term thinking and actions. As Shakespeare may have written in his comedy, "As You Like It:"

Pound, pound thou endless waves
Thou aren't so pervasive
As man's hesitancy

There is no disputing the power of poetry. It is timeless, the words resonating from the past into the future without ever losing their impact. Nor can the inestimable potential of energy from the omnipresent ocean be argued. In poetry, the audience is transported by the words, relaxing in the rhythm and feelings it evokes, letting it come to them and enjoying the emotional ride. In the ocean, one is carried by the flow, accepting the reality of its power and majesty.

The wave of the future is here; it always has been. Rife with energy and boundless potential it hammers with insistency at doorsteps around the world. Give a person a wave, and they can surf. Give them the power of the ocean, and there may be no end to the ride. **FMJ**

Bill Conley, CFM, SFP, FMP, LEED AP, IFMA Fellow, is facility manager at Yamaha Motor Corp. in Cypress, California, USA. Prior to that, he served as owner and chief sustainability officer of CFM2, a facility management and sustainability consulting company. Conley has more than 40 years of experience in the facility management profession and has been a proponent of sustainable operations for more than 20 years.

Conley has served on the IFMA board of directors, is a recipient of IFMA's distinguished member of the year award and has received the association's distinguished author award three times. He has been a regular contributor to FMJ for more than 20 years and has authored more than 50 FMJ articles.

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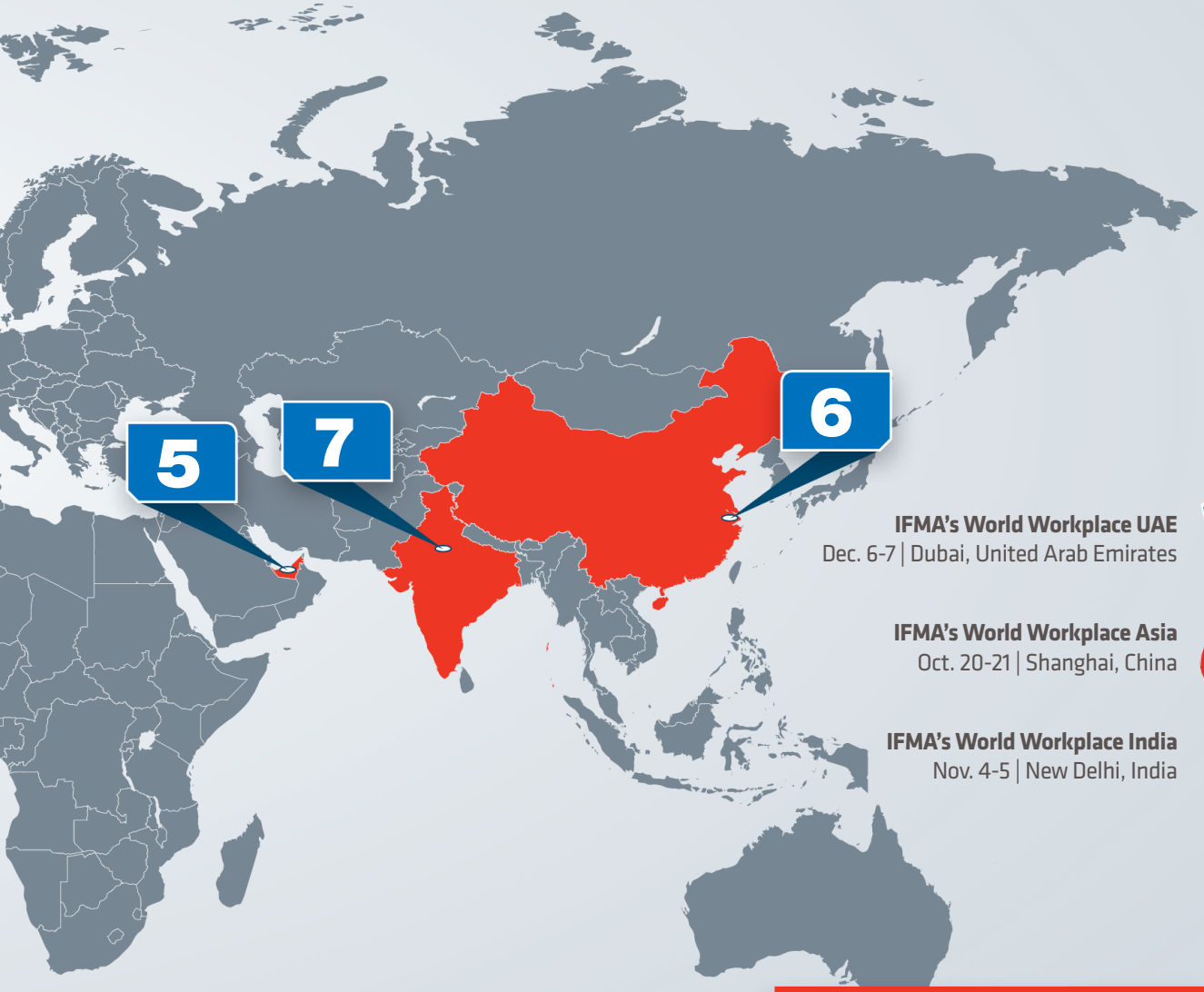

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REUSE ON CAMPUS

Lessons learned from university surplus property operations

BY
IAN ALEY,
DAVID NELSON,
ALFONSO MORALES
AND BILL ELVEY

University facility managers handle a steady stream of used furniture, computers and specialized equipment. Rather than treating this material as waste, many institutions find creative ways to repurpose items, often through a surplus property department. This reuse process can help meet an institution's environmental sustainability objectives while generating revenue to fund operations.

A university surplus department typically moves unwanted items to a central location for processing. Surplus employees wipe data from hard drives, clear capital equipment from internal tracking systems, and assess the functionality and value of items. Institutions and the general public may buy surplus items either through an online auction site or in-person sales floor. Some items are unsalable because they are broken, or because the market is saturated or non-existent. For instance, universities often receive more furniture than they can easily move through sales alone.

Beginning in the summer of 2015, the University of Wisconsin-Madison (UW) formed a working group involving representatives from all the departments directly or indirectly involved in the handling of surplus materials at UW: waste and recycling, environmental health and safety, campus services (on-campus moving), space management office, purchasing, office of sustainability, building managers and surplus. This working group conducted a study of best practices of the surplus property departments of other large public research universities and a market assessment of external service providers.

UW's external market assessment found a limited number and scope of available external services providers. Because universities are largely on their own in handling surplus material, many have generated entrepreneurial solutions to achieve the objectives of revenue generation and waste diversion. Over the course of the study, UW encountered a number of creative strategies to divert unsalable material from the waste stream (see Figure 1 for a summary of these methods).

Facility managers translate the policies of their institutions into day-to-day systems. They negotiate organizational (financial, personnel, physical and technological) constraints to realize the sustainability mandates of their institutions. This article provides facility managers with practical tools and benchmark data that they can use to initiate or improve existing surplus property systems. While the focus here is on universities, FMs can adapt these lessons to various organizational contexts.

Strategies to reuse unsalable items

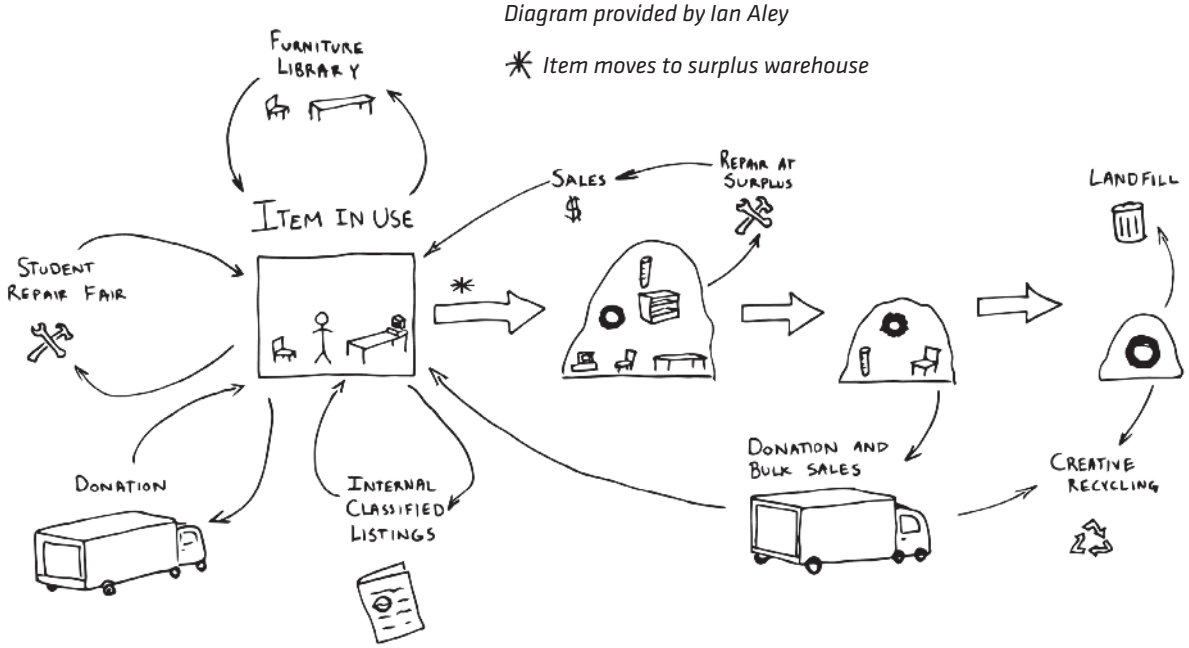
FURNITURE LIBRARIES

If the local market for furniture is saturated, furniture libraries can

LEFT The UW surplus warehouse with flags of peer universities. *Photo by Ian Aley*

REUSE OF SURPLUS PROPERTY

FIGURE 1: Summary of best practices for reusing surplus materials.
Diagram provided by Ian Aley



significantly reduce the amount of material going to landfills. These staffed or unstaffed warehouse spaces store furniture. In contrast to the large amount of space needed on a sales floor, furniture can be stored more efficiently in a high-density library format. Items are free to university and other public-sector employees as long as items are used at their place of employment.

Most states in the U.S. prohibit private individuals from bringing home publicly owned surplus material if the item does not first go through a competitive bidding process. Online or in-person sales satisfy that requirement. A furniture library distributing items for free does not qualify for this important method of repurposing material. Stanford University, Rutgers University, the University of Michigan and Oregon State University use the furniture library in tandem with a sales floor, reducing purchasing costs for campus departments and the amount of furniture going to landfills.

INTERNAL CLASSIFIED LISTINGS

The University of Oregon and Northwestern University run classified listings for university departments to post surplus items to sell or give away to other internal departments. These listings are similar to other online classified websites. They empower clients to repurpose items by connecting directly with one another, requiring little management from surplus staff.

Surplus material can be hazardous or contain sensitive data. Relying solely on internal classified listings could put the institution at higher risk for a data breach from improper disposition of surplus materials due to a rushed or uneducated decision by someone within a decentralized system. Facility managers can use internal classified listings to complement a centralized surplus operation and reduce the workload of surplus staff by finding new homes for items before they arrive at a surplus warehouse.

REPAIRS

Colorado State University stocks its surplus warehouse with necessary tools and parts to make small repairs, such as casters for rolling chairs. The University of Pittsburgh repaints filing cabinets to match a buyer's desired color scheme if that means not sending it to a dumpster. Other institutions, such as Ohio University, expressed a desire to make small repairs but that they did not currently have the staff capacity to do so.

DONATIONS AND BULK SALES

The University of Minnesota, the University of Oregon, Oregon State University and other colleges donate items to non-profits, schools and other public agencies. The University of Oregon chose to discontinue relationships with certain charities after learning that donated items were sold for scrap metal.

The University of Michigan and UW have a hard time finding non-profit entities that want to receive donations of the type and volume of material handled by the university. Most surplus operations clear their warehouse floors periodically through bulk sell offs or auctions in which customers must take all furniture in the lot, including desired and undesired items. It is then the bulk customer's responsibility to send undesired items to recycling or to the landfill.

CREATIVE RECYCLING

Multiple schools shred unsalable wood material and use it as mulch. Others shred or repurpose tires for use on playgrounds. The University of North Carolina breaks down unsalable wood furniture and sells the wood as lumber.

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Operational best practices

TRIAGE

The earlier in the process surplus staff can assess an item and direct it toward its appropriate final disposition, the less transportation and staff time is required. An ineffective triage process may lead to delays or backtracking within the system after surplus material arrives at an inappropriate location.

The triage role requires communication with the surplus sales floor to stay up to date with supply and demand for certain items. For instance, if the surplus operation already has 40 high-quality filing cabinets in stock, it may choose to send lower-quality new arrivals directly to scrap metal for recycling. The triage role also requires specialized knowledge so employees can evaluate items for functionality and hazards.

The University of Washington developed a smartphone application (app) for surplus staff to triage items in the field. The app makes the university's surplus material tracking system available to surplus staff at a loading dock or other remote location during a pick up. A product such as this could be shared or sold to other institutions, which could modify the app to suit their particular needs. An app could also include a section with an updated inventory of surplus items in stock, truck routing information, and a guide for identifying potential hazards.

SUSTAINABLE PURCHASING

Some universities work with suppliers in the purchasing phase to eliminate or streamline future disposal needs.

Oregon State University's purchasing department negotiated with its supplier of office materials to ship all supplies in reusable totes rather than using cardboard and disposable plastics. They also requested that the supplier list reusable toner cartridges and recycled content paper first in their listings of items for purchase, hoping that the higher visibility would lead to more departments choosing these sustainable products. All Oregon State cafeterias offer reusable durable plastic clams called Eco2Go for takeout food, rather than more typical paper or Styrofoam containers. The purchasing director said she is planning to reduce the number of Oregon State's modular furniture vendors and introduce durability and interchangeability requirements.

Temple University has introduced advanced user fees for all computer sales. This strategy embeds end-of-life costs in a product at the time of purchase, ensuring the user of the item pays for its eventual disposition. These charges are typically one to five percent of the sales price of an item. These fees, which only apply to the purchase of new items, can help incentivize the procurement of durable and/or used items. The revenue generated through these fees can fund waste, recycling and surplus operations.

Logistics, cooperation and staffing

Many surplus operations cross-report or co-locate with other departments. Surplus operations sharing warehouse space with waste and recycling or procurement departments make transfers particularly smooth. UW's surplus operation shares a warehouse and trucking services with the materials distribution services (MDS). MDS trucks leave the warehouse to deliver items such as office paper and cleaning supplies. They load surplus items from the on-campus docks they already visit for deliveries and return with them to the shared warehouse space. UW saves on transportation, infrastructure and staff costs because of this cooperation.

The study found the number of staff required to run a university surplus operations ranged between one and 27 full-time equivalents with a mean of 10. Larger operations tend to employ many students in the process. Slim operations often serve a smaller client base, rely on another nearby university surplus operation or simply divert less waste from the landfill.

Training and communications

Oregon State University's surplus department developed a series of videos to train student workers. These videos cover topics such as staffing the warehouse floor during public sales, picking up surplus items from loading docks and writing up posts for online sales. They help standardize procedures and contribute to ensuring safety and effectiveness.

Student workers often interface with the public and university departments, so the accuracy of communication can affect the reputation of the surplus operation. Many universities hire a new set of student workers each year or semester; instructional videos can reduce the staff time required to train new employees on policies and procedures.

Video can be a particularly effective method of educating both student and non-student employees; in many cases workers will prefer to watch a series of five-minute videos showing coworkers walking through practical situations to reading a manual. Surplus operations could also use videos to share information about the basic triage procedure with department administrators, building managers and other university staff to improve client knowledge of the surplus process.

These videos require very few resources to develop. Oregon State created a whole library of videos by hiring a single undergraduate student part-time for three months. The student used video equipment and software commonly available through university library systems. Oregon State suggested saving the raw video footage and video project in a format that allows for ongoing adjustment because policies and procedures change over the years.

Funding a surplus operation

Half of the university surplus operations that participated in the study funded their entire operation through sales.

It was rare for a surplus operation to run entirely through core funding. Some universities use a mixed model with core funds for administration, user fees for trucking and sales revenue for warehouse floor. Gross revenue generated by surplus operations ranged from US$190,000 to US$3 million in annual sales. Many universities split sales revenue with internal clients, especially for expensive items such as specialized equipment.

High on-campus land values can be a barrier to dedicating warehouse space to surplus material handling. UW dealt with this by establishing its warehouse in a lower-density area 10 miles southwest of the university. The University of Oregon, located 50 miles from Oregon State University, runs a slimmer operation by sending items to Oregon State's more robust surplus operation. Northwestern University, situated just outside of Chicago, has no surplus warehouse, relying entirely on an internal classified listing for departments to sell or give away their items independently.

Takeaway message

Surplus property systems can capture significant value either by reducing the cost of purchasing new items or by generating sales revenue. Because of this potential, surplus property operations can run on a cost-neutral basis and can help institutions reduce their environmental footprint.

UW is now considering potential improvements to its surplus operation based on the processes, practices and innovations gleaned through this study of its peers. The strategies presented in this article can support facility managers in establishing or improving surplus property functions to achieve these financial and sustainability goals. FMJ

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David Nelson is the director of purchasing at UW-Madison. He has more than 30 years of experience in engineering, quality and purchasing with organizations such as General Electric, Siemens and CUNA Mutual Group. Nelson has an MBA from DePaul University and is an ISM Certified Professional in supply management.

Alfonso Morales, Ph.D., is a professor of urban and regional planning at UW-Madison. His work on urban marketplaces and environmental and social sustainability is nationally and internationally recognized.

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GWI in Action: De Anza College Pilot Program

Creating career pathways from community college to facility management

The IFMA Foundation's Global Workforce Initiative (GWI) seeks to fill the growing FM talent gap as more than half of today's practitioners are expected to retire in the next five to 15 years.

Regional workforce concerns have led to the creation of several GWI pilot projects focused on creating career pathways from local community college technical programs to growing opportunities in facility management.

For example, in the state of California, Zero Net Energy has been mandated in the built environment by 2020 (residential) and 2030 (commercial). Their challenge is bridging a large workforce gap in a compressed timeline:

- 15,000 advanced energy workers are needed every year, and a vast majority of 300,000 incumbent energy-efficiency workers need significant skills upgrades.
- Approximately 3,200 facility management job openings annually are forecasted across four Southern California counties; but only one university-level FM program is offered in this region.

Support among energy, construction and utility employers and advocacy groups is growing for California's Strong Workforce Fund, which recognizes that community colleges are vital to the state's economy, preparing more than 2.6 million students a year for 21st century careers.

A recent initiative provided 10 community college students with valuable hands-on experience and expanded learning opportunities outside the classroom. The Energy Management & Building Science department of De Anza College, in conjunction with the foundation, IFMA's Silicon Valley Chapter and the Bay Area Community College Consortium's (BACCC) Energy, Construction & Utilities Sector, presented students with the opportunity to:

- Complete IFMA's Essentials of FM course for 25 hours of college credit;
- Attend 11 hours of meetings and facility tours hosted by IFMA's Silicon Valley Chapter;
- Be placed in summer internships at local Silicon Valley companies.

> "When I decided to re-enter the workforce, I took classes at De Anza and developed an interest in the field of sustainability. I'm looking forward to combining my experience as an environmental engineer, my interest in sustainability and the skills I've developed toward building a career in facilities management."
>
> -Sujata Aji, Student

This program is an amazing step toward offering a full spectrum of educational, networking and career development opportunities for those preparing to make FM their career of choice.

De Anza College Pilot Project Leaders:

- Larry Morgan, SAP, IFMA FM Essentials Instructor & Sponsor
- Christian Pellecchia, Slatter Construction, IFMA FM Essentials Instructor, Internship Coordinator & Sponsor
- Jamie Orr, BACCC Sector Navigator, Energy, Construction & Utilities
- Catherine Ayers, BACCC Sector Navigator, Energy, Construction & Utilities
- Jim Zuiderhoek, RMS, IFMA Silicon Valley Chapter Chairman & Sponsor

> "My passion and abilities are a great match for this pilot project. My experience working on the City of Cupertino GreenBiz internship provided a good understanding of facilities management and how building can be more sustainable."
>
> -Henry Bleisch, Student

Participants in the De Anza College pilot project included students Sujata Aji, Henry Bleisch, Lidia Burlanescu, Jerry Chimienti, Andie Creager, Huanliang "Nick" Fan, Cristina Friere Obregon, Constance Hogenhout, Teresa Patterson, Dylan Russo; and De Anza College Energy Management Program Coordinator & Instructor Bill Roeder.

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HEAT RECOVERY FROM WASTEWATER

BY LYNN MUELLER

In the last decade, the environment has been sending us warning signals that it needs to be saved. Subtle signs like increasing temperatures and decreasing water availability, and harsh warnings like cyclones, droughts and floods, have drawn international attention. Environmentalists all over the world have realized that some drastic solutions are necessary – and necessity, as they say, is the mother of invention. Several ideas directed at saving our planet have been implemented over these last few years; however, only a few have worked.

FMJ EXTRA
CLICK TO WATCH:
Sewage Heat Recovery

Concept

One of these ideas is both simple and efficient. It can be carried out by people and communities all over the world, allowing everyone to take the first small steps toward a better future. The basic strategy involves extracting the heat from wastewater leaving a building, recycling it, and using it to heat up the fresh water entering the unit.

Based on the fact that water exiting a facility tends to be at a higher temperature than the water that is pumped in, the concept of wastewater heat recovery has revolutionized energy saving and consumption. The general scenario shows that water washed down plumbing is around 20 to 25 degrees Celsius, and water entering the pipes is only around 7 to 9.

The U.S. Department of Energy conducted a study which revealed that on an annual basis, energy equivalent to 350 billion kilowatt hours is washed down the pipes in American homes and industrial centers. According to the records of the U.S. Environmental Protection Agency, roughly 30 to 50 percent of the energy and water flowing into a building goes to waste.

On the domestic front, water from showers and water used for dishwashing, cleaning and washing clothes primarily contribute to this figure. In North America alone, the average household sees 75 liters of hot water flushed down the pipes daily. Based on this figure, the energy washed down pipes is sufficient to meet the annual requirements of nearly 30 million homes.

How it works

Harnessing this energy involves a heat recovery system, which taps into the wastewater and reins it back into the boundary of the building from which it sought to escape. The system operates in three main phases. The first involves separating out solid waste from the sewage water. Solids and other semisolid particles contribute to around 2 to 3 percent of the total volume of water flushed out. The remaining 97 to 98 percent is all water bursting with heat energy.

In the second phase, a heat exchanger extracts the heat from the filtered wastewater and transmits the energy to the clean, cooler water pumped into the building, thereby warming it enough to fulfill its intended purposes. In the third and final phase, the filtered sewer water, now stripped of heat, flushes the solid waste filtered out in the first phase into the sewer system in the local municipality.

Implementation

Heat recovery systems have been established successfully in a number of communities across Canada. One project encompassed 172 units in a condominium in Vancouver. The sewage heat recovery system installed there uses the recycled energy to heat the water as well as the building. This extension of the normal application of recycled heat has resulted in a decrease in harmful emissions of nearly 100 tons annually.

ROUGHLY 30 TO 50 PERCENT OF THE ENERGY AND WATER FLOWING INTO A BUILDING GOES TO WASTE.

More cities across North America, Europe and Asia have adopted this idea and established sewage heat recovery systems. The practice is spreading, with communities in several parts of the world currently drafting more blueprints and plans to help them leverage this technology to build smarter facilities and better the environment. Norway and Japan have joined the league, as has the South Railway Station in Beijing, China. In the U.S., cities such as Seattle and Philadelphia have successfully implemented this idea.

Challenges

Like many great ideas, the concept of wastewater heat recovery does have its downsides, and one of the major complications is gaining initial acceptance.

Most people are unaware that an alternative source of energy as simple as this actually exists, and those who do learn of it may be skeptical at first. Part of the reason for this hesitance is that the problem of environmental imbalance seems too pervasive to have an easy solution. Another cause of initial resistance is due to the idea that using energy from sewer water might be unsanitary. While this is not how the process works — in fact, all solid sewage waste is filtered out, leaving clean water

EXISTING SYSTEMS THAT HAVE BEEN IN OPERATION FOR SEVERAL YEARS HAVE CONSISTENTLY EXHIBITED ENERGY SAVINGS OF AROUND 75 PERCENT.

behind from which heat is extracted — achieving a shift in this mentality may take time.

Another significant point to note is that sewage heat recovery systems offer a more favorable cost-benefit ratio when installed in medium-sized or large facilities (such as commercial centers), as opposed to smaller units. However, facility owners and operators can work together to establish common heat recovery systems that cover several buildings within a given area in order to achieve a more favorable return on investment.

Benefits

There are many benefits of installing a sewage heat recovery system, and they easily overshadow the initial hurdles. The recycled heat and energy can be used for a variety of purposes. Mostly, the heat recovery systems installed to date are used to heat water entering the pipelines. Commercial spaces and industrial complexes suffer a large percentage of expenses due to energy consumption. Recycling energy from the wastewater leaving these buildings helps to substantially reduce these expenses.

Another advantage is that a proficiently designed sewage heat recovery system can operate at an efficiency level of 500 to 600 percent. Translating this into monetary terms, it means that once you get one of these systems up and running, every dollar invested in the system accounts for energy worth five dollars recovered. The payback period for heat recovery systems is impressive, too, ranging from two to five years. Existing systems that have been in operation for several years have consistently exhibited energy savings of around 75 percent.

Furthermore, heat exchange systems can be fitted into existing construction with minimal difficulty. They are compatible with most kinds of buildings, and do not require extensive adjustments to fit in with existing architecture. This is a huge bonus, since adoption of most other alternative sources of energy like solar power, wind energy and hydroelectricity require massive modifications in the physical as well as aesthetic constructs.

Installing a sewage heat recovery system cuts down monthly expenses by a large extent, owing to reduced use of electricity. However, heat exchange systems can also be used for cutting down other costs. Reversing the mechanism in the pumps can allow for a generous reduction in air-conditioning costs. Today, with global temperatures rising steeply, air-conditioning units are no longer the luxury they once were and have become a necessity. Heat exchange systems can transfer the heat from the building to the sewer water, thus cutting costs while simultaneously offering a more favorable means to expel the heat from air-conditioning units.

With the right design and architectural modification, sewage heat exchange systems can be fitted into a number of facilities. This includes categories of buildings like hospitals, commercial complexes containing several offices and even prisons. The concept of sewage heat recovery can be expanded to construct systems that function at a district level, garnering wastewater from several buildings to a common space and supplying the heat extracted to multiple facilities situated within the system's operational boundaries.

Potential for the future

Although wastewater heat recovery technology is less than a decade old, it possesses a great deal of potential. Innovative engineers and designers around the world will add their own flourishes to the original design in order to better fit the buildings for which they are adapted. The winning argument in favor of a sewage heat recovery system is that currently, it is the only concept that scores positively on the three most important fronts: it is cost effective, environmentally friendly and easy to design. That, undoubtedly, is a win-win situation for everybody involved. **FMJ**

Lynn Mueller is president of International Wastewater Systems (IWS) in Vancouver, British Columbia, Canada, and has been a leading advocate of sustainable space conditioning energy systems for the last 25 years. In the past, he has served as president of WaterFurnace Canada and president of Earth Source Energy Inc. He was responsible for a large number of advanced sustainable energy systems including the Shangri La Hotel and Mole Hill, a city block of 27 restored heritage homes in downtown Vancouver.

Mueller has pioneered many innovative energy approaches and launched IWS to recover the 400 billion kilowatt hours of energy that goes down the drain every year in North America. IWS has successfully developed the SHARC technology and is well under way to implementing the system around the world. Connect with him at lynn@sewageheatrecovery.com or learn more at www.sewageheatrecovery.com.

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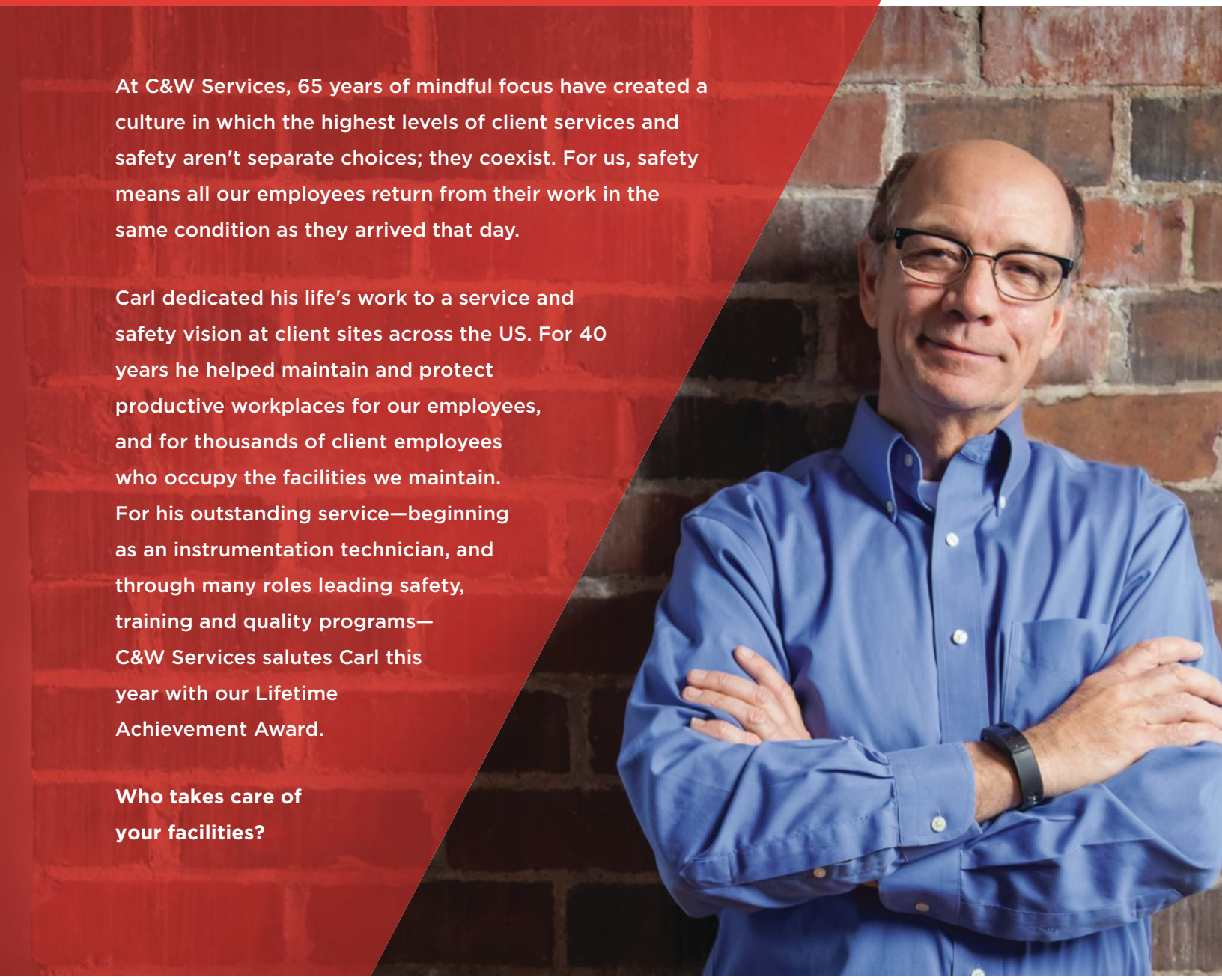

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5 steps to successfully leverage combined heat and power

BY ALEC CARNES AND TIM KRZYWICKI

Facility managers are continually faced with the challenge to reduce energy consumption without limiting or affecting the building use. One approach to consider is combined heat and power (CHP). CHP technology lets the user leverage multiple utility sources and their cost streams (electricity and natural gas, typically) into a more efficient process of generating power while capturing waste heat. This reduces carbon/greenhouse gas emissions and utility cost expenditures, and improves utility reliability without impacting building operation.

According to the U.S. Environmental Protection Agency Combined Heat and Power Partnership, there are five steps to a successful CHP project:

1. **Qualification**
2. **Level 1 feasibility analysis**
3. **Level 2 feasibility analysis**
4. **Procurement**
5. **Operation and maintenance**

What is combined heat and power?

Most buildings have several systems working to maintain the building environment or support manufacturing processes. Many of these facilities operate systems that produce heating and cooling throughout the year, regardless of whether they are in the traditional heating or cooling season. All of these systems use energy — typically electricity and natural gas. A CHP system allows facility managers to improve how efficiently their facilities use these energy sources.

According to the World Coal Association and the U.S. Energy Information Administration, a typical coal-fired electrical utility generates power at an efficiency rate of 33 to 40 percent based on total fuel consumption, while additional losses of 6 percent occur due to distribution. An onsite boiler plant using natural gas as the fuel source produces heating energy at an efficiency of 70 to 95 percent depending on equipment and application and based on manufacturer-published equipment efficiency. Instead of having independent boiler and electrical systems, CHP combines them to improve efficiency.

CHP is a process in which electricity is generated onsite, and waste heat from that process is used to make steam or hot water. Through the use of absorption chiller technology, a CHP system can even use this waste heat to produce chilled water for cooling. A CHP system produces electricity onsite using the same natural gas as a fuel source at an efficiency of 40 percent according the U.S. Department of Energy (DOE). However, the CHP system waste heat, which is recovered to generate hot water or steam, eliminates a portion of facility natural gas consumption which drives the CHP system total efficiency up toward 85 percent according to the DOE.

CHP systems involve multiple pieces of equipment. The electrical generation component can be:

- Reciprocating engine
- Combustion gas turbine
- Micro turbine
- Fuel cell

The waste heat from this equipment is used to generate steam or hot water by a heat recovery boiler.

Does the facility fit the profile for CHP?

The U.S. EPA CHP Partnership has determined a facility could be a good candidate for CHP if it is located in a deregulated utility market and the average cost for electricity (including generation, transmission and distribution) is more than US$0.07 per kilowatt hour. Although a CHP system can be installed at any facility, economic viability of the project is highly dependent upon a need for the waste heat produced year round.

Need for the waste heat is most likely if a facility has one or more of the following:

- Thermal loads (steam, hot water or chilled water) throughout the year
- Goals to reduce source carbon footprint or greenhouse gas emissions
- Upcoming central plant renovations
- Reliability issues with the electricity supply

A variety of facilities tend to match the profile outlined above and might benefit significantly from a CHP system. Some common facilities where CHP systems are appropriate:

- Industrial facilities
- Hospitals and medical centers
- Food processing facilities
- Laboratories and clean rooms
- Colleges and universities
- Sewage treatment facilities

If an FM believes her facility might be a candidate for a CHP system, she should initiate a Level 1 feasibility analysis. The EPA recommends that the Level 1 feasibility analysis should:

- Identify applicable regulatory concerns
- Establish project goals
- Establish a preliminary system size
- Calculate preliminary energy cost savings
- Determine preliminary construction estimate
- Estimate initial operation and maintenance costs
- Identify available grants, incentives or rebates

As the Level 1 feasibility analysis is initiated, the method of sizing the CHP system is very important to ensuring a successful project. The CHP system should be based on the smaller of either the electrical load (not common) or the thermal load (most common).

The measured utility data is important for CHP sizing. The ideal situation is when the recoverable heat and generated power is entirely used, but to match both is a rare occurrence. Therefore, CHP systems are typically sized to replace as much of the annual thermal load as possible. The electricity produced, which is normally less than the total demand, is then paralleled with the electric utility to reduce the overall electrical power demand of the facility.

It is important to understand what decision-making criteria will be utilized regarding the financial performance of the project. Many options for financing CHP systems (other than traditional self-financed capital projects) exist:

- Property Assessed Clean Energy financing mechanism (in the U.S.)
- Capital or operational lease
- Utility integrated financing
- Purchase power agreement

Some of these financing options can change the financial picture by driving different cash flow models, tax implications or duration of the finance period. Regardless of the finance arrangement, if the Level 1 feasibility analysis yields a return on investment period of five to 10 years, the facility manager should consider proceeding to the Level 2 feasibility analysis.

The Level 2 feasibility analysis will further develop the project scope and replace estimates with more refined data and information. This next phase of development focuses on a few key elements that yield investment-grade information:

- **Begin the design process for the project.** Typically, taking the Level 2 feasibility design to a 30 to 40 percent level of detail is appropriate. It is important to understand enough of the project impact to produce a detailed estimate of all project costs. This requires a significant amount of development, especially as it relates to potential structural modifications, hazardous material abatement and electrical distribution changes. In some regions, there may be utility incentives available to fund a portion of the Level 2 feasibility study.

- **Consider obtaining a guaranteed maximum price (GMP) proposal** from a qualified development team at the conclusion of the Level 2 phase. Although there will be premiums for gaps as the final design evolves, the opportunity to lock in the project cost is important. Having a 30 to 40 percent design will generally yield a competitive GMP at this stage.

- **Develop a detailed project schedule** for the remaining design, construction, commissioning and training.

- **Further refine the value and timing of any grants, rebates or incentives** that may be available. Ensure these have been properly integrated into the financial model. As an example, most rebates are paid 12 months after project completion, so you should avoid including that cash flow early in the project development.

- **Finalize the regulatory impacts of the project** (particularly those related to air permitting and other environmental regulations).

Depending on the project size, it may make sense to combine the Level 1 and Level 2 feasibility analyses into one step. CHP systems can range in size from 65 kilowatts to 15 megawatts, with cost ranges from US$500,000 to US$20 million or more. Clearly, the lower the project budget the lower the risk. As such, the simplification of

the feasibility analysis stage(s) is dependent upon the FM team's due diligence and tolerance for risk based on the project budget.

Taking the leap to CHP: procurement and operations

Once the facility manager has approval to move forward with the project, many challenges remain for the project team (some more obvious than others):

- Employ a qualifications-based selection process and then negotiate a competitive price. The CHP system is a highly complicated high-reliability system. The team that implements the CHP system should be qualified to perform work related to these complicated electrical and mechanical systems.

- As the design details evolve, ensure that the project team considers the impact on the existing facility, including changes to electrical short circuit coordination and arc flash ratings. The addition of electrical generation equipment may change the available fault current.

- The CHP system will require periodic maintenance including full rebuilds at various points in the equipment life cycle. It is important to understand the impact of these scheduled (and unscheduled) maintenance activities on the utility consumption and demand profile so they do not inadvertently drive those costs higher by setting new demand peaks. These can be managed by timing the rebuild at points during which the facility has an overall low demand, or by having multiple generator units that can be serviced independently of the other units.

- Include the ongoing rebuild cost into the equipment purchase. This limits the FM's risk related to potentially significant maintenance costs as well as ensuring the rebuilds occur at the optimum runtime, thereby maximizing the life of the CHP system.

- New day-to-day maintenance procedures will be a part of the CHP system. Ensure that qualified staff receive appropriate training on these maintenance requirements, as well as key benchmarking metrics to ensure the CHP system is operating normally.

When selecting specific equipment for the CHP system, each CHP system generator equipment type offers different advantages related to cost, performance, and operations and maintenance. Each project will have specific goals that determine the most appropriate CHP system to be applied.

A CHP system allows facility managers to improve how efficiently their facilities use energy sources.

The high points of each technology type are summarized below:

- **Reciprocating engines** ignite natural gas in a cylinder to drive a piston connected to a crankshaft (similar to automobile engines). They transfer linear movement from the piston to radial movement of the crankshaft. Some elements to consider are:
  - » Lower first cost
  - » Commonly applied generator type
  - » Shorter time between rebuild
  - » Emissions concerns
  - » Rapid start (can also serve life safety loads)

- Originally used for aircraft propulsion, **combustion gas turbines** ignite natural gas to produce high-temperature, high-pressure gas to induce shaft rotation. The combustion gas discharge is delivered to a separate heat exchanger for heat recovery. Some elements to consider are:
  - » Higher first cost
  - » Longer time between rebuild
  - » Lower emissions
  - » Higher exhaust gas temperatures allow for higher pressure steam production during CHP

- **Micro turbines** operate identically to combustion gas turbines, but on a small scale. Natural gas ignites in the combustion chamber and rotates a turbine which is connected to the shaft of an electrical generator. Micro turbines typically involve:
  - » Lower first cost
  - » Longer time between rebuild
  - » Lower emissions
  - » Lower sound levels

- **Fuel cells** may appear to be more complicated because electrical power is created without combusting fuel, but they are similar to batteries with an anode, cathode and electrolyte. The fuel source produces an electric current through a chemical reaction of positively charged hydrogen ions with oxygen (ambient air). Heat and water vapor are the byproduct that exits the cathode section. This technology involves:
  - » Higher first cost
  - » Non-mechanical with very complicated rebuilds
  - » Lower emissions
  - » Very low sound levels
  - » Wide range of capacities

Each type of electrical generation unit emits hot gas that is typically used to produce steam or hot water by a large steel drum heat exchanger. A common heat exchanger is the heat recovery steam generator, which has the following components:

- Optional duct burner (raises temperature of the entering gas)
- Superheater (raises steam temperature beyond saturation temperature)
- Evaporator (water is converted to steam)
- Economizer (uses steam condensate to pre-heat feedwater)
- Water pre-heater (pre-heats feedwater)
- Exhaust stack (discharges the gas into the atmosphere) FMJ

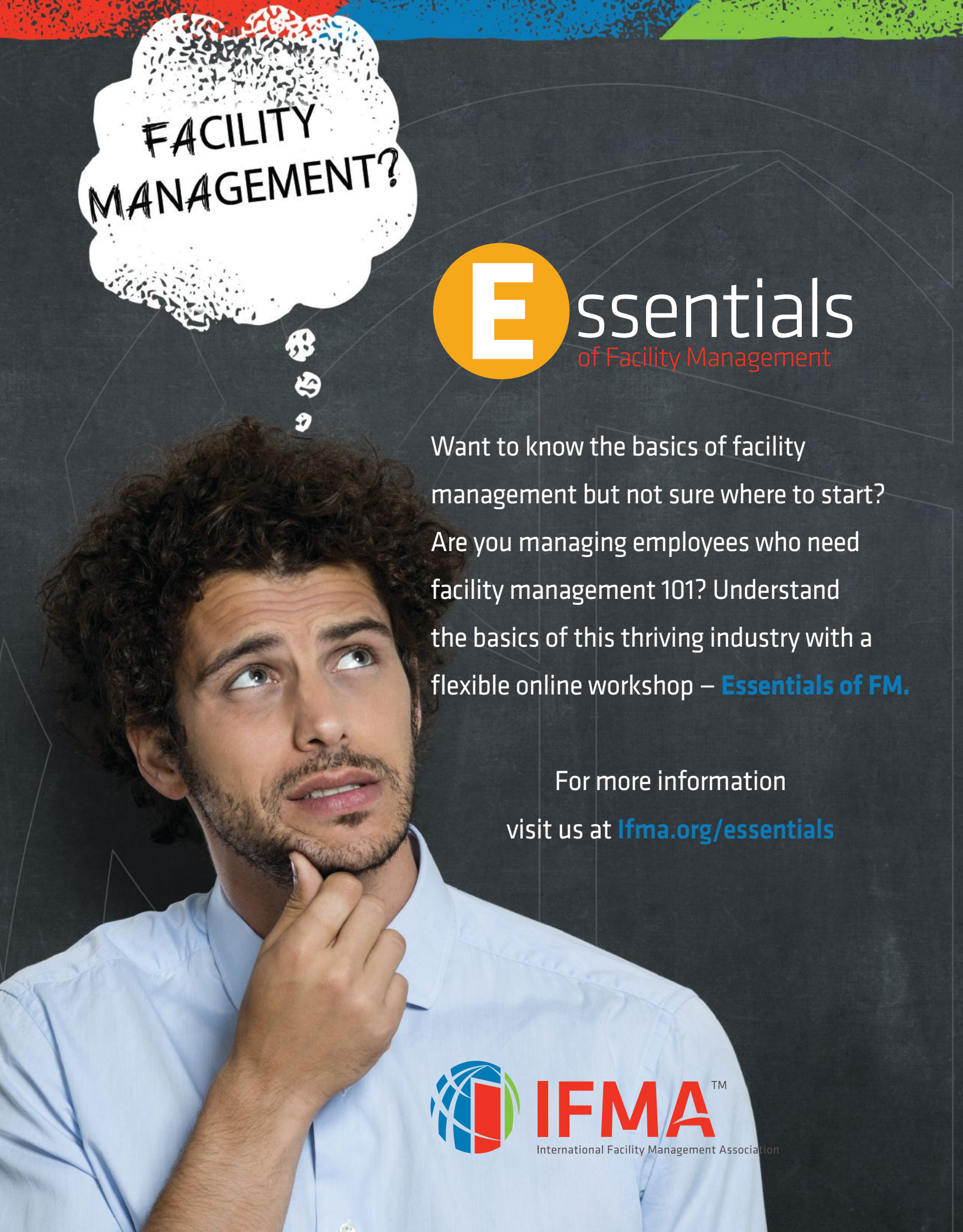
For more information on CHP and a detailed breakdown of each of these CHP technologies, visit www.epa.gov/chp/catalog-chp-technologies.

Alec Carnes, PE, CEM, HDBP, LEED AP BD+C, is the practice leader for the Heapy Engineering Building Optimization Group and is responsible for sustainability consulting, alternative energy systems and commissioning services. Under his leadership, the group is responsible for more than 200 LEED-certified projects, as well as commissioning for over 20 million square feet of facilities in the health care, manufacturing, research, higher education and government sectors.

Through energy auditing, retro-commissioning and building optimization services, the group has saved customers more than US$1.5 million in the last 18 months alone. Leveraging his more than 20 years of industry experience, Carnes sets the strategic direction for projects in combined heat and power, renewable energy systems, HVAC and control system retrofits, and control system integration and modernization.

Tim Krzywicki, PE, CCP, CPMP, LEED AP, is a project manager for Heapy Engineering's Cleveland branch office and has more than 12 years of experience in multi-discipline engineering. Some of his project management responsibilities include the development of project scope, fee and schedule; quality oversight; bidding meetings; and site observation.

As a mechanical engineer, he has been involved in hundreds of projects providing professional design services for HVAC and plumbing engineering, as well as sustainable duties such as LEED program management, energy modeling, life cycle cost analysis and green building grant assistance.



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LIBRARY HOURS

Library headquarters cuts energy demand

BY MARK MACCRACKEN

Built in 1992, the Alachua County Library Headquarters in Gainesville, Florida, USA, is the central administrative location for the Alachua County Library District (ACLD), an independent special taxing district and the sole public library services provider for Alachua County's nearly 250,000 residents.

From its 80,000-square-foot headquarters near the University of Florida in downtown Gainesville, the district oversees 11 other branch locations in municipalities throughout the county, a storefront library in collaboration with the Partnership for Strong Families in northeast Gainesville, two bookmobiles, multiple deposit collection sites and a library service to inmates of the Alachua County Jail. Each of these resources operates as part of the district's overall goal to provide every citizen of Alachua County with free, open and equal access to education, information and entertainment.

Background

It is important for ACLD to spend taxpayer funds wisely in order to sustain its many activities and best serve patrons. This means making sure operating costs are

In terms of costs, when electricity is used is just as important as, if not more important than, how much is used.

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minimized whenever possible. Energy is a significant expense for ACLD, second only to labor. Local utility company Gainesville Regional Utilities (GRU) supplies ACLD and deploys some of the highest energy rates in the state of Florida during the day.

In most areas of the county, nighttime energy can be as much as 50 percent less expensive than daytime energy. This is true whether a building is using time-of-use energy, which is a variable rate structure that charges for energy depending on the time of day, or what is considered a flat rate, which means pricing is fixed and remains the same regardless of when it's used. Flat rate users still see this spike in daytime pricing due to demand tariffs, which are common on most utility bills. These fees are levied on the peak demand which usually occurs during the day when demand for energy is at its highest, making the price of daytime energy significantly more than nighttime energy.

ACLD was on a time-of-use rate price structure; however, a reduction in demand charges presented the biggest opportunity for savings. GRU implements a demand charge that equates to roughly US$9.25 in

extra fees for each kilowatt used during peak demand hours. Consequently, ACLD's utility bill consisted of a time-of-use charge billed in kilowatt hours, plus a demand charge billed in kilowatts. In order to realize significant savings, ACLD needed to use energy when it was least expensive.

Solution

ACLD knew that it could improve operating costs and began to explore the implementation of energy-efficient technologies. The district looked to address the low-hanging fruit, or the areas that could easily be improved before making larger or more invasive changes. The district decided to focus on its library headquarters and use that building to test the success of various energy savings initiatives, such as a lighting upgrade and a cost-effective chiller change-out to replace the antiquated air-conditioning system.

After reading about the benefits of thermal energy storage for cooling buildings, Dan Whitcraft, CFM, the district's facilities and safety services administrator, reached out to another thermal energy storage customer and received recommendations for ice-based thermal energy storage and a referral to a Florida-based engineering firm with more than 20 years of experience designing ice storage systems. GRU was brought into the process from the start of the project in September 2014 and worked with the library to conduct a feasibility study based on actual utility rates for a 12-month period.

Analysis showed that energy charges are 68 percent less expensive at night due to GRU's pricing structure and chiller demand costs could be slashed by 100 kilowatts if load-shifting technology were used to reduce peak demand. This means that, in terms of costs, when electricity is used is just as important as, if not more important than, how much is used.

Based on this study and the fact that it was time for chiller replacement, it was determined that the ACLD headquarters building would be a prime candidate for ice-based energy storage and implementation of the system would be mutually beneficial for both the utility and the customer. If successful, the technology could reduce the burden on GRU's power grid during times of high capacity, thus limiting the chances of demand exceeding supply.

GRU became invested in the installation, intending to use it as a pilot before bringing in other large customers. With the results in favor of a load shifting technology, Whitcraft concluded that thermal energy storage was the obvious technology choice, as it is a load-shifting technology that can reduce the amount of energy being consumed during peak demand hours.

Whitcraft addressed the library director and proposed using this chiller replacement as an opportunity to save taxpayer dollars by implementing a thermal energy storage system to shift the library's peak energy usage from daytime peak hours to nighttime off-peak hours. The thermal energy storage system creates cooling in the form of ice overnight using less expensive energy and stores it in the energy storage tanks. The ice can then be melted for use during peak demand hours the next day.

In addition to adding the thermal energy storage system, the library also made changes to its lighting. Originally, it used metal halide bay lighting which generated a lot of heat within the building. The use of this lighting meant that the HVAC system had to work even harder to cool the building. By switching to induction lighting, the library was able to reduce the lighting load by 50 percent and reduce part of the burden being placed on the HVAC system.

Results

ENERGY COST SAVINGS

The decision to implement an energy storage system, paired with smaller and more efficient chillers, proved extremely effective, even without a rebate program. Using approximately 125 kilowatts of energy storage, the library is able to capitalize on significantly less expensive nighttime energy, which costs US$0.023 per kilowatt hour, as opposed to creating instantaneous cooling during the day that could cost as much as US$0.072 per kilowatt hour. That's a 68 percent savings just by using thermal energy storage.

Additionally, with thermal storage, monthly demand could be slashed in half. That's up to 50 percent off in demand charge savings by just using thermal storage. This is a significant figure, since 40 percent of the headquarters' total electric costs for the year can be directly attributed to cooling the structure, which is open seven days a week.

FLEXIBLE OPERATION

The ice-storage system is paired with four different modes of operation through the structure's building automation system: chiller only, ice only, combination and free cooling. The chiller-only mode acts as a traditional system where instantaneous cooling is created by the chiller. The ice-only mode relies purely on cooling that was created and stored the previous night. Combination mode enables the building to use both stored cooling and the chiller simultaneously to meet the day's cooling demands. Throughout the colder months, the free cooling mode can utilize outdoor air to chill the water used in the air-conditioning system in place of a chiller.

"We have complete control and flexibility over how and when the ice is used," says Whitcraft. "The tanks complete the charging processes at 5:50 a.m. and begin to come online at 6:30 a.m. During the hot summer months, the melting ice is able to handle 70 percent of the day's cooling load with the chiller handling the remaining 30 percent. We expect to only use ice, meaning no chiller, to cool the building during the winter months when outdoor temperatures are lower."

Where the demand savings come from

A common misconception is that if a building is not offered time-of-use pricing by the utility, then the building pays a "flat rate," implying that there is no difference between day and night costs. This is not the case, since demand tariffs are common on utility bills.

Typically, when demand charges are converted to daytime energy usage, electricity costs are about half the cost during nighttime hours, even when you are not offered a time of day rate. For example, if energy costs are "flat" at US$0.04 per kilowatt hour (kWh) both day and night, but demand costs are US$9.25 per kilowatt (kW) the effective daytime energy costs are US$0.096/kWh during the day because of demand charges for a daytime peaking building.

CALCULATE: IMPACT OF DEMAND CHARGES ON ELECTRIC BILL

Let's do a back-of-the envelope calculation on a 1,000-ton system to see the demand contribution to the energy charge.

DAYTIME COOLING COSTS

Demand charge/month
1,000 tons x 0.8 kW/ton = 800 kW
800 kW x US$9.25 = US$7,400/month

Energy usage for chiller for month
1,000 tons x 10 hours x 75 percent (diversity) 0.8 kW/ton x 22 days per month = 132,000 kWh

Approximate cost for demand converted to kWh
US$7,400 per month night demand/132,000 kWh per month = US$0.056/kWh

Daytime energy costs for running the chiller/kWh =
US$0.04/kWh + US$0.056/kWh = US$0.096/kWh

Daytime cooling cost per ton-hour =
US$0.096/kWh x 0.8 kW/ton = US$0.0768

NIGHTTIME COOLING COSTS

Demand charge/month
Buildings with comfort cooling peak during the day, so demand charges do not contribute to nighttime cooling costs.

Nighttime energy costs for running the chiller/kWh =
US$0.04/kWh + US$0 kWh (demand contribution) = US$0.04/kWh

Nighttime cooling put into storage cost per ton-hour =
US$0.04/kWh x 0.8 kW/ton = US$0.032

To summarize, during the night, the cost to store cooling will be about 3 cents per ton-hour, while during the day a ton-hour costs closer to 8 cents to generate. So a flat all-day energy charge of US$0.04 per kilowatt hour, day and night, combined with a peak daytime demand charge of US$9.25 per kilowatt hour, can be a great rate for storage. In this example, creating cooling at night is almost 62 percent less expensive.

OTHER BENEFITS

The building upgrades also offered numerous benefits for the library when considering life cycle costs. The use of energy-efficient, less heat-intensive lighting allowed the library to reduce its chiller capacity from 195 tons to 150 tons, while the addition of ice-based thermal energy storage brought the chiller size down further to 130 tons. Operational cost savings generated from the energy upgrades, including more efficient lighting, a new, more efficient chiller, and thermal energy storage tanks, are expected to total around US$40,000 on an annual basis. The district is confident that, given these predictions, it will be able to pay back the cost of installing its ice storage tanks in less than two years. The ice storage tanks have a life expectancy of 40 years and require minimal upkeep, making them a prudent investment that can provide savings which far outweigh their costs.

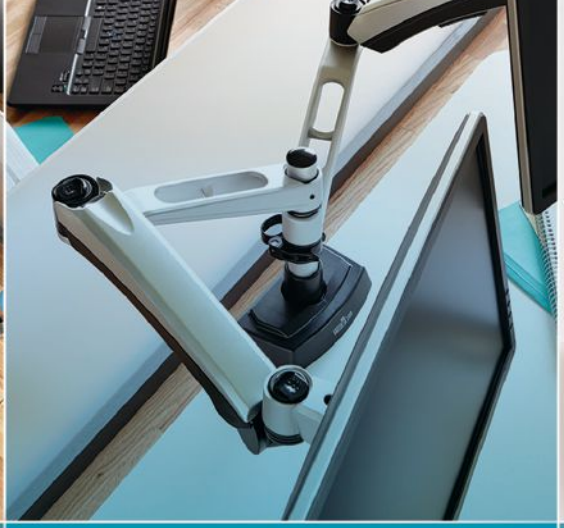
Both ACLD and GRU have been extremely pleased with results and have provided tours of the installation to nearby universities and other large energy users. The library district's staff has also been supportive, with the district's director, Shaney Livingston, even considering implementation of ice-based energy storage at additional locations within the library's branch system.

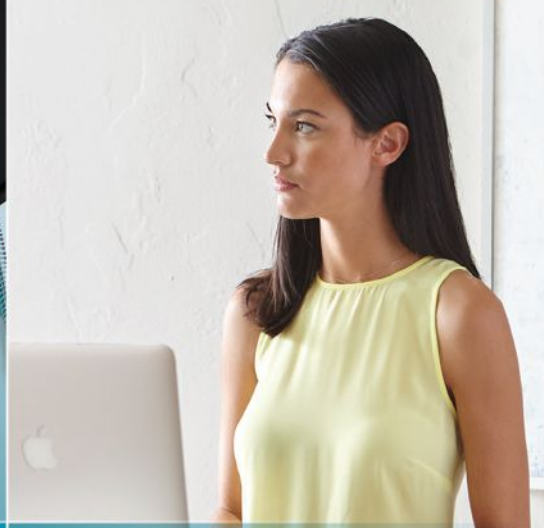
Outcome

Through the support and cooperation of its local utility, the library headquarters was able to successfully reduce peak demand. The energy cost-saving initiatives put in place by ACLD have enabled it to realize significant savings in terms of peak energy consumption and reduction in demand charges. ACLD is proof of the impact that an energy storage system can have on utility bills and now serves as an example to other area businesses looking to realize similar savings. FMJ

Mark M. MacCracken, PE, LEED Fellow, is CEO of CALMAC Manufacturing Corporation, the largest manufacturer of thermal energy storage equipment in the world, with over 4,000 installations in 37 countries. In his more than 30 years with CALMAC, he has been involved in all aspects of the company, including research and development contracts, patents, manufacturing, marketing and finance.

MacCracken is the former chair of the U.S. Green Building Council board of directors and was the principal investigator on research projects with Oak Ridge National Labs, NASA and the U.S. National Renewable Energy Research Lab. He has a Bachelor of Science degree in mechanical engineering and three U.S. patents.





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Sustainability How-to Guide: Carbon Footprint

BY TREVOR ANDERSON AND SHARON JAYE

Sustainability is no longer just a value-based question. It is a core strategic imperative for any company that intends to thrive and grow in the years ahead.

Carbon has become the currency of the sustainability movement. In the U.S., about 40 percent of carbon emissions can be attributed to the construction, operation and maintenance of buildings. It also has been widely reported that about 40 percent of U.S. carbon dioxide emissions are from facilities.

As the stewards of the built environment, facility managers are in a unique position to measure and monitor both building- and workplace-related carbon emissions. Whether considering energy management, waste handling, environmental impact, purchasing, air quality or a host of other sustainability issues, the practice of carbon footprinting is a standard method of measurement of environmental stewardship.

What is a carbon footprint?

The term carbon footprint is slang for a greenhouse gas (GHG) emission inventory. According to the U.S. Environmental Protection Agency (EPA), a greenhouse gas inventory is an "accounting of greenhouse gases emitted to or removed from the atmosphere over a period of time."

GHG inventories quantify the amount of greenhouse gases emitted into the atmosphere and are a critical management tool for organizations of all sizes and sectors. They enable companies to identify their emission sources and track changes over time. They can also inform corporate strategies and help organizations prioritize actions to reduce emissions, as well as provide benchmarks against which the success of these activities can be measured. Facility managers use them to establish baselines for tracking emission trends, develop mitigation strategies and assess progress.

This article provides an overview of the most commonly used international standards for measuring and reporting carbon footprints, including:

- Greenhouse Gas Protocol
- International Organization for Standardization
- Global Reporting Initiative
- The Climate Registry

Greenhouse Gas Protocol

The Greenhouse Gas Protocol, developed by World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD), is the most widely used standard for measuring, managing and reporting greenhouse gas emissions. The protocol is used in almost every GHG standard in the world, from the International Organization for Standardization to The Climate Registry, and includes all seven greenhouse gases required by the United Nations Framework Convention on Climate Change: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride and nitrogen trifluoride.

The GHG Protocol Corporate Standard provides standards and guidance for companies and other organizations preparing a GHG emissions inventory. It was designed to:

- Help companies prepare a GHG inventory that represents a true and fair account of their emissions through the use of standardized approaches and principles
- Simplify and reduce the costs of compiling a GHG inventory
- Provide businesses with information that can be used to build an effective strategy to manage and reduce GHG emissions
- Increase consistency and transparency in GHG accounting and reporting among various companies and GHG programs

The GHG Protocol Corporate Standard also includes the GHG Protocol Scope 2 Guidance, which provides recommendations on what companies should disclose around their electricity purchases and requires them to use both a location-based and a market-based method when calculating and reporting their indirect emissions.

Companies also have the option to use the GHG Protocol's Corporate Value Chain (Scope 3) Standard for assistance in assessing the impact of their entire value chain emissions and identifying the most effective ways to reduce them. Users of this standard can create a more complete inventory and account for emissions from 15 categories of Scope 3 activities, both upstream and downstream of their operations.

International Organization for Standardization

The International Organization for Standardization (ISO) created an international standard for GHG accounting and reporting. ISO 14064 (2006) specifies principles and requirements at the organizational level for the quantification and reporting of GHG emissions and removals, and includes requirements for the design, development, management, reporting and verification of an organization's GHG inventory.

Implementing this standard promotes consistency, transparency and credibility in GHG quantification, monitoring, reporting and verification; enables organizations to identify and manage GHG-related liabilities, assets and risks; facilitates the trade of GHG allowances or credits; and supports the design, development and implementation of comparable and consistent GHG schemes or programs. The three parts of ISO 14064 are:

- **14064-1:2006, Part 1** details principles and requirements for designing, developing, managing and reporting organizational or company-level GHG inventories. It includes requirements for determining organizational boundaries, GHG emission boundaries, quantifying an organization's GHG emissions and removals, and identifying specific company actions or activities aimed at improving GHG management.
- **14064-2:2006, Part 2** focuses on GHG projects or project-based activities specifically designed to reduce GHG emissions or increase GHG removals. It includes principles and requirements for determining project baseline scenarios and for monitoring,

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quantifying and reporting project performance relative to the baseline scenario, and provides the basis for GHG projects to be validated and verified.

- **14064-3:2006, Part 3** details principles and requirements for verifying GHG inventories and validating or verifying GHG projects. It describes the process for GHG-related validation or verification and specifies components, such as validation or verification planning, assessment procedures and the evaluation of organization or project GHG assertions.

ISO 14064 was designed to work in conjunction with two other standards, ISO 14065 2007 and ISO 14066 2011. ISO 14065 provides requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition, and ISO 14066 provides competence requirements for greenhouse gas validation teams and verification teams. An additional standard, ISO 14069:2013, provides guidance for the application of ISO 14064-1 to greenhouse gas inventories at the organization level, for the quantification and reporting of direct and indirect emissions.

A revision to the ISO 14064 family of standards is currently under development. As of July 2015, the update reached "Committee Draft" stage, and is nearing publication. It was expected to be complete in the spring of 2016. If your facility requires compliance with ISO 14064, please monitor or subscribe for news updates on their website.

Global Reporting Initiative

The Global Reporting Initiative (GRI) is a voluntary, multi-stakeholder approach to develop a corporate reporting system based on sustainability for organizations around the world. It has set sector-specific metrics for specific types of enterprises presenting a uniform format for reporting information that is integral to a company's performance in regard to sustainability and environmental concerns.

GRI's G4 Sustainability Reporting Guidelines provide the best and most up-to-date guidance for effective sustainability reporting. They offer a globally relevant framework to support a standardized approach to reporting, and have been designed to be universally applicable to all organizations.

In addition to being the most user-friendly version to date, G4 has an increased emphasis on the need for organizations to focus on those topics that are material to their business and their key stakeholders. This means that sustainability reports will be centered on the most critical matters in order to achieve the organization's goals and manage its impact on society. G4 is also available in an easy-to-navigate web version — G4 Online.

While the GRI provides guidelines for reporting all aspects of sustainability, the "Environmental Category" covers impacts related to greenhouse gas emissions. The reporting of GHG emissions is based on the requirements of the WRI and WBCSD GHG Protocol Corporate Accounting and Reporting Standard. The "Emissions Aspect" section provides the following seven guidelines:

1. G4-EN15 – Direct greenhouse gas emissions (Scope 1)
2. G4-EN16 – Energy indirect greenhouse gas emissions (Scope 2)
3. G4-EN17 – Other indirect greenhouse gas emissions (Scope 3)
4. G4-EN18 – Greenhouse gas emissions intensity
5. G4-EN19 – Reduction of greenhouse gas emissions
6. G4-EN20 – Emissions of ozone-depleting substances
7. G4-EN21 – NOx, SOx, and other significant air emissions

The guidelines are presented in two parts:

- **Reporting Principles and Standard Disclosures:** zcontains guidelines for reporting, disclosure templates and organizational criteria to prepare a sustainability report "in accordance" with G4.
- **Implementation Manual:** explains how to apply the reporting principles, how to prepare the information to be disclosed and how to interpret the various concepts in the guidelines. Organizations should refer to the Implementation Manual when preparing a sustainability report.

The Climate Registry

The Climate Registry (TCR) is a non-profit collaboration among states, provinces, territories and tribes throughout North America that was formed to continue and expand the emissions reporting work of the California Climate Action Registry.

It is the only voluntary carbon reporting program that is supported by U.S. state governments, offers hands-on support and service to assist its members in measuring, verifying and reporting the carbon in their operations, and produces high quality, consistent and credible data to help organizations become more efficient, sustainable and competitive. Its reporting protocols capture the best practices available in GHG accounting, and are developed through a transparent and comprehensive public stakeholder process.

Hundreds of U.S. organizations report their emissions to TCR's carbon management program, including leading corporations, universities and local and state government agencies. The benefits of participation include:

- **Save money and improve energy efficiency:** Reducing emissions is almost always associated with reducing operational and energy costs.
- **Protect and build your company's reputation:** Measuring and

reporting your emissions ensures that your company's efforts are transparent and credible.

- **Build competitive advantage:** Performing a GHG inventory can help drive cost savings, improve operational efficiency and reduce emissions, providing the opportunity to become more energy efficient, redesign business operations and processes, implement technological innovations, improve products and services, and ultimately build sustainable competitive advantage.

- **Manage risks:** Measuring emissions helps facility managers adjust operations so they are less carbon-intensive, preparing the company for potential increases in energy costs and carbon-related regulations, and measuring and reporting the GHG emissions may also be required by future state, provincial, federal or international regulatory GHG programs.

- **Receive recognition for your company's leadership:** TCR and its board recognize leading organizations for their leadership in measuring and managing their GHGs.

- **Build in-house capacity and exchange best practices:** TCR provides a range of services, including a live help desk, trainings, webinars, reporting tools and software, and a community of board members and hundreds of leaders from across industries and sectors.

The facility manager's role

As a profession, facility managers have the most profound influence as to how buildings affect the environment. The importance of that role and the resulting outcomes of these activities have a far-reaching impact.

The carbon footprint of an organization promises to be a major focal point in the near future dictated by common sense, cost savings and legislation. Reporting on carbon footprint performance is one important way for organizations to manage their impact on sustainable development. The challenges of sustainable development are many and it is widely accepted that organizations have not only a responsibility but also a great ability to exert positive change on the state of the world's economy, the environment and social conditions.

If you are interested in learning more about the standards mentioned in this article or the process of carbon footprinting, take a look at the Carbon Footprint Sustainability How-to Guide, available for free in IFMA's Knowledge Library.

If you are interested in getting involved in the development of ISO FM standards, or for more information, contact Laverne Deckert/IFMA Standards at ifmastandards@ifma.org. Help us form the DNA of the FM profession of the future. **FMJ**

Trevor Anderson, LEED Green Associate, is a sustainability consultant with Steven Winter Associates in New York, USA. He has more than four years of experience in the sustainability field, including positions with consulting and commercial real estate firms, environmental nonprofits and local governments. He has a bachelor's degree in biology and business administration and a master's degree in sustainability management from the Kogod School of Business at American University.

Sharon Jaye, D.Ed., SFP, is the executive director of the Green Schools Alliance, based in Washington, D.C., USA. She has more than 15 years of experience in managing sustainable facilities for educational institutions in higher education and K-12 schools. She has a bachelor's degree in business administration, a master's degree in project management and a doctorate of education in educational leadership.

Behind every successful FM is a host of product and service providers that offer solutions to make the hectic task of ensuring seamless facility operations a little smoother. This showcase goes behind the brand to reveal the culture that makes these powerhouse businesses the best in their class.

C&W SERVICES

COMPANY NAME C&W Services
EXPERTISE FM Services
CSP LEVEL Silver
CSP SINCE 1991
WEBSITE cwservices.com

FMJ: WHAT ARE THE TOP SUSTAINABILITY CHALLENGES FACING FACILITY MANAGERS TODAY?

C&W: As IFMA's SFP® credential program promotes, sustainability in facilities is no longer just about environmentally friendly practices like green cleaning. It's about improving the facility's impact on the environment, productivity and people. For facilities practitioners, the challenge is to wear many hats – to be an expert in everything from energy efficiency, to the procurement and use of green products and materials, to creating workspaces that support active, mobile workforces.

Many of these challenges come in the form of new complex technologies that require continual learning and acquisition of new skills to operate and maintain. Facilities themselves have become living entities that form a bridge between the environment and populations that inhabit them. Facilities teams have to undergo a paradigm shift from maintenance to a holistic perspective on how they identify and achieve improvements for these interconnected systems; provide customer service that meets the changing needs of occupants while maintaining sustainable operational philosophies; and demonstrate business acumen to achieve returns on sustainability investments.

FMJ: TELL US ABOUT THE EVOLUTION THAT LED TO THE CREATION OF C&W SERVICES AND WHAT WE CAN EXPECT FROM YOU NEXT.

C&W: C&W Services continues to invest in supporting our on-site teams so that they can be leaders in sustainability and other areas of innovation. We've recently brought on experts to lead new programs in productivity and engineering, for example. Our teams have access to the expertise they need to problem solve and are enabled by training, strong career paths, forums for best practice sharing, etc.

In creating service excellence, it's also critical that every member of the facilities team is engaged in understanding client needs, creating the best and safest environment, and solving any problems. Every day we hear inspiring stories about how front-line team members add value at client sites. We're pleased that a new employee recognition program, launched in conjunction with World FM Day, will formalize our recognition of great service. You can read our employees' individual service stories at cwservices.com/blog. You can also find our perspectives on how active working environments intersect with sustainable facility goals at info.cwservices.com/ad.

Office DEPOT OfficeMax

COMPANY NAME Office Depot
EXPERTISE Office Supplies/Printing
CSP LEVEL Silver
CSP SINCE 2016
WEBSITE business.officedepot.com

FMJ: HOW CAN FACILITY MANAGERS USE STRATEGIC PRODUCT SOURCING TO HELP MEET SUSTAINABILITY GOALS?

OFFICE DEPOT: Facility managers can support their sustainability goals through connecting greener purchasing to their overall sustainability strategy. Procurement is a big piece of the puzzle that is often overlooked when assessing environmental and social impact for your organization.

FMJ: WHAT ADVANTAGES DOES YOUR BUSINESS SERVICES DIVISION OFFER FOR FACILITY MANAGERS?

OFFICE DEPOT: We start with an assessment of what is currently being purchased. Through our Green Business Review we are able to provide a dashboard of overall green/non-green spending, as well as to break down the data into various categories and end users within an organization. Once the dashboard and other data have been reviewed, we work with our Business Services Division customers to identify priorities in their sustainability strategies and connect these with products that we offer.

Once the change has been made to greener alternatives, we then assist FMs in communicating these changes internally to help move the needle in terms of green purchasing. The next step is to reassess and see what changes have occurred after greener alternatives are in play. This is a cyclical process that starts with and returns to assessment, as gauging the "what happened" factor is key in a continuing green purchasing strategy for facility managers.

IFMA's Corporate Sustaining Partners (CSPs) are trusted vendors that support the operational excellence of facility management teams. By partnering with IFMA, this elite group demonstrates the highest commitment to creating a more comfortable and efficient built environment.

COMPANY NAME MCS
EXPERTISE FM Software
CSP LEVEL Silver
CSP SINCE 2016
WEBSITE www.mcssolutions.com/solutions

FMJ: WHAT STEPS SHOULD FMS CONSIDER TO ENSURE THE SUCCESSFUL IMPLEMENTATION OF NEW SOFTWARE?

MCS: Any integrated workplace management system (IWMS) implementation project should start with a needs analysis and define strategic goals to ensure that all project decisions bring value to the organization. Project-to-value mapping helps facilitate decision making and performance monitoring and improves project focus and communication.

Further steps to consider and best practices:

» **Process definition –** Review existing systems, data sources and methodology. The analysis will identify other areas that could benefit from automation, as well as existing capabilities and workflows that can be improved.

» **Software configuration –** Companies are moving away from a heavily customized vendor-dependent delivery model to a flexible self-service model (i.e., standard software that has embedded best practices and is configurable by end users).

» **Data migration –** The software platform should include a user-friendly data migration tool to import a wide range of large data volumes quickly and in a structured manner.

» **Integration –** Software implementation needs to ensure integration between an IWMS and other applications, such as financial and enterprise resource planning software, building management systems, and mobile applications.

» **Deployment to users –** Show users how they will benefit from the new software, including mobile solutions that give them increased flexibility and control over the way they choose to work.

» **Training and support –** eLearning can effectively improve user adoption, enabling users to achieve a high level of proficiency and prevent knowledge loss.

FMJ: CAN YOU SHARE MCS' CORPORATE SOCIAL RESPONSIBILITY PHILOSOPHY?

MCS: MCS aims to operate in a socially responsible manner and contribute to sustainable development.

The core expertise of MCS is in the area of effective and sustainable real estate and facility management and the creation of environment-minded, people-centric and healthy workplaces. As an employer, MCS encourages diversity in its teams and builds a learning environment allowing people to grow both professionally and individually. To learn more, visit www.mcssolutions.com/corporate-social-responsibility.

CSP

IFMA CORPORATE SUSTAINING PARTNER

IFMA's **Corporate Sustaining Partners (CSPs)** are an elite group of companies that have made a powerful statement in support of facility management by partnering with IFMA. It goes beyond just selling a product or service - these companies believe in the FM profession and believe in supporting its future.

These outstanding providers can enable you to;

- Easily find the top FM products and providers
- Make informed buying decisions
- Take part in increasing the role of your profession
- Help your association offer exceptional services, products, resources and opportunities

Contact **April Tone** to learn more about how you can benefit from IFMA's corporate programs.

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Emaar Community Management | www.ecm.ae
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Keilhauer | www.keilhauer.com
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Redlee/SCS Inc. | www.redleescs.com
SCA North America | www.torkusa.com
ServiceMaster Clean | www.servicemasterclean.com

LANDSCAPE/MAINTENANCE/PLANTS /SERVICES/SUPPLIES
Ambius | www.ifma.ambius.com
U.S. Lawns | www.uslawns.com

OFFICE SUPPLIES/PRINTING
Office Depot | www.officedepot.com
Staples | www.staples.com

PEST CONTROL
Rentokil Steritech | www.rentokil-steritech.com

RESTROOM PRODUCTS
Kimberly-Clark Professional | www.ifmaandchess.com

ROOFING
Astec Re-Ply Roofing Systems | www.whyreplace.com
North American Roofi ng | www.naroofi ng.com
Sika Sarnafil Inc. | www.usa.sarnafil.sika.com

SECURITY
AlliedBarton Security Services | www.alliedbarton.com
American Security Force | www.americansecurityforce.com
Securitas Security Services USA | www.securitasinc.com

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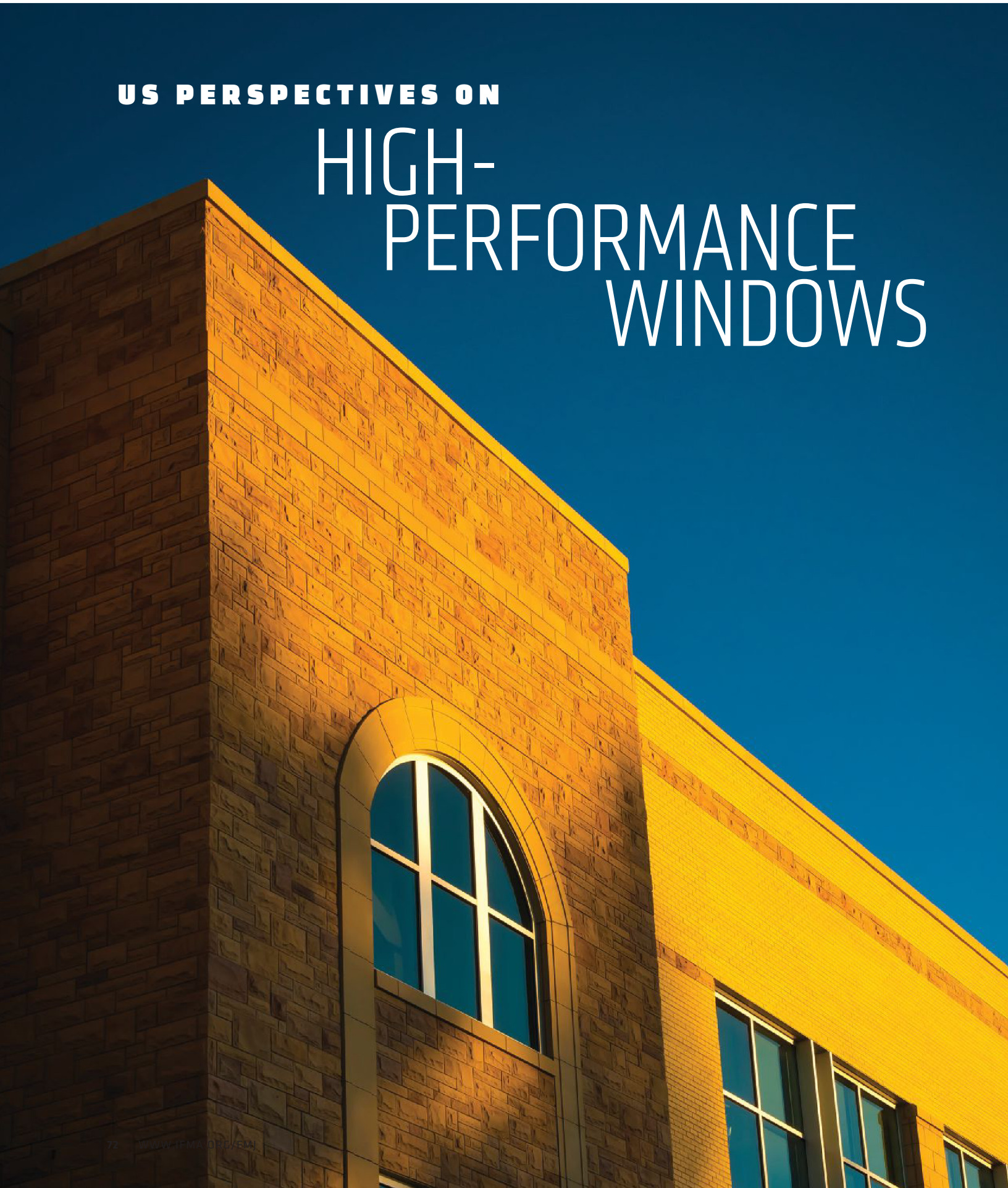
APCO Sign Systems | www.apcosigns.com

STORAGE/SHELVING/FILING
REB Storage Sytems International | www.rebsteel.com

TECHNOLOGY SOFTWARE TOOLS
ARC Document Solutions | www.e-arc.com

WATER & FIRE RESTORATION
Coit Cleaning & Restoration Services | www.coit.com



US PERSPECTIVES ON

HIGH-PERFORMANCE WINDOWS

BY JOHN BENDT

Today's facility managers face myriad challenges in managing interior environments to provide a comfortable workplace for building occupants. The challenge is even greater in buildings that have window systems installed prior to 1980. These windows were designed without the benefits of low-emissivity glass and improved frame thermal barriers that help reduce heat flow into and out of the workplace.

Without modern window performance, building occupants are prone to complain about being too hot or too cold. This discomfort can contribute to a loss of productivity for occupants, as well as increased operating costs for facility managers. New high-performance window systems can significantly improve occupant comfort, reduce energy costs, and minimize capital costs for upgrading HVAC and lighting systems.

Impact of inefficient windows

According to the U.S. Environmental Protection Agency (EPA), inefficient windows account for 50 percent of the cooling load in warm climates. During warmer months with periods of direct sun, older window systems can allow too much solar heat gain, leading to uncomfortable temperatures. This can in turn challenge facility managers to balance airflow and ambient temperature to keep all occupants comfortable.

In buildings with older glass technology, occupants will often close the blinds or shades, reducing the amount of natural daylight coming into the building and causing more people to turn on electrical lights generating even more heat. Excessive heat can even result in some occupants bringing in electric fans in to cool their work areas, which adds to energy costs through increased plug loads.

The EPA also has noted that inefficient windows account for 25 percent of a typical building's heating load in cold climates. In buildings that have window systems with poor insulating values, occupants that sit near them often will plug in their space heaters and rely on additional layers of clothing to stay warm. It can be very challenging for facility managers in buildings with old windows to regulate temperatures throughout the space.

According to the U.S. National Building Sciences' Whole Building Design Guide, "In 1990 alone, the energy used to offset unwanted heat losses and gains through windows in residential and commercial buildings is one-fourth of all the energy used for space heating and cooling in the United States."

Measuring heat gain

The industry benchmark of solar heat gain coefficient (SHGC) is used to help measure and control unwanted heat through windows.

This is the fraction of incident solar radiation (both heat and light) admitted through a window, including radiation that is directly transmitted as well as that which is absorbed and subsequently released inward. An SHGC of 0.2 indicates that little incident solar radiation is entering a building in the form of heat or light. An SHGC of 0.8 indicates that much of the incident solar radiation is transmitted through the window.

The best way to balance visible light transmittance with an appropriate SHGC depends upon the climate, building orientation, shading conditions and other factors. Typically, windows with low SHGC values are desirable in buildings with high air-conditioning loads, while windows with high SHGC values are desirable in buildings where passive solar heating is needed. Solar heat gain of glass in commercial window systems generally ranges from above 0.8 for uncoated water-white clear glass to less than 0.18 percent for highly reflective coatings on tinted glass.

Improvements in window technology

Through the energy crisis of the 1970s, commercial buildings largely relied on tinted or reflective glass to manage unwanted solar heat gain. In the early 1980s, the first glass to use microscopically thin, low emissivity (low-e) coatings to reflect solar infrared heat energy was introduced into the commercial building market.

Today, this technology has greatly improved. Manufacturers now can "stack" multi-layer coatings on the glass to improve the performance. These coatings total only one-ten-thousandth the thickness of a human hair, yet provide significant improvement in both solar heat gain coefficient and thermal transmittance (U-factor). U-factor represents conductive and convective heat flow per unit area, expressed in units of British Thermal Units per hour, per square foot, per degree Fahrenheit.

To quantify a commercial window system's thermal performance, U-factor is the accepted measurement. The higher the U-factor, the more heat is transferred (lost) through the window in winter. U-factors usually range from a high of 1.3 for a typical aluminum-framed, single-pane window to a low of around 0.16 for a multi-paned, high-performance window with low-emissivity coatings and expanded thermal barriers in the aluminum frames. Window manufacturers can provide test reports to show the insulating value of their products. To ensure an accurate product comparison, be certain to check that the test specimen sizes are the same.

Many studies have shown that health, comfort and productivity are improved for building occupants with well-ventilated indoor environments, access to natural light and a view to the outside environment. One measurement that can help in evaluating these benefits is visible light transmittance (VT or Tvis). This is the amount of light in the visible portion of the spectrum that passes through the glass. A higher VT means there is more daylight in a space.

With proper design and specification, glass with the appropriate VT can offset electric lighting and its associated cooling loads. The type of glass, the number of glass panes and any glass coatings influence the VT. Ranges for VT can be above 90 percent for uncoated water-white clear glass to less than 10 percent for highly reflective coatings on tinted glass. A typical double-pane, insulated glass unit has a VT of approximately 78 percent. This value decreases somewhat by adding a low-e coating and is decreased substantially when adding a tint.

New glass technology can provide the appropriate VT and SHGC, while reducing glare. Glare can cause discomfort for occupants when too much bright light enters a building. Glare is most uncomfortable when there is a large difference between the entering sunlight and the area on which the occupant is trying to concentrate. Discomfort occurs when the eye attempts to even out the contrast between the task and the surrounding surfaces.

Other test reports and data that aid in selecting an optimal window system include: air, water and structural performance, acoustic performance, condensation resistance, and special performance, such as hurricane impact resistance or blast hazard mitigation.

Retrofitting an existing building's window system can often noticeably improve air infiltration. Not only does this help overcome occupants' complaints about drafty, old windows, but it also makes maintaining a constant interior temperature and relative humidity easier, and places less demand on mechanical systems.

Facility managers may choose to complete on-site pressure chamber testing to get actual air infiltration rates. As a guideline, ASHRAE's "Handbook of Fundamentals" indicates that older, existing windows may experience air infiltration of:

- 2.5 cfm*/square foot at 1.56 psf† for existing, non-weather-stripped, hung or sliding windows;
- 1 cfm/square foot at 1.56 psf for existing, weather-stripped hung or sliding windows, or for non-weather-stripped awning or casement windows; and
- .5 cfm/square foot at 1.56 psf for existing, weather-stripped awning or casement windows.

Today's window technology with improved weather-stripping, hardware and precision machining has significantly ameliorated air infiltration rates. The

American Architectural Manufacturing Association, which establishes the window industry's standard testing procedures and performance ratings, requires that architecturally rated window systems meet:

- .1 cfm/square foot at 6.24 psf for new fixed windows or curtainwall;
- .1 cfm/square foot at 6.24 psf for new awning, casement or other operable windows; and
- .3 cfm/square foot at 6.24 psf for new hung or sliding windows.

These rates are substantially better than older window system technology and the previously published ASHRAE guidelines.

Evaluating whether to retrofit

Replacement window systems may be a large capital decision. When evaluating initial cost, remember to consider the projected savings that new windows can have on a facility's energy costs, downsizing of HVAC and lighting capacity, and lowered maintenance. When properly specified and installed, modern window systems can reduce lighting and HVAC costs by up to 40 percent.

While lower operational energy costs are always welcome, even a small increase in employee productivity can have a significant positive financial impact, as salary costs are generally 10 times higher than energy costs in U.S. office buildings. Energy-efficient, high-performance buildings provide occupants with access to daylight, comfortable temperatures and better air quality. These environmental characteristics are correlated with lower absenteeism and higher productivity, and can save up to US$2,000 annually per employee.

Demonstrating their energy efficiency, more than 28,000 facilities have been certified by the EPA's ENERGY STAR program. Associated benefits include up to a 26 percent increase in property value, up to an 11 percent increase in occupancy rates and up to a 15 percent increase in lease rates. Improving both the performance and the appearance of existing buildings, a new energy-efficient window system is proven to enhance the building's overall value. **FMJ**

** Cubic feet per minute, + Pounds per square foot*

RESOURCES

- National Institute of Building Sciences' Whole Building Design Guide, www.wbdg.org/resources/windows.php
- Efficient Windows Collaborative, www.commercialwindows.org/index.php
- ASHRAE, www.ashrae.org/resources--publications/bookstore/handbook-online
- American Architectural Manufacturers Association, www.aamanet.org
- American Institute of Architects and Rocky Mountain Institute, "Deep Energy Retrofits," 2013, www.aia.org/aiaucmp/groups/aia/documents/pdf/aiab099241.pdf.

John Bendt serves as vice president of Apogee Enterprises, Inc.'s Building Retrofit Strategy Team. He assists facility managers in evaluating the benefits of energy-efficient building envelope renovations and upgrades, including by offering free energy modeling, product selection and design assistance, and a network of installers covering North America.

Previously, Bendt served in leadership roles at two Apogee companies — as vice president of sales and marketing for Wausau Window and Wall Systems, and as vice president of service and special projects for Harmon, Inc. Prior to joining Apogee, he worked in numerous general management positions for Otis Elevator Company, a unit of United Technologies Corporation.

With more than 25 years in the commercial building industry, Bendt has led many teams responsible for upgrading building systems to enhance the value of commercial buildings.

WINDOW FILMS: IMPROVING COMFORT, SAFETY AND ENERGY USE

BY JAKE OBERLE

Although it's accurate to assume that no two commercial buildings across the globe are completely alike, there is one element that nearly all share — windows. Whether the building's architecture leverages thousands of square feet of glass or only has a few windows, it's important for facility managers to consider five important components when evaluating window performance:

1.

ENERGY EFFICIENCY

According to the U.S. Department of Energy, about 42 percent of a building's energy is lost through its envelope. In consequence, operating dollars are often literally "flying out the window" due to inefficiencies.

2.

UV PROTECTION

Although ordinary glass used in commercial buildings filters out ultraviolet (UV) B radiation (which is why we don't often get sunburned indoors), both UVA and infrared radiation, which causes heat, are readily transmitted through standard glass.

3.

PRESERVING INTERIOR INVESTMENTS

We've all seen what the sun's rays can do to our draperies, artwork and furniture. For buildings that experience long periods of direct sunlight, it is imperative to find a solution to block UV rays.

4.

REDUCING INTERIOR LIGHTING COSTS

Utilizing natural light is an easy way to increase energy savings, and in turn, return on investment. Recent studies have demonstrated that spaces outfitted with daylight-sensing controls can reduce the energy used by electric lighting by 20 to 60 percent.

5.

SAFETY AND SECURITY

In most cases, commercial burglars forcibly enter through doors, windows, skylights or other openings by prying them open, smashing glass windows and doors, forcing the locks open, or kicking in doors. However, it is well documented that windows are the often the most fragile, and frequent, point of entry.

As a best practice, facility managers should evaluate if their building's windows are working to full capacity. Fortunately, if an issue does arise, window films provide an easy, turnkey solution that will address numerous problems without altering the exterior façade or requiring a significant capital investment.

Which window film works best for your needs?

After assessing your building's windows and determining any pain points that should be addressed, the next step is researching what type of window film will work best for your needs. As outlined above, the most common issues involve energy efficiency, UV protection, interior lighting costs, preserving interior investments, and safety and security.

WINDOW FILMS FOR ENERGY EFFICIENCY

If you're looking to reduce energy expenditures, sun control window films offer a perfect solution, as they reject up to 99.9 percent of the sun's heat producing infrared light. Non-metalized window films are optically clear and barely visible, providing superior heat rejection capabilities without altering the aesthetics of a building. Additionally, some sun control films offer less reflectivity than the windows they cover, allowing for unobstructed views and less interior glare.

Société Générale in Switzerland installed sun control window film as the building's design and numerous windows caused consistent overheating and discomfort for occupants, despite the use of blinds and air conditioning. However, facility

managers were also faced with a unique challenge, as the building is a historical landmark, so any modifications could not involve new construction or reflect sunlight off of the building.

Due to Société Générale's very specific requirements — no mirror effects, no changes to the building's external aspect and no loss of light — they installed sun control window film to address their overheating problem. After the project was completed, occupant comfort improved almost immediately, but individuals were still able to take advantage of the building's uncompromised natural light.

WINDOW FILMS FOR UV PROTECTION AND INTERIOR INVESTMENT PRESERVATION

In addition to acting as a barrier to the sun's heat-producing infrared rays, sun control window films also reduce the effects of solar heat and visible light on a building's furnishings. They can block up to 99 percent of the sun's harmful UV rays, which are the single largest cause of fading. In addition, while it's important to note that no film can stop fading completely, window films can dramatically slow the progress of fading to preserve the brilliance of artwork, draperies and flooring.

With more than 55,000 square feet of windows, many exhibitions at the Rock and Roll Hall of Fame and Museum are housed in an iconic geometric building designed by world-renowned architect I.M. Pei. From Chuck Berry's guitar to Elvis Presley's custom three-wheel motorcycle, the building is responsible for the historic preservation of many irreplaceable objects.

In an effort to preserve the building's ability to present its collections in natural light, but simultaneously protect the priceless artifacts from UV damage, executives decided to install window film. Once the film was in place, the Rock and Roll Hall of Fame and Museum began seeing immediate benefits, including increased energy efficiency and decreased cooling costs. Overall, the facility is expected to experience a total energy cost savings of approximately US$20,000-US$40,000 a year.

WINDOW FILMS TO REDUCE INTERIOR LIGHTING COSTS

Daylighting films utilize technology to redirect light that would have originally hit the floor a few feet from the window up onto the ceiling, helping to light the room as deep as 40 feet from the window. By redirecting more than 80 percent of light onto the ceiling, daylighting window films provide more natural light, which has been linked to increased productivity and purchasing

behavior, and helps to reduce a building's dependence on electric lighting.

Additionally, compared to existing light reflecting strategies, this type of film is easily integrated into new or existing windows, as it requires no extra hardware or infrastructure. Most importantly, it works at all times of the day, even when the sun is at a low angle.

Known as a net-zero retail store, the Walgreens in Evanston, Illinois, USA, is equipped with solar panels, two wind turbines and a geothermal system to generate electricity. When conceptualizing the space, the designers wanted to make the most of the available natural light flowing through the windows and reduce the dependence on electric lighting. However, in the United States, achieving a net-zero facility typically requires a dedicated lighting strategy.

By installing a window film that utilized the building's natural light, the company was able to extend the facility's daylight zone and fit the overall design of the net-zero project. After the film was installed, guests to the store were able to shop comfortably without unnecessary hotspots.

WINDOW FILMS FOR SAFETY AND SECURITY

In addition to sun control properties, window films can help protect facilities from unwanted events, including break-ins or severe weather. The ultimate high-technology window films utilize a strong, micro-layered, tear-resistant film to hold glass together in the event of an impact.

Remarkably, some safety and security window films and attachment systems can help fortify a building's windows from blast-related attacks and accidental explosions. In fact, some window films have been able to protect against a multitude of blast standards in testing, including both shock-tube and open-air arena explosions.

In 2000, the National Gallery in Ottawa, Ontario, Canada, installed safety and security window film after rigorous testing of many competitive films. The building — a visual arts museum of international stature — houses Canada's collection of historic and contemporary art utilizing skylights to cast natural daylight on the country's treasures.

> Window films provide an easy, turnkey solution that will address numerous problems without altering the exterior façade or requiring a significant capital investment.

With the United States Embassy less than 300 meters away, the gallery is located in a high security risk area. In consequence, both the Royal Canadian Mounted Police and Ottawa-Carleton Regional Police recommended the implementation of a comprehensive window protection system for exposed areas of glass.

By choosing to install safety and security window film, glass surfaces on the building were substantially strengthened without altering the beautiful and awe-inspiring aesthetic impact of the building.

Are window films right for your building?

Window film is a retrofit application that is suitable for almost all building types, ranging from new construction to historical landmarks. Once applied, facility managers will begin experiencing immediate benefits, with a complete return on investment ranging from six months to several years.

Although the reasons for installing window film differ based on the project, most often commercial customers are looking for:

- Lower heating and cooling costs
- Lower utility demand costs
- Improved occupant comfort
- Improved safety and security
- Extended air conditioning equipment life
- Utility rebates

Window films are made to last for many years. However, the exact length of time depends upon the type of film applied, window orientation, type of glass to which it is applied and the particular climate in which it is applied.

When considering commercial window film products, facility managers should look for professional, accredited installers, as they have the experience and training to identify and address unique circumstances that may affect installation and performance. Furthermore, warranties offered on quality films installed by professional dealers usually cover costs of removal, costs of replacement film and costs of reinstallation, if necessary.

Conclusion

As most facility managers know, the cost of completely replacing a building's windows when faced with issues associated with infrared light, UV rays and safety and security are not only cost-prohibitive, but also disruptive to occupants. Additionally, undertaking a new construction process can often be a daunting, time-consuming venture that focuses the attention of the management team away from their most important task — successfully running a building and maintaining return on investment.

As illustrated in this article, window films offer a superior solution for a multitude of issues and concerns. Most importantly, once a film is installed, every aspect of a building's leadership team — from the initial architects to the facility's occupants — will be happy with its many benefits. **FMJ**

Jake Oberle is the U.S. commercial marketing manager for 3M. Oberle has been with 3M for eight years with varying roles and responsibilities in sales and marketing. For more information about window film, visit: 3m.com/windowfilm.

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Fighting infections, costs with ultraviolet light

While it goes relatively unnoticed in the sunshine that blankets the Earth's atmosphere, ultraviolet light (UV) is being harnessed by the commercial building industry to reduce maintenance costs, increase facility energy efficiency and fight health risks.

BY AARON ENGEL

Myriad UV light systems developed in the last decade are helping commercial buildings reduce biological growths in heating, ventilation and air conditioning (HVAC) system coils and interiors, while also improving their energy efficiency. More recently, short-wavelength ultraviolet (UV-C) light use has played a significant role in the worldwide effort to offset the alarming rise in hospital-acquired infection (HAI) cases by disinfecting health care facility air and surfaces of infectious, resilient pathogens.

The process of using UV light to disinfect viruses, bacteria, mold and other biological contaminants is called ultraviolet germicidal irradiation (UVGI). UVGI technology disinfects pathogens in the air and on surfaces by scrambling their DNA and preventing reproduction. The non-ozone-producing UV-C is the most effective wavelength for deactivating biological contaminants.

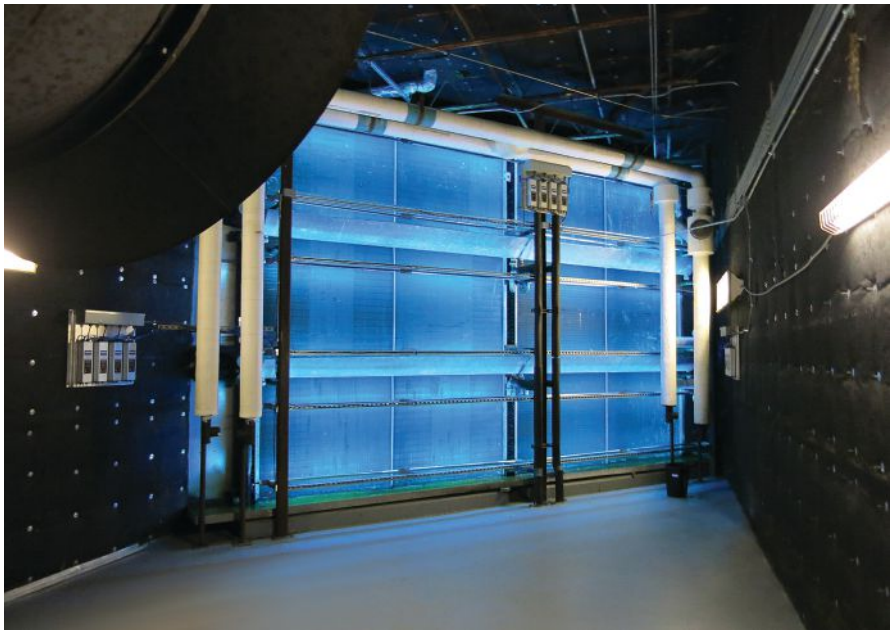
While some microorganisms may require longer exposure times, nearly all can be sterilized by UV-C. As opposed to other longer and less lethal UV wavelengths appearing in unfiltered sunlight, such as UV-A (used in black lights) or UV-B (causes sunburn), biological contaminants have no prior experience with or defense against UV-C because it is filtered out by the atmosphere before reaching the Earth's surface.

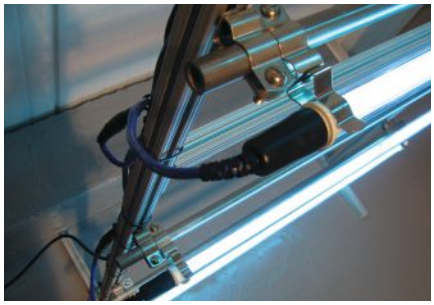
Reducing maintenance costs

UV-C light systems can be instrumental in reducing maintenance costs by eliminating mold procreation on an HVAC system's coils, interiors and ductwork. The cool, dark and damp interiors of HVAC systems, particularly during air conditioning season, attract mold and other biological contaminants that spread throughout a building via the air distribution system.

Cleaning biological contaminants from HVAC systems is costly. Installing UV-C light systems on an air conditioning coil not only disinfects biological contaminants, but also prevents new growth and reduces conventional cleaning frequency. UV-C systems are relatively inexpensive in terms of equipment and installation/labor costs. When compared to in-house staff or outsourced continual cleaning service costs, their payback is typically within one year.

UV-C light systems don't require maintenance other than replacing the UV lamps (bulbs) every two years.





Photos courtesy of Fresh-Aire UV, Jupiter, Florida, USA

Many manufacturers offer lifetime warranties on their power supplies. Manufacturer warranties vary greatly and often cover ballasts (power supplies), electronics and hardware, while also guaranteeing the UV-C lamp itself.

Increasing energy efficiency

Energy efficiency is also a benefit of UV-C light systems. A thin film of mold or other biological growths act as insulation on HVAC system coils and reduces heat transfer energy efficiency.

Studies have also proven that just a .002-inch-thick bio-film on coils can reduce the free area and increase air velocity up to 9 percent. The result is a system with higher static pressure across the coil and higher fan energy use. Eliminating biological growths can result in up to a 30 percent cooling capacity increase when compared to a dirty coil. Furthermore, biological growth can also attract dirt that ordinarily wouldn't accumulate on a clean coil.

Saving lives in health care

The exponential growth of HAIs threatens the mission of the health care industry to improve patient health. According to an HAI Prevalence Survey conducted by the U.S. Centers for Disease Control and Prevention, on any given day, one in 25 hospital patients has at least one type of HAI. More than 722,000 HAIs in U.S. acute care hospitals occurred in 2011. About 75,000 of those U.S. hospital patients contracting HAIs died during their hospitalizations.

Health care administrators are increasingly looking toward UV-C disinfection to help reduce HAIs. Two popular UV-C applications are airborne disinfection and environmental surface disinfection systems (ESDS).

Airborne disinfection through HVAC air distribution

Airborne disinfection is typically facilitated by the same UV-C light systems that prevent biological contaminant buildup in HVAC units. In this process, microbes are disinfected within the airstream as it passes through the HVAC system's UV light field. There are UV light systems large enough for huge building-wide air handlers or slight enough to fit smaller HVAC systems such as room unit ventilator coils or mini-split ductless air conditioning evaporator coils.

Airborne disinfection has been proven effective in studies. Airmid Healthgroup in Dublin, Ireland, an indoor air cleaning device test facility, has proved that UV-C lights sterilize microorganisms when installed in HVAC systems commonly used in health care facilities. The 2013 study used UV-C light systems to demonstrate airstream microbe inactivation in an ASTM-style environmental test chamber that simulated a typical building's indoor environment and HVAC air handler arrangement.

A single-pass test was also performed on an ASHRAE Standard 52.2 test duct system. While the single-pass test demonstrated impressive inactivation results for bacteria, virus and mold, indoor air quality experts claim even higher inactivity rates among the three tested microbes could occur in a multiple-pass environment, such as the continual recirculation of air from a typical building HVAC system.

Environmental surface disinfection systems in health care

ESDS disinfection is applied either via stationery ceiling mounted UV light systems or mobile robots. In contrast to airborne disinfection, ESDSs disinfect surfaces as well as air within the UV-C field of a given space.

ESDSs complement manual disinfection practices. Studies show that as much as 50 percent of high-touch surfaces are not adequately addressed through manual cleaning. ESDSs are particularly strategic in surgery suites and areas where patients have compromised immune systems that are susceptible to the many microbes in health care settings.

UV-C robots are also popular ESDS systems. They carry a higher cost and require trained staff to transport, calibrate and operate them for each room they surface disinfect. In contrast, a stationery ESDS system can be automatically programmed to operate for a minimum disinfection time during unoccupied periods.

Like airborne disinfection, ESDS has also been proven in studies. As reported by www.sciencedaily.com and presented at the 2012 IDWeek, an annual scientific meeting where infectious diseases professionals meet, ESDS effectiveness was presented in a study by researchers at Duke University Medical Center and the University of North Carolina Hospital System. The study confirmed that UV-C killed drug-resistant bacteria on door handles, bedside tables and other hospital room surfaces.

Looking into the future of UV

As more equipment in buildings becomes susceptible to biological contaminants, UV manufacturers are responding. Recent innovations include miniaturization to reach confined areas of smaller systems, plus advancements in technology that promise improved monitoring, controlling and interfacing UV equipment with building management systems (BMSs).

Commercial ice machines, for example, are being outfitted with UV systems to maintain ice sanitation, clarity and taste. An ice and cold water dispenser or ice machine's exposure to exterior bacteria through condensate drains and ice chutes can generate mold, slime and other biological contaminants inside the machine that eventually transcend to the ice and can impact the health of its consumers.

Miniaturization of UV lamps now make UV light systems available for nursing station ice machines (also known as "flakers"). Cleaning these machines can cost an estimated US$200 to US$400 per unit depending on the severity of the mold growth. Multiplying a US$400 cleaning cost by four annual cleanings means that maintenance costs can surpass US$1,000 for just one machine. Many hospitals have dozens of nursing station ice dispensers. Worse yet, an ice machine with mold can cause a facility to fail a health inspection, even if everything else around it is spotless.

The next frontier for UV disinfection is the application of microprocessor controllers that can monitor multiple lamp systems throughout a building's air handler systems. The controllers can monitor for lamp efficacy or failures and relay the information to the BMS or send alarms and updates to maintenance personnel.

From an operational standpoint, UV equipment capital costs are typically paid back in less than a year in terms of reduced or eliminated maintenance costs. Maintenance requires a one-minute UV lamp replacement every one to two years. In contrast, coil cleaning can be expensive for health care facilities, depending on the number of units and their sizes. Also, residual toxic biocide chemicals on poorly rinsed coils contribute to poor indoor air quality, affect occupant respiratory systems and prematurely shorten HVAC system life cycles.

While maintenance costs and energy efficiency equate to a dollar value, no amount of money can equate to saving lives or increasing quality of life by minimizing HAIs. No person should go into a hospital or a workplace and become sicker than when he or she entered. While viruses and infections are an accepted risk of entering some facilities, UV disinfection can help minimize their occurrence. **FMJ**

UV-C light systems can be instrumental in reducing maintenance costs.

Aaron Engel is vice president of business development at Fresh-Aire UV (www.freshaireuv.com), North America's largest manufacturer of UV disinfection and carbon/photocatalytic oxidation-based indoor air quality products. Fresh-Aire UV offers UV-C light systems for most HVAC systems, ice machines and surface disinfection, as well as free trial demonstrations of UV-C lights on HVAC coils of selected commercial buildings. Engel can be reached at aaron@freshaireuv.com or +1-800-741-1195.

DIRECT-FIELD SOUND MASKING TECHNOLOGY PROTECTS SPEECH PRIVACY

Cambridge Sound Management, the world's largest provider of sound masking technology and a Silver-level Corporate Sustaining Partner of IFMA, has announced a new speech privacy solution for medical office waiting rooms, exam rooms and pharmacies.

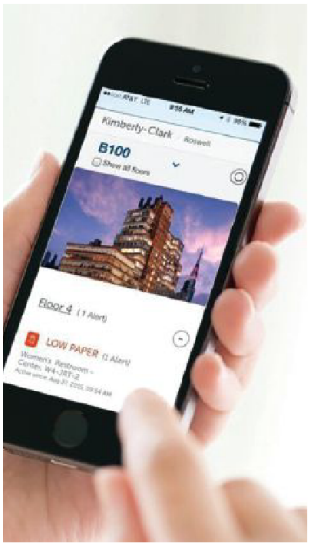
The Qt Patient Privacy System helps protect patient privacy by making conversations in health care environments less intelligible to unintended listeners. Often overlooked in health care design is the lack of speech privacy in reception areas where private conversations can be easily overheard. Furthermore, patient exam rooms often provide inadequate speech privacy due to a lack of sound blocking building material. With an increased focus on patient quality of care and achieving HIPAA privacy regulations, the Qt Patient Privacy system is an affordable solution to solve an important problem.

The Qt Patient Privacy System is an all-in-one privacy solution consisting of a control module, two lighted privacy status signs and a series of direct-field sound masking emitters. The control module is easily installed behind the reception desk or in the back office, and the lighted privacy signs inform patients and staff that their conversations are protected.

The barely visible direct-field sound masking emitters can be installed in any ceiling type. The system is installed by Cambridge Sound Management's extensive network of certified sound masking specialists.

To learn more about Cambridge Sound Management's sound masking solutions, visit **www.cambridgesound.com.**

APP HELPS FACILITY MANAGERS MANAGE RESTROOMS REMOTELY



Kimberly-Clark Professional has adopted IBM cloud to create a new intelligent facility management app that helps clients better monitor and manage restrooms remotely, lowering costs and improving consumer experiences.

The new intelligent restroom app was built using IBM Bluemix development platform and is hosted on the IBM cloud. Through the use of the IBM Internet of Things foundation service, facility managers collect data and alerts from sensors integrated into restroom amenities, from soap dispensers to air fresheners, as well as non-amenities like entrance doors. All the data is managed and monitored through a central dashboard that can be viewed on desktops or mobile devices remotely.

In pilot tests of the intelligent restroom, Kimberly-Clark Professional has been able to reduce the amount of supplies used in the restroom by up to 20 percent. The solution is available currently in select North American markets.

Kimberly-Clark Professional, a Gold-level Corporate Sustaining Partner of IFMA, partners with businesses to create Exceptional Workplaces*, helping to make them healthier, safer and more productive. To see how Kimberly-Clark Professional is helping people around the world to work better, visit **www.kcprofessional.com.** For more on IBM Cloud, visit **www.ibm.com/cloud-computing.**

MOBILE DEVICE CHARGING STATIONS ENHANCE OUTDOOR SPACES

Legrand, a global leader in power, light and data technologies and Silver-level Corporate Sustaining Partner of IFMA, has launched outdoor charging stations for mobile devices, the first in a series of permanent outdoor power offerings. These robust yet elegantly designed pedestals combine charging outlets with lighting elements to support the growing demand for mobile connectivity in outdoor spaces.

The Outdoor Power Charging Stations are composed of two charging station models, the Charging Station with Accent Light and Power Pedestal, which are both available in three standard finishes: black, bronze and silver, as well as in custom colors. The charging stations are National Electrical Manufacturers Association (NEMA) 3R-rated for use in outdoor spaces, and each station includes a combination of two or three gangs of power devices, including USB charging, but can also be used for audiovisual or communications connectivity.

The Charging Station with Accent Light includes a small LED locator light to enable device charging during the day and after dark. The station stands out from traditional bollards by virtue of the accent light, which clearly indicates charging.

The Power Pedestal does not include an LED light, as it is designed for areas that are already illuminated, such as outdoor dining spaces, or for areas where a lower-profile solution is desired.

For more information about Legrand Outdoor Power Solutions, visit **www.legrand.us/outdoor.**

ADA-COMPLIANT AIR PURIFIER FOR SMALL SPACES

AeraMax Professional, a commercial-grade air purifier that removes up to 99.9 percent of airborne contaminants in common areas such as workplaces, schools and health care facilities, announces a slim model designed for smaller spaces such as offices, restrooms, urgent care facilities and exam rooms.

The AeraMax Professional II is only 4 inches deep and has flexible integration options for rooms ranging from 150 to 300 feet in area. Similar to AeraMax Professional's III and IV models, AeraMax Professional II uses patented EnviroSmart™ technology so the machine automatically adjusts to optimize performance.

AeraMax Professional II uses true HEPA filters and carbon filtration to remove up to 99.9 percent of airborne contaminants, including dust, allergens and viruses.

AeraMax Professional can be wall mounted, recess wall mounted, or set on a floor stand to fit the requirements of any room.

To learn more about all of AeraMax Professional's air purification solutions, as well as how to fight asthma, allergies and the flu in your facilities, visit **www.aeramaxpro.com.**

RELIABLE MONITORS ADDRESS CORROSION-RELATED PROBLEMS IN FIRE PROTECTION SYSTEMS

AGF Manufacturing has developed the CORRINSITE™ Corrosion Monitors to address the increase of corrosion-related failures in both wet and dry fire protection systems. The CORRINSITE Corrosion Monitor is a new, reliable monitoring tool designed to measure piping wall loss under real world conditions.

AGF's CORRINSITE provides an inexpensive and foolproof method to monitor for hidden corrosion problems in any fire protection system; it is maintenance-free and easy to install. It is incorporated directly into the sprinkler piping system where it is subject to the same conditions as the pipe. As the pipe corrodes, the monitor corrodes. When the monitor corrodes beyond its limit, moisture penetrates the sealed chamber and transforms the white sight glass to a fluorescent orange color indicating a corrosion problem and need for further investigation.

The CORRINSITE comes in two models and various sizes:

» The CORRINSITE Model 7700 In-Line Pipe Corrosion Monitor is suitable for new construction and retrofitting into existing fire protection systems. It is available in schedule 10 or 40, black steel or galvanized pipe.

» The CORRINSITE Model 7800 Mechanical Tee Corrosion Monitor is easily retrofitted into existing fire protection systems and is available with a painted red or galvanized steel mechanical tee.

To learn more about AGF's corrosion monitors, call **+1-610-240-4900** or visit **www.testandrain.com.**

FREE ONLINE ENERGY SAVINGS CALCULATOR FOR AIR CURTAINS PROVIDES CUSTOMIZED DATA

Berner International Corp., a leading U.S. manufacturer and innovator of air curtains, introduces the Berner Air Curtain Energy Savings Calculator, a user-friendly, online energy savings estimation tool accessible by any web browser for quick payback calculation and air curtain selection.

This time-saving energy-savings calculator, which is available for free at **www.berner.com**, is the most powerful air curtain energy savings computational tool in the industry, because it also incorporates air curtain selection and return-on-investment (ROI) calculations. Thus, the user gets energy savings, a payback in years, and an air curtain model choice, all automatically calculated and saved to a URL for revisits, sharing with colleagues or client presentations.

Each calculation allows for the comparison of two or more Berner air curtain models' effectiveness ratings and ROI energy savings for comparative purposes.

The program's user-friendliness enables facility managers, architects, consulting engineers, contractors and Berner's manufacturer's representatives to input door dimensions, use times, local energy rates and other data. Users can choose between National Weather Data (BIN Data) and associated utility rates or manually enter their own weather data. Users can also manually select an air curtain model, or use the embedded air curtain selector program.

The program is based on loads calculated from generalized customer input, typical meteorological year (TMY2) weather data and ASHRAE calculations. The air curtain efficiency used to determine the payback period is based on generally accepted theory, laboratory and field tests.

Other program benefits:

» Inputs are easily revised by reopening the URL and changing input data or using a different air curtain model

» Inquiries are sent confidentially to the location's respective manufacturer's representative for sales follow-up

» Includes a wide variety of drill-down opening selections ranging from exterior to interior doorways and walk-in cooler/freezers (doorway types range from food service, hospitality, education, health care and retail to industrial dock doors)

For more information on Berner International products, visit **www.berner.com**, email **info@berner.com** or call **+1-800-245-4455.**

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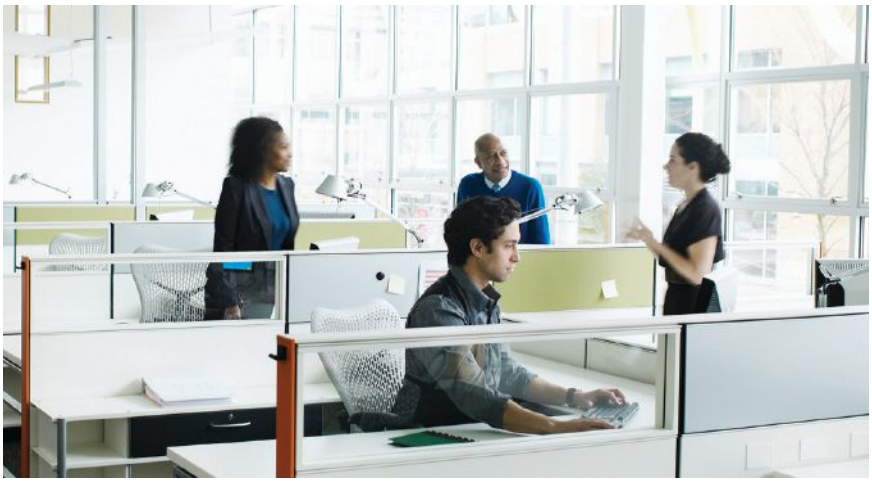

Modern organizations are adopting new approaches to workplace planning and operations that have been enabled by mobile technologies and a highly dynamic workforce. These new approaches include flexible workspace, support for cross functional teams, ad-hoc and collaborative areas, and flexible workspaces that break away from the practice of assigning one workstation per employee.

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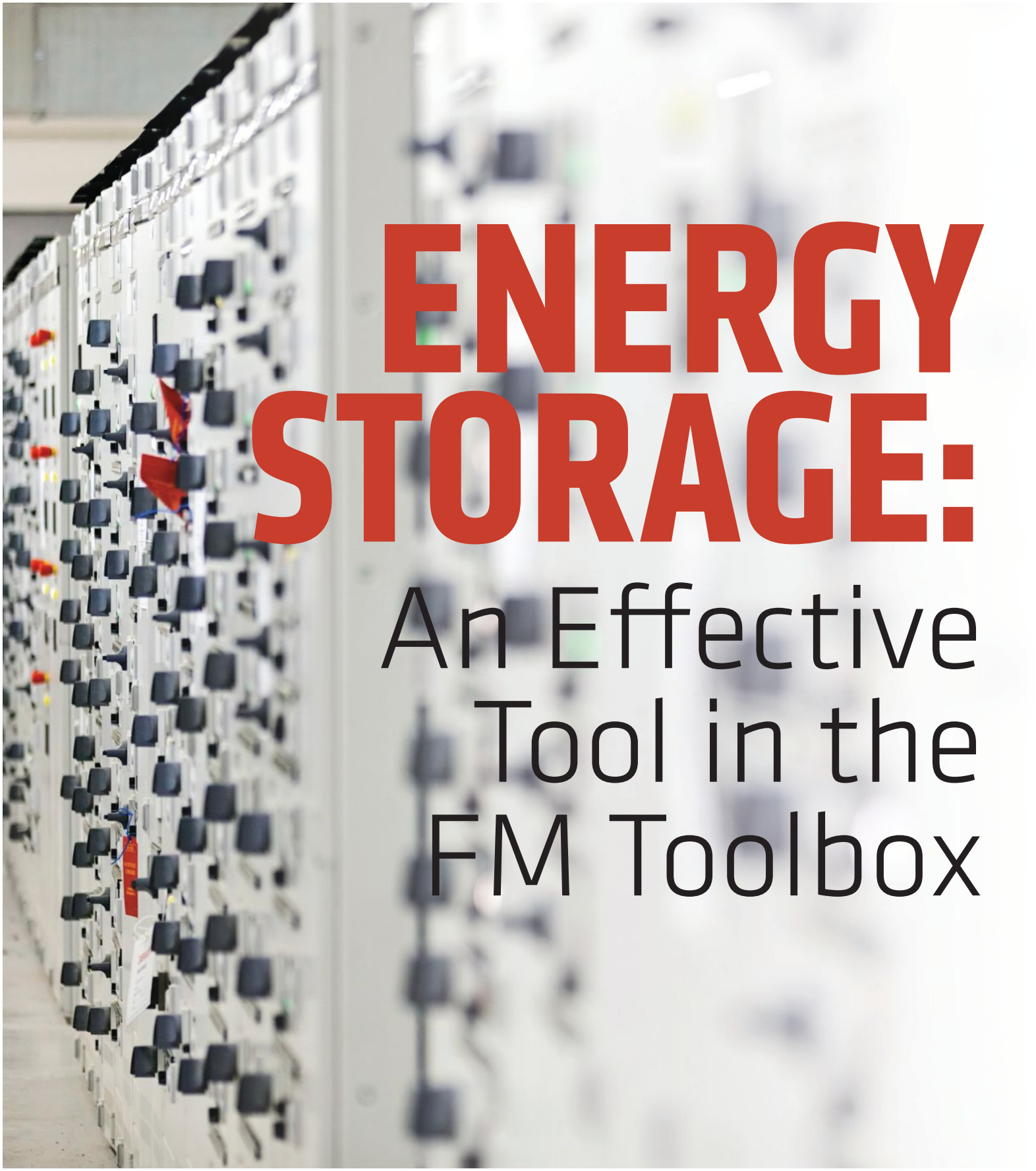

ENERGY STORAGE:

An Effective Tool in the FM Toolbox

BY JANICE LIN

Santa Rita Jail, located just outside San Francisco, California, is one of the largest correctional facilities in the United States. With an average daily power demand of three megawatts, the facility sought a way to cut its energy bills while increasing the stability and security of its power supply. The jail functions as a microgrid system with onsite generation, allowing the facility to operate indefinitely with no connection to the local utility. In 2012, Santa Rita Jail decided to install energy storage to further optimize its energy consumption and control its costs.

Since installing an advanced energy storage system, Santa Rita Jail has saved US$100,000 annually on electricity costs. Energy storage enables the facility to purchase electricity during peak hours, then store it and use it during peak demand periods. In addition, the jail has bolstered the security and reliability of its power supply, protecting itself and its inmates against power outages.[1]

Energy storage: The "holy grail" of energy

Energy storage, often called the "holy grail" of energy, is regularly touted as a solution to fixing aging power grids, a critical tool in increasing the spread of renewable energy, and a bridge between the needs of utilities and their customers.

But what is energy storage, and how can it be put to use in facilities today? Grid-connected energy storage is not a new concept, and it is commercially available as a valuable tool for reducing electric bills, increasing resiliency and earning revenue. And, unlike the elusive "holy grail," energy storage is easily discoverable.

The Santa Rita Jail is just one of more than 1,000 storage systems — equivalent to 150,000 megawatts — installed worldwide, including nearly 2,500 megawatts of what is called "advanced energy storage": advanced (non-lead-acid) batteries, thermal energy storage, flywheels and other technologies beyond conventional pumped hydro storage. In California alone, there are more than 130 installations of customer-sited, behind-the-meter storage systems installed at commercial and industrial facilities.[2]

In human history, the need for energy storage has been long recognized, resulting in countless examples of its active use. For hundreds of years, humans have been storing the sun's energy in the form of jam. When fruit ripens in the fall, rather than let it rot and go to waste, we can add sugar and bottle it, thus enabling it to be stored for use at a later date. Jam can be thought of as a form of "bottled sunshine." When we eat too much jam, the pesky "love handles" that result are a great example of naturally occurring energy storage in our bodies.

WHAT'S THE COST OF A POWER OUTAGE?

How much does it cost when the power goes out? Nearly 60 percent of Fortune 500 companies report experiencing a minimum of 1.6 hours of downtime per week. In loss of labor alone, this downtime could add up to US$869,000 per week, or more than US$46 million annually.[4]

According to a report from Schneider Electric, which looked at outages in hospitals across North America, facility managers estimated that the financial impact of an outage could average as much as US$900,000.[5] The report notes that one in 20 hospitals in the U.S. are not fully prepared for a large-scale outage, and would see on average greater than US$1 million in revenue loss and other costs.[5]

For automotive manufacturers, similarly, a voltage sag for less than one-tenth of a second may cause production losses as high as US$200,000. Referring to outages affecting the automotive industry, the president of Business Forward (a business trade association located in Washington, D.C., USA) stated, "An hour of downtime means more to these plants than a year's worth of electricity rate increases."[6]

Outages are more than just an annoyance to many businesses – they can have serious repercussions to the bottom line.

Energy storage in the electric power system is also critical, especially due to the need to balance supply and demand on a 24/7 basis. Historically, most of this storage is in the form of upstream fossil fuel storage. To maintain electric system reliability, we've traditionally overbuilt supply: sizing generation, transmission and distribution capacity to accommodate peak annual demand. The net result is that we have trillions of dollars of infrastructure that isn't used very often and greenhouse gas (GHG) emissions from power plants that aren't run very efficiently.

What if those real-time fluctuations in demand could be controlled, so that the supply side of the infrastructure could be better utilized? The result would be significant system-wide cost- and emission-saving impacts. This is where customer-sited energy storage comes in. By managing energy loads, energy storage enables facilities to lower immediate costs by reducing demand charges. Intelligent load management can also provide a valuable service to the grid itself, effectively transforming facility load from a cost to a revenue center.

Energy storage is a proven group of technologies that has been in existence for decades. Thanks to tremendous technological progress in recent years, there is now a wide range of affordable and reliable storage options available, and a host of major companies are now delivering grid-connected storage to the marketplace.

Energy storage 101

Energy storage can refer to a wide range of technologies and approaches to manage power. The technologies that are most relevant to commercial and industrial facilities include:

- **Solid-state batteries:** Batteries are often paired with an intelligent software system that can charge and discharge them based on a building's energy usage, weather patterns and historical use.
- **Flow batteries:** These are a type of rechargeable battery that allows energy to be stored directly in the electrolyte solution. Benefits typically include a longer cycle life and fast response times.
- **Flywheels:** These systems use electric energy that is stored in the form of kinetic energy. If power fluctuates or goes down, the rotor will continue to spin and the kinetic energy that results can be converted into electricity. Flywheels are useful for power quality and reliability.
- **Thermal storage:** Thermal technologies enable temporary energy reserves in the form of heat or cold. Ice storage, for example, works by making ice during off-peak hours when rates are low. When demand increases and rates go up, the ice system turns off the air conditioning and uses the stored ice to provide cooling.

Energy storage can be installed at many points in the grid, including factories and other commercial or industrial facilities. There are already many tens of thousands of grid-connected behind-the-meter storage systems installed at commercial, industrial and residential locations throughout the world.

What is the value of energy storage for facilities?

Storage can provide a wide range of benefits to facilities, and in many cases multiple benefits at once.

DEMAND CHARGE REDUCTION

Depending on location, many commercial and industrial facilities are subject to demand charges on their energy bills. These charges are based on the 15-minute period in which the demand for energy is highest throughout the day, and in some cases can account for 50 percent of the total energy bill.

While energy efficiency or solar photovoltaic can reduce total electricity consumption, these benefits do not always coincide with a building's peak usage. Energy storage systems, especially those paired with intelligent software, can track a facility's load and reduce demand charges by dispatching battery power during periods of peak demand, effectively "flattening" the load.

PARTICIPATION IN DEMAND RESPONSE PROGRAMS

Demand response for commercial and industrial facilities traditionally involves ratcheting down usage at times of peak demand. Energy storage can enable participation in demand response markets without impacting onsite energy use or operations. By responding to utility price signals, storage systems can increase financial returns from participating in demand response programs while also benefiting the grid overall.

MAXIMIZING TIME-OF-USE RATES

Energy storage systems can shift consumption of electricity from expensive periods of high demand to periods of lower-cost electricity during low demand. This reduces the risk of lowering the value of onsite solar if tariff structures change over time and peak demand periods shift to the evening when the sun isn't shining. This also allows facilities to make the most of time-of-use pricing and reduce tariff structure change risk to electricity costs.

ENVIRONMENTAL BENEFITS

Energy storage has many environmental benefits that can make it a valuable tool for meeting sustainability goals. By improving the overall efficiency of the power grid, storage accelerates the broader adoption of renewable energy. On a more local level, an energy storage system produces no emissions, so it can be placed anywhere in a facility with no immediate environmental or air quality impacts. And, if paired with solar photovoltaic, not only will the power be GHG-free, but in the U.S. the combined system is eligible for federal investment tax credits.

EMERGENCY BACKUP

Planning for emergency backup power is an essential part of a resilience plan. Historically, commercial and industrial facilities have invested significantly in local emergency backup infrastructure. With advanced storage solutions on the market today, there may be opportunities to upgrade this infrastructure to provide not only emergency backup, but also a host of other money-saving and revenue-generating solutions. Using this infrastructure on a daily basis for demand charge reduction ensures a higher level of reliability and availability during outages than standalone battery/diesel generators that are only used for outage events.

For example, big-box retailer Walmart recently installed energy storage at eight retail sites across California. These stores pair photovoltaic solar with battery storage to achieve financial savings and operational reliability. Walmart is working with SolarCity on the solar-plus-storage systems to provide both peak load reduction and emergency backup power.

In the event of a power outage, Walmart's critical load backup system is programmed to initiate a series of events to prevent unintentional islanding and to coordinate with the existing building management system that is utilized across several Walmart locations. The scale of these backup power systems goes beyond traditional solutions and is a significant operational advantage for Walmart. These systems are the first of their kind in providing backup power at this scale while also reducing demand charges.[3]

Tapping financial incentives

In many areas, commercial buildings can take advantage of financial incentives to install storage. In California, for example, the legislature has actively encouraged widespread storage development. Facilities in the state can benefit from the Self Generation Incentive Program (SGIP), which allocates US$83 million per year in funds to support new and emerging distributed energy resources. Historically, SGIP financing can cover up to 60 percent of the total project cost of a storage system.

In New York, storage is eligible for incentives under an enhanced load reduction program designed to manage the planned closing of the Indian Point nuclear power plant. Many other U.S. states also have storage incentives in place or are considering adopting them. FMJ

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Janice Lin is the director and founder of the California Energy Storage Alliance and the founder and chair of the annual Energy Storage North America conference. She has more than two decades of experience in clean energy strategy, market development and corporate strategy. As founder and managing partner of Strategen Consulting, she has advised a diverse range of clients including renewable energy equipment manufacturers and service providers, large corporations diversifying into clean energy, and real estate developers building sustainable communities.

WANT TO LEARN MORE?

Energy Storage North America (ESNA) is holding its annual conference and expo in San Diego, California, USA, on Oct. 4-6. The conference will enable facility managers to better understand the steps needed to procure and install storage and meet leading project developers. ESNA features a conference track for facility and energy managers to share case studies of solar plus storage, demand charge reduction, electric vehicle charging and outage resiliency use cases. IFMA members attending World Workplace are eligible to attend the ESNA expo on Oct. 5 at no charge using code ESNA16IFMA. Registration information is available at esnaexpo.com/attendees/registration.

ASK THE EXPERTS

BY IFMA'S FACILITY MANAGEMENT CONSULTANTS COUNCIL

IFMA™ FM Consultants Council
International Facility Management Association

In each issue of FMJ, IFMA's Facility Management Consultants Council shares some commonly asked FM-related questions accompanied by advice from top FM consultants. The questions and answers presented in this section align with IFMA's core competencies following the themes outlined for the given edition of the magazine.

While the following answers are intended to be helpful, these responses should not be deemed complete and are limited in context by the space allocated. Please contact the individual consultants directly for further explanation of the opinions expressed.

The theme of this edition of FMJ is **"Sustainability."**

The Facility Management Consultants Council (FMCC) represents more than 300 FM consultants from various countries around the globe. Its mission states, "The FMCC is the resource and voice for facility management consultants worldwide to leverage our collective expertise to benefit IFMA members, and the facility management profession."

Questions regarding the Ask the Experts section of FMJ can be directed to Mark Sekula, CFM, FMP, LEED AP, IFMA Fellow, president of Facility Futures, Inc., at msekula1@wi.rr.com.

Visit FMCC online at fmcc.ifma.org or join the conversation on the council's LinkedIn group at http://linkd.in/1gAa8ae.

QUESTION: You have a client whose sustainability activities have been limited to recycling. The facility manager is interested in implementing a sustainability program at her organization's corporate headquarters located in a large metropolitan suburban office park (250,000 square feet/23,225 square meters with approximately 1,200 occupants). Eventually the FM wishes to expand the sustainability program to the rest of the organization's real estate portfolio (five additional office buildings in geographically distributed locations totaling 1 million square feet/93,000 square meters). What advice would you provide the FM to get the program started?

ANSWER:

1. **Water recycling.** Gray water from wash basins could be filtered, cleaned and reused for flushing toilets or for landscaping, facility cleaning, etc. The first step for the FM is to investigate current water consumption and relevant costs, and analyze return on investment and payback period if investing in water recycling plants. Financial analysis must also consider the running costs of such systems (maintenance, spare parts, chemicals and staff resources).

2. **Paper recycling.** This should follow the same scenario as water. The purchasing department should be able to provide data on the quantities of office paper purchased each year by the company, and also breakdowns of which business units are placing the requests on a monthly basis. Copy machines and printers could also be programmed to track the number of copies and printouts made on a monthly basis per user and per business unit.

ANSWERED BY:
Dr. Hany M. Idreis, Sc.D, FMP
Jeddah, Kingdom of Saudi Arabia

Dr. Hany Idreis holds a Doctorate of Science in work environment policy from the University of Massachusetts Lowell. He is qualified by the National Examination Board in Occupational Safety and Health, an ISO 14001 lead auditor and holds the Facility Management Professional™ (FMP®) designation. He works as a head of health, safety and environment for Abdul Latif Jameel Co. (the sole distributors of Toyota, Lexus and Komatsu in Saudi Arabia for more than 11 years).

ANSWER: My advice to this facility manager would be to investigate the Sustainability Facility Professional® (SFP®) credential through IFMA. (In an ideal world, the consultant would also hold this designation.)

The SFP courses would teach her how to reach out and convince upper management of the benefits of sustainability. Through the first module (Strategy & Alignment for Sustainable Facility Management), she would learn organizational strategies, sustainability considerations and how to establish goals and initiatives and then reach them. Getting corporate buy-in would be a major step in the right direction.

The second module would guide her in actually managing the facility sustainably. This would include developing sustainability policies, integrating sustainability in FM plans and learning how to develop and implement programs. It would also teach her about financial benefits and arguments that will help in talks with corporate management.

The third piece is the actual nuts-and-bolts approach to operating the facility. This module explains how a focus on sustainability can augment operations and maintenance and assist in streamlining processes and improving efficiency. Dollar savings and cost avoidance will further strengthen her case for sustainability programs.

Sustainable facility management is a long-term process. The SFP is the best avenue for an FM to learn about how to have success through sustainability. If the FM is not able to go this route, then the next best thing would be to have a consultant who is conversant with these precepts who could serve as a mentor. Either way, though, the best counsel I could offer would revolve around the SFP.

ANSWERED BY:
Bill Conley, CFM, SFP, FMP, LEED AP, IFMA Fellow
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Bill Conley has more than 40 years of experience in the facility management profession and has been a proponent of sustainable operations for more than 25 years. During his tenure as a facility manager and through his training and experience with sustainable operations, Conley has come to understand the importance of the facility contribution to the financial success of a company. He is a past president of FMCC, a member of IFMA's Environmental Stewardship, Utilities and Sustainability Strategic Advisory Group and an IFMA Qualified Instructor. He currently serves as Facility Manager for Yamaha Motor Corporation in Cypress, California, USA.

ANSWER: This client, like any FM who relishes our profession, looks forward to analyzing, organizing and presenting a sustainability business case to top management, especially if financial, environmental and social return on investment are all in play. So get going! Considerations of scope, technologies, goals, teams, project management and a highly visible small project to start — these are bread and butter in FM.

Whoa! Hold on a minute. Is sustainability a top-tier theme in the client's company now, with a corporate strategy and objectives? Are the client and her top management well and clearly aligned about expanding or elaborating sustainability programs? Who in top management champions sustainability? Or, on the other hand, perhaps this client needs a partner in her initiative to open the C-suite to thinking of sustainability as a corporate principle that warrants strategic consideration. These are widely different scenarios.

Now, communication: She should find out as soon as possible how sustainability is understood as a concept and held as a value in the headquarters culture of 1,200 souls, and build a communications plan to implement prominently and indefinitely. Yes, staff now take part in recycling, but the program will soon go beyond recycling, with changes that may inconvenience employees and require new knowledge and processes. At the same time, 1,200 employees can be a great force of ambassadors in the communities where they live, with suppliers and customers, with regulatory and political officials, and with people at the five other sites mentioned. Staff there will be ready to take up the cause if they have heard good things.

With strategic alignment assured and communications planned, the client can get on with forming teams, work processes and measurements, schedules, technology choices, cash flows, and so on, to get something done — a pilot project, at least. We are, after all, FMs.

We thrive on doing these things, whenever someone will let us. But be sure of the strategic management and cultural aspects first and set your targets accordingly.

ANSWERED BY:
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David Reynolds is with FM-CONSULT-CREATE. He joined FMCC in 2014, is a recent CFM and has held an FMP since 2004. His background is in systems, project management and consulting in small companies serving a variety of clients and industries. He holds degrees in science, engineering and allied health areas.

He focuses on FM as organizations adopt asset and risk management principles and practices, where clear, visible, interactive, maintainable, processes and models, data and measurements can better frame FM in alignment with organization strategies and objectives. Reynolds' pro bono work includes construction, maintenance, safety and health. He is also a member of IFMA's Operations and Maintenance, Health and Safety Community.

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