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Responding to a historic drought, the nation's busiest airport upgraded restrooms and plumbing systems to reduce water use



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By Marty Silverman – General Pipe Cleaners

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The 'Softer' Side of Maintenance Management

Dan Hounsell, Editor

So many of the daily activities in maintenance and engineering departments involve tangible things, such as roofs, boilers, mowers, and plumbing fixtures.

Even for those things related to maintenance and engineering that are not exactly tangible — software and regulations, for example — managers can see them and share them. They seem tangible, anyway.

Given this tangible, physical nature of the profession, it is understandable that managers might not pay as much attention to so-called soft skills. But two articles this month offer managers clear and compelling evidence that these skills are just as important — and in many cases, more important — than the technical skills departments tend to focus on.

Take listening, for example. In the Roundtable this month on page 19, Dave Lubach, our associate editor, talks with managers about the challenges of personnel management. The response of one manager to a question about the

most effective strategies in managing people stuck out: "Listening, listening, listening and, of course, listening."

Now consider the process of data analysis, which might seem pretty dry and academic. But in the context of learning from equipment failures in facilities — see Michael Cowley's Management Insight column on page

6 — the process of gathering and analyzing all possible information related to a failure is essential in finding its causes and preventing it from happening again, thereby cutting costs and freeing up staff for more productive work.

No doubt, the emphasis on technology and technical skills in maintenance and engineering departments will remain essential in ensuring facilities operate efficiently, safely, and cost-effectively. But managers who can develop and use so-called soft skills in their everyday activities will have a wider array of tools to work with in helping their departments achieve these goals.

Dan Hounsell offers observations about trends in maintenance and engineering management and the evolving role of managers in facilities.

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In or Out? The Outsourcing Conundrum

Dave Lubach, Associate Editor

Maintenance and engineering managers often view outsourcing as a potential solution to mounting workloads in many institutional and commercial facilities.

But while the controversial strategy can address these issues, managers should not make the decision to outsource a task or project lightly. Paul Adjan, facility manager with the Glynn County Airport Commission in Brunswick, Ga., tries to avoid outsourcing when possible. What are his concerns?

Loss of control. Retain control of key decisions.

Wasted time. Avoid time spent explaining building systems to vendors when in-house technicians probably know them better.

Quick fixes. Some contractors tend to work quickly and gloss over important details essential for the safety of staff and occupants.

High initial costs. Avoid proposals that could cost more than handling the work in-house.

Adjan's concerns are valid, but I would add one more concern to the list: life-cycle considerations.

Contractors tend to focus on the short term — getting a signed contract for the project in question.

Once they're done, it's on to the next job, regardless of the quality of the completed job. Managers — especially those in facilities that are not likely to be sold or replaced any time soon — have no such luxury and need to take a longer view. They have to live with the results of the finished project.

By keeping work in-house and focusing on long-term performance, managers are more likely to deliver higher-quality work that costs less.

Dave Lubach offers insights gleaned from conversations with maintenance and engineering managers in institutional and commercial facilities.

Warren discusses the development of his department's web-based training program to improve worker safety

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EXECUTIVE OFFICES

2100 W. Florist Ave.
Milwaukee, WI 53209-3799
(414) 228-7701; fax: (414) 228-1134
E-mail: dan.hounsell@tradepress.com

CORPORATE

President/CEO
Robert J. Wisniewski
bob.wisniewski@tradepress.com
Senior Vice President of Client Solutions
Brad R. Ehlert
brad.ehlert@tradepress.com

COO/CFO
Jeff Schenk
jeff.schenk@tradepress.com

Publisher
Brian J. Terry
brian.terry@tradepress.com

Vice President – Content Development
Dick Yake
dick.yake@tradepress.com

Editor
Dan Hounsell
dan.hounsell@tradepress.com

Associate Editor
Dave Lubach
dave.lubach@tradepress.com

Production Director
Bobbie Reid
bobbie.reid@tradepress.com

Production Manager
Wendy Melnick
wendy.melnick@tradepress.com

Director of Audience Development
Eric Muench
eric.muench@tradepress.com

Customer Service Manager
Steve Soller
circulation@tradepress.com

Vice President of
E-Media & Creative Services
Wayne Winter
wayne.winter@tradepress.com

Creative Director
Jeff Giencke
jeff.giencke@tradepress.com

Graphic Designer
Emily Hawkins
emily.hawkins@tradepress.com

Electronic Production Coordinator
Jon Warner
jon.warner@tradepress.com

For reprint pricing email:
reprints@tradepress.com

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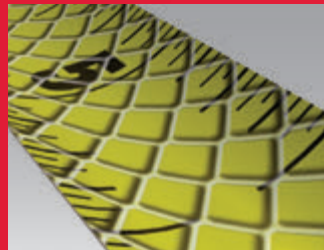
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Michael Cowley, CPMM, is president of CE Maintenance Solutions — www.cemaintenancesolutions.com. Cowley provides maintenance training, coaching and consulting services to facility and manufacturing organizations nationwide. He is a frequent speaker at national facilities management conferences.



Michael Cowley

Preventing Failures By Learning From Them

For nearly as long as anyone can remember, maintenance and engineering managers have been asked to do more with less. We are constantly asked to cut staff, overtime, and spending on contractors, parts and supplies. The only way to meet these demands effectively is to function more efficiently, which in turn means reducing reactive or emergency work and increasing preventive maintenance (PM) and predictive maintenance (PdM).

But despite the best efforts of managers and their staffs, emergencies still happen in institutional and commercial facilities — generally, at the least opportune times. Boilers break down, roofs leak, toilets back up, and nature ultimately takes its toll on building materials and components. The most common response to emergencies is to quickly repair or replace the problem component and move on. This approach is understandable, given most departments' workloads.

But for managers who are truly serious about getting the maximum productivity and efficiency from their front-line technicians, a smarter strategy might be to learn from the failures and apply the lessons to the department's activities and priorities.

What is an emergency, anyway?

The key to learning from emergencies and failures is to spend a little time with every catastrophic event — or for that matter, any significant breakdown — and do what you can to prevent it from happening again. We all know that in leading-class companies around the world that have great maintenance organizations, the primary focus is minimizing the reactive work and maximizing the proactive activities, such as PM and PdM.

To get this ratio moving in the positive direction and fine-tune your maintenance processes, you must continuously adjust and improve your proactive activities. So every time you experience a significant problem or failure, you need to ask yourself, "How we could have prevented this from occurring?"

What is an emergency or significant failure? Every industry and facility defines a catastrophic failure a little differently, but a good rule of thumb defines it as any breakdown or failure that causes a system or major piece of equipment to actually fail and shut down, either automatically or manually. A second definition is any situation in which you need to change assignments for a significant number of your staff to resolve a breakdown or failure.

A third definition describes situations in which you have a reduction or unplanned disruption in the performance of your facility that causes changes in the planned performance schedules. A final definition covers instances in which a significant expense is incurred trying to restore an asset, system or building to its normal operating condition.

Finding the answers

Now that we know what an emergency is, let's figure out what to do when they occur. Consider these questions and recommended actions in the aftermath of a crisis or failure:

What happened? Gather all of the details about the failure, and question all technicians and supervisors involved in the repair. Visit the site personally, remembering it is always better to touch a situation yourself instead of relying on reports from others about the details of the failure. Make sure you have a good handle

equipment history since installation — a process that requires a well-managed work-order and asset-management system. Look for similar failures in situations that have occurred in the past that might have contributed to the most recent failure. The goal is to discover tangible steps that can be put in place to prevent failures in the future.

What is the work-order history?

Examine the last year's worth of work orders for the asset or component, looking for signs or evidence of problems that might have led to the failure. What we are looking for are signs or symptoms we should have noticed that could have prevented the failure.

What did PM inspections reveal?

Review the last year or two of PM inspections for the asset or component. In theory, these inspections and procedures catch all potential failures. That is the purpose of the PM program. Look closely at the procedures, task lists, and checklists for all failures. The key might be in the details. Look especially closely for items that were found and hopefully repaired. Did any of these discrepancies contribute to the current failure? Were they repaired properly, and were they fixed in a timely manner? Could improved or modified PM procedures have prevented the failure?

With answers from all of these questions in hand, it is time to modify your PM procedures and inspections to reduce or eliminate the possibility of future failures. Don't forget that the key to eliminating or reducing catastrophic failures is constantly striving to improve your PM program.

In lieu of buying new assets and equipment each year, improving your PM program is the only way to effectively create a leading-class maintenance culture and remove the chaos and daily failures from your facilities. ■

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The key to eliminating or reducing catastrophic failures is constantly striving to improve your PM program

on the sequence of events leading up to and following the failure. Take pictures of the failure, if possible, knowing that recreating the circumstances that led up to the failure will be difficult once the repairs have begun.

Who or what caused the failure, if known? If possible, determine if someone or something caused the failure, such as operator error, improper maintenance techniques, low-quality parts, or factors and causes completely outside your control.

What is the history of the asset or system? Review the asset, system, or

The ABCs of Inventory Management

Attention to software issues and storeroom logistics can lay the groundwork for a reliable flow of spare parts and equipment

By Frank Murphy

Perhaps the biggest challenge facing many maintenance and engineering managers — whether they realize it or not — is the state of their departments' inventory management systems. These essential systems ensure a reliable supply of spare parts and equipment for front-line technicians, but they often are among the most inefficient, misunderstood and potentially money-wasting systems in institutional and commercial facilities.

Bringing efficiency to inventory management requires managers to address several core issues — software needs, storage options, and product identification — that might at first appear basic but are, in fact, the cornerstones of a streamlined operation. By understanding the role each plays in inventory management, managers can make decisions that ultimately deliver greater technician productivity and lower operating costs.

Software solutions

The first step in streamlining inventory management is installing a computerized maintenance management system (CMMS) or, for departments with a CMMS that no longer can meet the daily demands of maintenance, replacing the existing software.

Managers can select from among many fully functional and reasonably priced systems, but it is important to select one that is bar-code capable and that allows the parts inventory module to interface with modules for equipment history, preventive maintenance (PM), scheduling, work-order management, and purchasing.

The CMMS is an invaluable tool that streamlines, coordinates and plans most maintenance functions, and it allows managers to schedule shutdowns, outages, and routes for PM and predictive maintenance. It also can ensure that the spare parts and supplies required for these activities are either reserved for that activity or are ordered ahead of time so they are available when needed.

Because the CMMS links the inventory and work-order modules, the work order includes a list of parts that are checked out to the work order using bar-code technology. The storeroom operator logs on to the portable bar-code scanner, registers the work order, the parts' locations, and

the parts to be issued and then enters the quantity to be issued.

The work order contains equipment, cost center, department and other charge-code numbers, so when a technician closes the work order, the CMMS records the various costs for chargeback — along with subsequent costs for maintenance labor hours and parts — to a history file.

When the storeroom supervisor issues parts, the inventory module generates a report on parts levels that have fallen to or below the reorder point and sends that information to the purchasing module, which sorts and groups parts by vendor for reordering. Most software will transmit these purchase orders directly to the vendor.

Shelving and storage

One common question regarding a storeroom's capacity is, "How do I get 25 pounds of sand in a 10 pound bag?" Managers asking this question regarding inventory management want their storerooms set up neatly and organized efficiently so parts are available and accessible.

The size of the storeroom is a major consideration. The available space must be designed not only to provide the maximum storage capacity. It also must provide the greatest amount of space for storage and the maximum parts density the storage units can deliver.

The required size of the storeroom, its placement in the facility, the condition of the floor, the position of light fixtures and other lighting, the number and size of doors, the available vertical space, and climate control are factors managers must consider. Managers also must take into account whether there is a mezzanine over the parts room and, if so, its size, access doors for pedestrian and fork trucks, under-mezzanine lighting, and fire-sprinkler systems.

One key consideration is the location of the storeroom clerk or operator's office. Some facilities erect an 8- by 20-foot modular office at the entrance to the storeroom, which provides enough space for a two-person office, office furniture and computer stations. The office must include computer drops, as well as electrical drops



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and outlets both inside and outside the office. Installers also might need to place electrical drops within the storeroom on walls or on roof-beam support columns.

The shelving units must fit safely and neatly within the storeroom and be functional for the parts they store. The existing storeroom space — as well as the kind of parts they must hold — will dictate the size, style, type, and number of fixtures. Home-made shelving units generally are space-wasters, and inexpensive shelving units found at home-improvement stores are not sturdy enough. While they might be less

expensive, they are not designed for storing the heavier parts most storerooms must accommodate. Overall, a parts storeroom must be a safe and efficient workplace that enables the rapid location of and easy access to needed spare parts and equipment.

The storeroom clerk must ensure nothing is stored in the storeroom's aisles or in front of the pallet racks. Large motors, pumps, gearboxes, cylinders, and machine components require heavy-duty pallet racks, while most other parts occupy shelving that is generally 12-18 inches deep, with bin boxes holding some smaller parts.

Modular drawers are the most space-efficient method of storing smaller parts, but they also are more expensive than shelving.

The most common mistake managers make in setting up a storeroom is selecting fixtures that fall well outside these parameters. They too often buy more storage units than needed, and they turn them over to storeroom clerks who have little experience or familiarity in assembling these fixtures.

Labeling and identification

When it comes to locator schemes for parts and equipment for effective inven-

tory management, the best guidance for managers it is to keep it short and simple. Each spare part requires only a five- or six-digit number, which becomes the bar-code number and appears under the bar code on the part or part-locator label.

The parts record in inventory module of the department's CMMS contains other required descriptors and information, such as OEM number, description, type, manufacturer, model, serial number, and vendor. The bar-code number in the CMMS is the primary link to all of this data.

Part locator methods can be a bit more flexible. For example, managers can identify shelving rows by letter — A, B, C and so on. Shelf numbers appear sequentially along the row — A-01 through A-82. Then they can identify pallet racks (PR) by sequential beam numbers — PR-01 through PR-16 — while drawer cabinets (DC) follow the same sequential method — DC-01 through DC-10) with drawers sequentially numbered.

Satellite storage areas in other buildings or remote locations can use a short two- or three-letter and number code that identifies that location, such as pump building (PB) or Warehouse 2 (WH2), followed by the shelf location of the part — PB-A48 or WH2-PR27. Attempting to put other identifiers into either part or part locator methods is unnecessary, complicates the simple and direct solution, and can create confusion.

For gray shelving, the clerk can attach 1-inch black-on-white label tape in the center of each shelf edge. Locator identification tapes can go to the left side of the shelf edge, and both can be set up as bar-code labels. Placing parts identification labels on the shelf edge is not recommended because parts can be moved on and off the shelf inadvertently or relocated, or they can become obsolete, which can result in recording the wrong part number in an inventory, generating inaccurate information.

If a part's surface is non-adhesive or does not provide space for a part label, the clerk can place the identification tags on the bin box containing it or on a manila tag attached to the part. These labels contain the bar code and bar-code number. Clerks also can mark pallet racks and shelving ends with 4-inch, black-on-white or black-on-yellow label tape. Drawer cabinets use similarly colored 2-inch label tape.

Once the department approves and finalizes the step-by-step storeroom setup plan for effective inventory management, the physical setup can take place. Before the project begins, storage fixtures should be on site, and installers should remove junk and obsolete and damaged parts from the storeroom. If a storeroom redesign or relocation takes place, managers can arrange for a temporary laydown area to enable access to the parts. ■

Frank Murphy, CPMM — Frank@sosims.net — is president of Inventory Management Services Inc. He has 30 years of experience in storeroom setup and modernization.

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Control systems for boilers and water heaters have become more user friendly in recent years, as more information is available to operators and the ability to monitor systems using mobile devices has improved.



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Energy Strategies

Boilers and Water Heaters: Post-Installation Issues

Managers face training, testing and maintenance challenges long after units are up and running to achieve sustainability goals

By Dave Lubach,
Associate Editor

When replacing boilers or water heaters in institutional and commercial facilities, maintenance and engineering managers must ensure the project meets a series of important goals, including reliability and life-cycle costs. The new equipment also must deliver increased sustainability in the form of energy efficiency.

But sustainability considerations do not end once installation is complete and the unit is up and running. Training and inspection considerations, testing and maintenance strategies, and the specification of diagnostic tools and technology to help technicians carry out proper maintenance are all important factors to consider to ensure boilers and water heaters operate at maximum efficiency and offer a significant return on investment.

The good news for managers specifying boilers and water heaters with sustainability and long-term performance in mind is that, thanks to improving technology, the overall performance of boilers and the ability to maintain them has never been better.

“The information that’s provided by many of the new water heater and boiler controls makes maintaining and efficiently operating the equipment a whole lot easier,” says Matt Schulz with A.O. Smith Corp.

Initial considerations

Once boiler and water heater installation is complete, managers need to address three basic but necessary factors to ensure units to perform as designed, says Michael Gambill with Weil-McLain:

- budgeting of funds for routine maintenance and system repairs
- using software to maintain records of maintenance needs

- deciding whether to perform maintenance in-house or outsource to a licensed contractor.

Manufacturers say that venting issues often lead to critical problems with startups of boilers and water heaters. For example, venting that runs too long or has improper terminations can shorten the service life of a boiler or water heater.

“Venting and gas-pressure problems are our primary problems for startups on boilers and water heaters,” says Howard Holliman with A.O. Smith. “A lot of products are vented out the side wall or direct-vented, so going side wall, we’re limited in distance. It seems like no matter how far we can vent, they always need to add just a few more feet to it.”

“With gas pressure, facilities usually have an undersized gas piping, or regulators aren’t properly sized for the equipment, and it causes hard starts and other issues.”

Smarter boilers

Boilers and water heaters used to provide only the most basic information, such as a digital readout of temperature and fault codes, to operators. Once alerted to a fault code, operators then had to consult with the owner’s manual to determine issues that needed attention.

In recent years, control systems have become much more user friendly, providing more information to operators. The ability to monitor boilers and water heaters using mobile devices adds another dimension of convenience and efficiency.

“These days, boilers are expected to be smarter,” says John Kopf with Weil-McLain. “For example, boilers are expected to communicate with the building automation system (BAS). New controls are expected to be plug and play, intuitive and informative.”

Bonus Info

- Even a barely visible accumulation of soot can reduce a boiler’s efficiency by up to 10 percent. If the soot accumulates for several years without a cleaning, it is common to find efficiency has declined by 20 percent or more.

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With the goal of reducing energy use on the minds of managers, the ability to track the number of failures and errors in a system gives operators more precise information about inefficiencies and helps them find mistakes and correct them faster.

"To be able to walk up to a water heater and boiler and pull out fault code history, you can quickly pinpoint areas to look at," Schulz says. "If a unit has a history of vent problems, or condensate, blockage or igniter issues, along with the different fault codes, it just speeds up the diagnostic time for that."

Modern boilers also have made it easier to conduct staged turndowns when reduced workloads allow, or to equalize run hours between multiple boilers, to ease the demands on the lead boiler and optimize energy efficiency.

"Boiler efficiency typically runs best between 30 and 60 percent of load," Kopf says. "When you run one boiler at full load, it's less efficient than when you have two or three running at 40 to 50 percent of load."

Training recommendations

One easy place for managers to start the training process is to ensure operators know the ins and outs of a specific boiler or water heater.

"Whoever your manufacturer is, get the basic training on how it should be installed," Kopf says. "Then (address) the piping and venting controls, and get more product-specific as you go along."

Learning to use a manometer to measure gas pressure and knowing good venting practices are also essential steps in the training process, as is developing knowledge of piping design.

"A lot of manufacturers include video testing on a number of specific products," Schulz says. "This is a great way to get a better understanding of how the controls work and how to set it up, as well as testing procedures."

"Another good tool is the service manuals. I think our industry does a relatively good job of providing detailed service manuals with detailed photos of where to test for electrical connections and how to troubleshoot. We've got pretty lengthy service manuals that are product-specific."

Gambill says proper training should include these three facets:

- Identifying the right boiler application: "There are so many different boiler models (that) explaining each model's capability is important for each different application. Have a clear understanding of the application for the right type of equipment."
- Knowing how to troubleshoot: "Once the technician knows the application, they need to be trained on how to diagnose a problem."
- Training for maintenance: "Routine scheduled maintenance training should be done at the same time troubleshooting training is conducted."

Regular checkups required

Following manufacturers' recommendations with regard to annual maintenance, startup testing and shutdown is

important for operators when trying to ensure long-term performance of boilers and water heaters.

Other important factors to consider are the quality of water flowing through the systems and the cleanliness of the area around the unit to prevent chemicals from seeping into supply water.

"Make sure water chemistry is proper for the boiler, so take water samples, and see if there is any need for an inhibitor," Kopf says. "Regardless of the type of boiler, the water should be treated to keep the pH level at the neutral level. With time, there are some leaks, or you need to add water, and you

just keep adding clean water and changing water chemistry. On an annual basis, you should check the chemistry and add inhibitor when needed."

In addition to regularly inspecting areas such as the vent run and expansion tank for water heaters, managers should make sure boiler rooms and water heaters are clean and free of products, such as soap, salt and other chemicals.

"Those kinds of items tend to shorten the life of a water heater," Holliman says. "They're very corrosive and cause the water heaters to fail early. It's also important to keep the boiler room clean and free of con-

taminants, such as salt for the water softener, and paint. If you're going to keep it in there, it has to be in air-tight containers, not contaminating the combustion unit."

A combustion analysis is recommended every two years to ensure the unit keeps running at peak performance, Holliman says.

"A lot of times, we'll be happy to look at combustion reports," he says. "We can tell a lot by looking at the combustion analysis of the unit whether it has the proper amount of combustion air or the vent's blocked or something like that." ■



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Atlanta Airport's *Sky-High Savings*

HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

A restroom retrofit at Hartsfield-Jackson Atlanta International Airport — the nation's busiest — consisted of replacing 1,391 toilets, 651 urinals, and 1,181 water faucets to help reduce water use.

Responding to a historic drought, the nation's busiest airport **upgraded restrooms and plumbing systems** to reduce water use

By Dave Lubach, Associate Editor

When historic drought conditions seriously threaten living conditions in a significant part of

the country, institutional and commercial facilities of all kinds feel the heat.

Such was the case in Georgia in 2007, when record dry conditions — reported as the worst in more than 100 years — made for difficult living conditions in the Atlanta area. For one of the first times in U.S. history, a major city was forced to take drastic steps to keep from running out of water.

Hartsfield-Jackson Atlanta International Airport was no exception to a state mandate that required public water system providers to reduce their use by 10 percent. In response to the conditions and the mandate, the airport began a major water-conservation initiative in early 2008 that included a significant retrofit of the airport's restrooms, which serve more than 90 million passengers a year.

As the drought eased and conditions returned to normal in 2009, the airport's water-conservation efforts continue to expand, with additional initiatives such as rainwater harvesting and low-water use landscaping, aimed at reducing energy savings 20 percent by the year 2020.

"We've always been good stewards of our resources," says Sharon Douglas, the airport's sustainability manager.

"We were looking for (projects) to save us water and money, even before the drought. We try to implement the latest and greatest technology that has the lowest impact on our resources."

Taking the plunge

The drought conditions were so severe in the southeast in 2007 that the state's governor asked residents to take part in vigils to pray for rain, and the general public was concerned that Lake Lanier, the main source of water for the Atlanta area, would dry up.

The airport is one of the state's top facilities in terms of water use, so officials were ready to do their part. In the process, they realized the time was right for the airport to make a long-term commitment to a sustainable water savings plan.

Merely because of the size of the facility and constant traffic, a restroom retrofit is a massive effort for the airport. It sits on 4,700 acres of land, including buildings and runways. The concourses and international and domestic terminals occupy 130 acres, or 6.8 million square feet — an expanse larger than the Pentagon. The restrooms must endure the constant traffic flow of more than 250,000 daily airline passengers, in addition to 58,000 people employed at the airport.

Because the water reduction request was a state mandate, the project's scope, schedule and budget were set by a state agency. A contractor hired by airlines servicing the airport to operate and maintain

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the passenger terminal complex handled the installation, says Tommy Davis, the project manager. The restroom retrofit had a budget of \$5 million, and work took place between the hours of 11:30 p.m. and 4:30 a.m. to avoid working during the airport's heavy traffic during the day.

The retrofit consisted of:

- removing 1,391 toilets with a rate of 1.6 gallons per flush (gpf) and replacing them with 1.28 gpf models
- replacing 651 1-gallon gpf urinals with 0.5 gpf units
- retrofitting 1,181 water faucets with flow rates between 1 gallon per minute (gpm) and 2.2 gpm with high-efficiency faucets with flow rates of 0.5 gpm

The whole installation process took less than a year to complete. Payback for the project was estimated at three years, but the return on investment was two years, Douglas says.

"There were no impacts to regular operations, including no impacts to passengers that travel through the airport every day," Davis says. "And we received the expected savings. The project was completed within the scope, schedule and under budget by almost \$62,000. Our benefits have included a 10 percent or more reduction of water usage year over year since the project's inception."

The airport realized an immediate and drastic reduction in water use because of the retrofit. In 2008, the airport used 308

Closer Look: Restroom Retrofit

Sharon Douglas, sustainability manager, and Charles Marshall, utilities manager, at the Hartsfield-Jackson Atlanta International Airport, discuss the facility's efforts to reduce water use at the nation's busiest airport.

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In 2008, the airport used 308 million gallons of potable water in the central passenger terminal complex. By 2011, water use dropped to 253 million gallons — an 18 percent reduction

million gallons of potable water in the central passenger terminal complex. By 2011, water use dropped to 253 million gallons — an 18 percent reduction. The airport has saved about 55 million gallons of water each year since the project was completed.

A bump in the road

The contractor's initial plan was to only replace flush valves on existing urinals and toilets, but the contractor scrapped those plans after complaints from customers during test installations.

Not surprisingly, Davis says that maintenance and engineering managers who take on a plumbing project should use



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Sustainability efforts at Hartsfield-Jackson Atlanta International Airport also included replacing steam chillers with electric chillers in an effort to save more than 10 million gallons of water a year, as well as collecting rainwater used for washing the airport's rental car fleet and irrigating turf and plants.

components from a single manufacturer to ensure smoother operations. And, he advises, be sure to consider different options before making a decision on which manufacturer to go with.

"We received a number of complaints from our customers about water overspray from the urinals, and we decided that it was necessary to replace the flush valves and urinals and toilets using the same manufacturer for each," Davis says.

"We suggest that prototypes are installed before selecting the preferred manufacturer. By installing prototypes from three different manufacturers, we were able to obtain feedback from the public and our maintenance department on the performance of the fixtures. Thus, we made our final equipment selection based on the performance, maintenance, availability of parts, and budget."

No setbacks occurred in terms of time and cost to the project, because contractors identified the issue early in the planning phase, before procurement and construction began. Since the project was completed, the contractor in charge of maintenance on the toilets, urinals and sink valves has reported no significant issues, Davis says.

Wait, there's more

The restroom retrofit helped the airport take a significant step toward saving water, but it was just the first step in a much stronger sustainability program.

One year after the restroom project, the airport replaced its steam chillers with electric chillers. The airport expects to save more than 10 million gallons of water a year because of the change.

Another water conservation project involves rainwater harvesting and low-water-use landscaping. The airport's maintenance department installed three 2,500-gallon cisterns to capture water runoff from a roof to use for irrigation purposes on the property.

Reclaimed water also is responsible for 80 percent of the airport's water used for washing the fleet of rental cars. The airport use storm water collected from the new international terminal that opened in 2012 for harvesting and irrigation purposes.

The initiatives are part of the airport's sustainability plan to curtail energy savings 20 percent by 2020.

Included in that plan is a water audit that is looking at ways to save water not only in the concourses and terminals, but also in the airport's buildings. ■

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Flooring Update: Changes Under Foot

Technology advances and sustainability considerations are leading managers to rethink decisions on carpet, tiles and wood floors

By Lewis G. Migliore

The floor covering industry is being inundated by more new technology and styling trends than ever. Products, construction, styling and installation technologies are changing so fast that it is nearly impossible for maintenance and engineering managers to keep up with the changes.

Of all building materials, floor coverings of all kinds are changing most, and attitudes about floor coverings are changing, as well. The green movement has many managers reconsidering floor coverings as they look for alternatives to the most common products, such as carpet and vinyl.

But managers' interests are not always well thought out relative to the ramifications of alternative green flooring products. Certainly, some floor covering products are made from natural materials, most of which have been in existence for decades. But these products are not always the most appropriate for a particular institutional or commercial facility, and they might not work best in a particular application. Beyond that, there have been changes recently in the way they are produced and installed.

A closer look at the many changes in floor coverings can help managers make specification decisions that more successfully meet their facilities' needs.

Color considerations

Flooring materials, particularly carpet tiles, are using lighter colors, including bright yellow and pink. Though the colors are stunning in their brilliance and visual impact, they have drawbacks.

Yellow flooring, in particular, is difficult to get and keep clean. Such bright colors might work in low-traffic areas, but in high-traffic areas, they are likely to create more frustration than managers and staffs need.

For high-traffic and high-soiling areas, managers should select colors that will hide the soiling. Light colors still show the soiling more, while dark colors show lint and dust, and medium colors hide the most staining. Patterns with colors blended or shades of a medium color or even some lighter color accents also work well and evoke more of a design element.

Imagination is the only limitation in creating almost any conceivable style and pattern. Carpet tufting and weaving machines can produce almost any design, style and pattern imaginable. This flexibility also exists in many hard-surface flooring materials. Installations themselves can become more creative by mixing materials, colors and designs.

Vinyl tile decisions

Luxury vinyl tile (LVT) is more a style variation than a material variation, though certainly differences exist between LVT and vinyl composition tile (VCT).

LVT typically is warmer and softer and more capable of looking like stone, wood and metal. It comes in tiles or planks, and some stone variants can even be installed with grout that is made for these products, which emulates ceramic tile, and it is more luxurious in appearance and color than VCT. It also is the hottest hard surface flooring material on the market.

VCT also is a composite material. It is used most often in commercial applications, such as grocery stores, drug stores,

and hardware stores. It is a workhorse hard surface flooring material.

PVC-free vinyl flooring material also has emerged recently. This product is used as an alternative to sheet vinyl and tile flooring products. It has high performance characteristics, will fight indentations from the weight of heavy furnishings, and uses an applied adhesive that thwarts the effects of moisture and alkalinity.

Natural flooring

Cork, rubber, bamboo, linoleum and wood fall into this category of flooring products. Three of these products are wood-type flooring or contain wood materials.

Hardwood is cut entirely from a particular tree, such as oak, cherry or mahogany. Engineered wood has a face of a particular type of wood, but beneath that is layered, in opposing directions, wood material that provides stability. Hardwood has a tendency to react more with changes in environmental or substrate conditions and should only be used above grade. Engineered wood is more dimensionally stable and can be used below grade.

Of all building materials, floor coverings are changing more dramatically than most, and so are attitudes about them.

The green movement has many managers rethinking their approach to floor coverings as they look for alternatives to the most common products, such as carpet and vinyl.



One important fact to remember about wood is that it is a tree cut into flooring material. As a result, it will do the same things on the floor that a tree does in a forest — gain and lose moisture, expand, contract, crack, warp, distort, dent and scratch, regardless of the finish. These characteristics are not a bad thing, just natural. So managers who want to install wood floors must understand they will be subject to these conditions, which might limit its applications.

tainability claims of manufacturers. Just because a product might be green, managers have to understand the material's contents and the way it will perform once installed. Do not get caught up in sales hype or environmental conscientiousness when the product actually might create headaches and more costs.

This is not to say managers should not specify natural products. But they must know what products to use, how and where to install them, and a product's natural char-

acteristics that might have unforeseen and costly consequences.

Tile backing and installation

Carpet tile is the most highly engineered textile floor covering material. Its use has exploded and continues to grow. It possesses many positive attributes, not the least of which is ease of transportation and installation in high-rise buildings.

Many managers believe its most positive feature is the ease of replacing a tile

due to damage or spills. Taking up one tile and replacing it is easy, but the new tile might not blend in, due to such factors as soiling, color change, and traffic.

Carpet-tile backing can be made from polyvinyl chloride (PVC), polyester, polypropylene, polyurethane and other materials. Many of these backings contain recycled content, such as plastic bottles, windshield liners and recycled fiber. One challenge the industry has faced with the changes in backing technology and mate-

The best way to be environmentally conscious is to select the best products, and properly install and maintain them to prevent premature failure

Bamboo is actually grass, not wood. Most bamboo comes from China and Asia, and the manufacturing process and quality can vary. The performance levels also can vary, and the material can have a low or high hardness rating. Managers must be sure to know the product being specified and its past applications in similar situations.

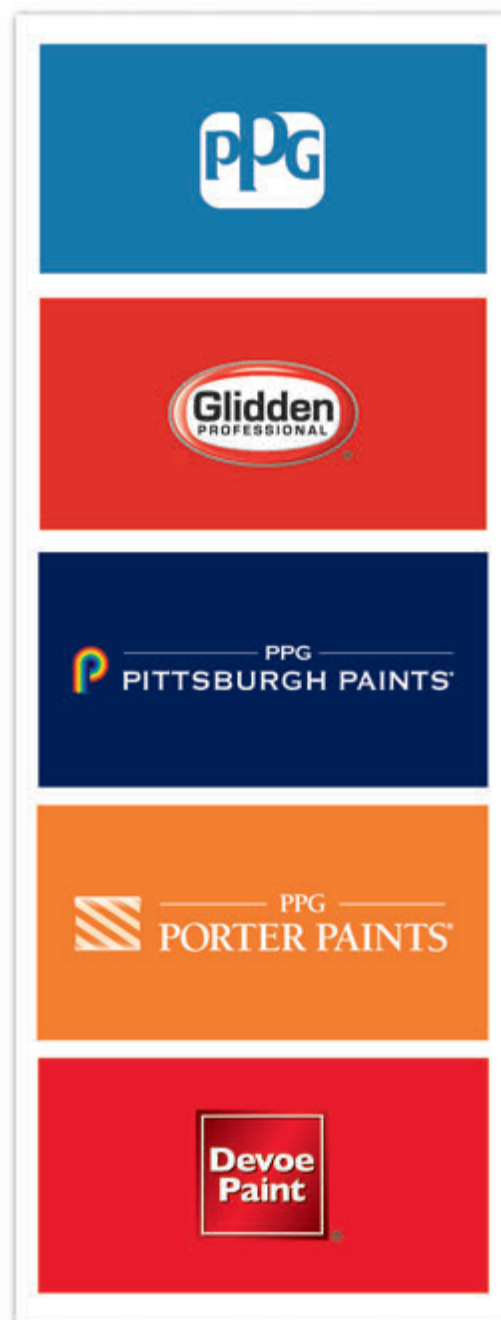
Cork is the bark of a tree. It is great product, but if it is not installed properly, planar issues — lying flat — can arise. Installing cork is a very specific process, and if it is not installed properly by experienced mechanics, it will curl on the edges.

Linoleum contains cork dust, wood flour, linseed oil, and fillers, which are often calcium carbonate found in rocks of all kinds. Linoleum today uses woven polyester backing for burlap. Linseed oil oxidizes, causing the material to change color, and it can be sensitive to atmospheric conditions. Matching a replaced tile, even with attic stock, can be nearly impossible. Polyester backing can be embossed onto the face of the flooring tiles when packaged. This product also might curl on the floor and should be installed by manufacturer-trained installers.

Rubber has gained in popularity, especially in health care facilities, schools and, in thicker variants, sports and gym flooring. Rubber flooring is a high-performance material that, in most cases, delivers excellent performance. It is important that managers buy from manufacturers with long and solid reputations. Rubber flooring also should be installed by manufacturer-trained mechanics.

Whatever flooring type managers choose, they need to take into account sus-

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Flooring Substrates: What Lies Beneath

THE BANE OF ANY FLOORING is compromising substrate conditions and, in particular, concrete moisture and alkalinity, which wreak havoc with all kinds of flooring but particularly sheet goods. Moisture in concrete, whether the concrete is new or old, has generated more lost capital than any other flooring issue.

Maintenance managers need to understand that concrete never dries. It is influenced by atmospheric conditions, as well as conditions in and beneath

a slab, whether below, on or above grade. Moisture and the alkalinity it brings when it migrates from the slab can destroy the tackifier in adhesive. If the moisture cannot evaporate and remains beneath the flooring material, the result will be bubbles, blisters, and a build-up of moisture.

When this occurs, managers must turn to drastic measures. The substrate must be clean and dry, and a certified independent concrete tester must test it to ensure the site is acclimated, meaning that

the HVAC system is operating as it would when the space is occupied and that the substrate is mitigated or that an installation system and flooring material have been installed so moisture will not affect the substrate.

When a flooring installation fails due to moisture and alkalinity issues, the cost of correction or replacement can be 10 times greater than the original installation cost.

— Lewis G. Migliore



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rials is ensuring tiles remain flat. Curling issues have been pervasive and frustrating.

As with any new technology, manufacturers and customers must go through a learning curve. Out of the box, the carpet tile must be flat, square and stable. Adhesive is not supposed to hold carpet tile flat on the floor; the tile should do that on its own. The adhesive keeps carpet tile from moving laterally.

For the most part, installation technology and carpet tiles go hand in hand. But carpet tiles are not the only products affected by recent advances. Installation using an adhesive in a bucket is losing favor because of sustainability concerns. In addition, issues such as substrate conditions, incorrect application, failure due to contaminants, cheap adhesives and environmental conditions also can compromise the use of a separate adhesive.

As a result of these issues, alternative systems have been developed from Velcro squares to adhesive squares and applied bonding agents and mechanical locking or click systems. One system designed to thwart the effects of moisture and alkalinity is an applied polyacrylic adhesive that can be applied to any hard-back flooring material. Another system uses magnetism as an installation method.

Spotlight on recycling

The flooring industry has made a concerted effort to manufacture products that have a smaller impact on the environment. Some carpet products can be recycled, while other products can be converted to energy. Also, many flooring products use recycled content. Some flooring products can be turned into other products, such as automobile engine compartment components, bumper stops, and outdoor furniture.

The industry — particularly carpet manufacturers — have been extremely involved and ahead of the curve for several years in recycling efforts. But the best way for managers to be environmentally conscious is to make sure they select the best flooring products, properly install and maintain them, and provide a controlled environment so that they do not prematurely fail. ■

Lewis G. Migliore is president of LGM & Associates — www.lgmandassociates.com — and has been associated with the floor covering industry for the past 40 years.

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Personnel Management

Do you struggle to communicate with your employees? Are you maximizing the resources inside your department? Managers discuss their personnel management challenges and success stories



Shelly Cason,
Facilities Operations
Manager, Leon County (Fla.)
Facilities Management



Paul Adjan,
Facility Manager, Glynn
County Airport Commission,
Brunswick, Ga.



Patrick Crowley,
Deputy Director,
Facilities and Engineering
Division, San Jose (Calif.)
International Airport

By Dave Lubach, Associate Editor

Personnel management is among the toughest responsibilities for maintenance and engineering managers with institutional and commercial facilities. Because their backgrounds tend to be technical, many managers generally are not as familiar with such tasks as hiring, training, evaluating and motivating employees. In this roundtable, three managers address the main challenges of personnel management.

[Q] What are your top personnel management challenges?

CASON: Three of our main personnel management challenges include the ability to retain and to positively motivate our up-and-coming employees with competitive compensation packages. Unfortunately, losing a competent employee can negatively affect the morale of our other employees, which can also be quite a challenge. Another challenge that we face is the loss of our committed long-term tenure employees with extensive tacit knowledge. A final challenge that we face is keeping up with the new technologies over such a diverse group of employees as found within modern-day facilities departments.

ADJAN: Time — there is never enough. Money — there are always cuts. And people — they lose morale because of the lack of time and money.

CROWLEY: Retention and compensation of employees, and attrition at the mid-manager level are my main challenges.

[Q] How much of a challenge was it for you to adjust to personnel management?

ADJAN: Not too much. As I learned my trade, I closely watched the people in charge to see how and what they did and how and what the reaction was from their subordinates. This taught me a lot of the things that never work, and I stayed away from them as I employed all of the ways things did work.

look for different ways to challenge our employees to expand their knowledge in the field or utilize their hidden talents.

CROWLEY: The transition to managing blue-collar workforce took some adjustment based on previous experience managing engineers.

[Q] What have you done to expand your skills as a personnel manager?

ADJAN: I have read books on people that did well as a manager and put into practice all that I could. I always watched what the leadership around me did and put into action all of those things as well.

CROWLEY: I've had discussions with human resource personnel, attended classes that my company hosted, and took part in mentor guidance.

CASON: We value our employees and offer training opportunities to assist our employees in their upward mobility within the department. As an incumbent operations manager, I recently graduated with an MBA in leadership management and am currently looking to continue my education in the field of facilities management. I personally strive to learn from others and have been very fortunate to have had three excellent directors assist me in

“Engaging in communication and listening to what others have to offer has truly helped me to become a better manager”

CASON: Personnel management challenges can be somewhat daunting, due to the fact that unfortunately there is only so much you can do to address the challenges. But these types of challenges offer us a great opportunity to be creative as a team and

my career path. All three have been very influential in allowing me to expand and grow in my knowledge within county government.

[Q] What strategies have been most effective in helping you become a better manager?

CROWLEY: Practice active listening, offer consistent feedback on expectations, and maintain open-door access for staff.

ADJAN: Listening, listening, listening and, of course, listening. You cannot solve a problem without enough information to assess the problem. Too much will take too long to resolve an issue, but too little will only benefit one party and alienate the other. Listen to what goes on daily, and a lot of times a small issue can be handled fairly before it turns into a larger issue.

CASON: The ability to garner hands-on training from long-term-tenure employees, such as my directors, has clearly been the most effective strategy in advancing my management career path. Finding these unique employees to mentor me has been critical in my advancement because they gave me the opportunity to use my talents, be creative and work on several different types of projects that may not have actually been in my job description. This type of learning environment offered me a very safe learning atmosphere without fear of repercussions due to failure and recognizes that every decision is a learning opportunity. This safety-net component granted me the opportunity to think outside the box. Also, the ability to participate in educational, self-development training has been another very effective strategy in assisting me in becoming a better

manager. Engaging in communication, and listening to what others have to offer, has truly helped me to become a better manager.

[Q] Give me an example of a successful personnel management moment you've experienced.

CROWLEY: I worked extensively with a staff member for additional training requirements in performance evaluations and provided specific classes that the company assigned to the employee to attend and meet every two weeks for progress reports. It took a significant effort for the direct supervisor

and me. However, it has paid off and the employee has turned around and is now a quality member of the work team.

ADJAN: I had a guy that would spend more time figuring out how to get out of work than just doing the job. I made myself very visible wherever he was so as to almost be watching him. He finally approached me to see why I was always in the area and I calmly explained that I thought I knew why he took so long to accomplish a task, but I offered him a chance to explain his actions

first. When he knew he'd been caught, I took him for lunch, and we discussed his actions, why they were seen as wrong, the amount of time spent on getting out of the job versus doing it, and we came up with a trial period of specific tasks within his job description as a test. Long story short, he became one of the most productive workers and a great mentor to the rest of the staff.

CASON: One great example happened recently and dealt with reducing our current fiscal year budget. We were directed to look at ways to reduce our overall budget. Our director brought the team together to discuss the issue, and then collectively the team

recognized several opportunities to streamline some processes. This collaborative team effort resulted in eliminating two vacant positions and reorganizing the operations unit. This type of collaborative team effort provided the employees the ability to work together to resolve a major issue, and it provided them the opportunity to use their many different — and some hidden — talents within the department. I think that what happened that day made every worker in the room feel like a value-added participant on our work team and improved the employee morale greatly.

[Q] What kinds of lessons have you learned along the way about personnel management?

CROWLEY: Consistency is mandatory. Don't quickly react. Evaluate things on a case-by-case basis, but maintain a consistent approach. Don't place personal expectations of the staff ahead of their own direction. Insist on them thinking about one-to-five year career goals.

CASON: Providing employees the opportunity to use their talents has been a very valuable asset to our facilities department. Providing flexibility and encouraging employees to be creative in accomplishing their projects within a safe learning environment, while alleviating fears, gives them a sense of ownership, and many times the employees feel more invested and dedicated in their jobs. Finally, actively listening and providing an open line of communication is vital in personnel management. Employees are individuals with individual needs, whether their needs are personal or family needs. In order to have a well-established, well-functioning and efficient team, the employees need to be recognized as individuals first. Always remembering the golden rule — treat others the way that you would want to be treated — has truly been a valuable and critical lesson. You definitely get more out of your employees when you recognize them for their contributions.

ADJAN: Listen to those around you, not only for problems or complaints but also for the great ideas the folks in the field always come up with. Praise down and complain up. Always be positive, regardless of how bad the situation seems. Be truthful and fair in all dealings. ■

“Listen to what goes on daily, and a lot of times a small issue can be handled fairly before it turns into a larger issue”

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SUSTAINABILITY

Cherokee County (N.C.) School District: Lighting the Way to Sustainability

Energy bills were consuming 25 percent of the district's budget five years ago. To address this challenge, the department instituted an energy-conservation program and energy-infrastructure conversions focused on lighting-replacement projects. All T12 lamps were replaced with T8 or T5 lamps. Every gymnasium with mercury-halogen lights now has T5 instant on/off fixtures. Every incandescent bulb was replaced with an LED lamp. One lighting experiment involved converting the smallest school to LEDs. The project achieved a cost avoidance of 39.83 percent for one month. The district's total cost avoidance from the projects is about \$1.3 million.

Leon County, Fla.: Old and Outdated to Renewed and Green

The facilities management department wanted to provide county residents with an educational tool for sustainable technology practices. The maintenance staff retrofitted an inefficient 50-year old building with state-of-the-art technology in demonstration of sustainable practices. Sustainability programs have supplied a considerable amount of the required water used to irrigate an on-site botanical garden, cooling via groundwater-sourced HVAC systems, and a majority of the facility's own energy needs through installation of solar PV panels. To further reduce electricity demand, part of the existing building's HVAC system was replaced by a closed-loop geothermal HVAC system, which has reduced annual electricity use by about 3,000 kilowatt-hours.

RENOVATIONS & RETROFITS

Mississippi State University: Retrofitting for Efficiency

To meet energy-efficiency goals set by the university's administration, the Campus Services Organization identified an array of facility upgrades and retrofits. In addition to high-efficiency boiler upgrades — including a multi-million dollar conversion of the campus's central steam plant to high-efficiency hot-water condensing units — the department's staff planned and executed upgrades of building automation systems in more than 30 facilities, which account for as much as a 50 percent drop in individual-building energy use. Since 2006, the resulting Energy Management Program has yielded a 37 percent drop in energy use per square foot, accounting for more than \$23 million in avoided utility expenses.

Orlando Health: Renovations Deliver Efficiency

South Seminole Hospital was built in 1984 but by 2013 was reaching the point at which its infrastructure — including air handlers, chillers, generators, medical gas systems, and supporting equipment — was well beyond end of life. The only newer components were two 450-ton chillers, a 750-kilowatt generator, and a replacement air handler. Following upgrades by the engineering and facilities team to power systems, HVAC components, and medical-air systems, the hospital now has the latest type EPSS system with paralleling gear, a modern chilled-water and support system, a reliable medical-air system, and two new air handlers. The renovations and retrofits delivered energy redundancy, control, reliability, and efficiency to hospital operations.

FINANCIAL MANAGEMENT

Lee County Port Authority/Southwest Florida International Airport: Savings Take Off

Facing declining revenues, a hiring freeze, no raises and the addition of a new 798,000-square-foot terminal, the maintenance department needed to ensure customers would receive the same levels of quality with less dependence on outside vendor support and professional service contractors. Staff identified areas to improve operating efficiency and reduce costs, focusing on lighting retrofits, improvements to HVAC system controls, and the installation of additional air-temperature sensors. They also provided training on the control system that has led to a better understanding of the its functionality and configuration. As a result, utility costs have dropped more than 33 percent in four years.

Stony Brook (N.Y.) University: Bottom-Line Lessons

This retrofit project began when the university's administration and Sustainability Studies academic program conducted lighting audits of campus buildings to measure lighting use, controls, and occupant behavior. In response to the audit, the division of facilities and services retrofitted a parking garage with 390 high-efficiency fluorescent, induction, and LED fixtures. As a result of the project, the garage is estimated to use 65 percent less electricity, or about 240,000 kilowatt-hours annually, and will require less maintenance. To gain a better understanding of electricity demand and consumption, the department also installed more than 130 smart electric meters on campus.

PERSONNEL MANAGEMENT

University of Michigan: Training Is Academic

Believing the university's interests for long-term financial stewardship would be best served through a local training program for building managers, the training department within the 1,200-person Plant Operations department formed the Plant Academy. The academy — offering courses taught by university subject-matter experts covering building systems, facilities business systems, and health and safety — aims to increase the knowledge and skills of building managers and promote best practices in facilities management. Ninety-two managers have completed the program. In 2012, the program expanded recruitment to academic business officers who oversee facility budgets and provide supervision to facility professionals.

University of Pittsburgh Medical Center: A Prescription for Safety

The medical center needed to comply with municipal regulatory requirements by providing standard core safety training for all facilities, as well as control costs and operate more productively. Two departments — Engineering and Maintenance (E&M), and Environmental Health and Safety (EHS) — developed uLearn courses to meet the accreditation requirements for the renewal of stationary engineering licenses. EHS associates conducted one course at each of the monthly E&M departmental safety meetings. E&M managers tracked training completion and conducted makeup sessions. The program's success benefits patient safety and ensures all facilities have consistent and standardized safety training.

To view all entries for the 2013 Achievement Awards, visit www.facilitiesnet.com/msaa

The Mowing-Sustainability Connection

Greater attention to the height of cut and the impact of drought can result in healthier, more attractive turf areas

By Ken Hutcheson

With concerns about climate change rising, institutional and commercial facilities are now expected to do their part to reduce their impact on the environment. For this reason, grounds managers are beginning to recognize the importance of creating and maintaining landscapes by using sustainable landscaping techniques.

Contrary to popular belief, sustainable landscapes do not necessarily require an expanded budget. In fact, many environmentally friendly practices actually can minimize costs. With proper planning, grounds crews can produce sustainable landscapes that benefit the department and its budget.

Turf-grass selection

Sustainability has had a major impact on many departments' grounds care activities and strategies in recent years, but perhaps no area has been affected more by its arrival than mowing. The heightened emphasis on the environmental impact of mowing has led to changes in the equipment that departments use, as well as the turf that equipment operators mow.

The selection of turf grass is one of the single most important decisions managers must make. They should base the selection on the property's location and the way the turf is used and maintained. Selecting turf grasses that are not suitable for a specific

area results in continual stress for the plants and makes them more susceptible to diseases and pests. The result is increased maintenance costs for both labor and pesticides.

For example, managers should specify Centipede grass for soils with low pH in order to ensure healthy, optimal growth. Also, it is difficult to grow St. Augustine turf grass without supplemental irrigation or enough sunlight. Managers who need assistance with turf grass selection can work with a landscape contractor.

Once managers have selected appropriate turf grass based on their landscapes' conditions, the next step is to work with a contractor to develop and implement a maintenance plan and schedule. Mowing is the most common practice for turf grass maintenance — and the most damaging when done improperly.

Equipment operators must ensure mower blades are sharp so they cut rather than tear the turf leaves. This step cuts down on the amount of water lost from the grass, and it helps to conserve moisture and reduce the need for additional watering. It also is important to remember that shredded ends of grass blades are more susceptible to disease invasion and can increase the need to apply fungicides.

A growing number of departments use mulching mowers or decks to minimize the amount of clippings that require transportation and disposal. These mowers chop the grass clippings into small pieces, which fall through to the soil. The resulting grass mulch helps to keep the soil



shaded, which helps retain moisture that will keep turf areas greener.

But managers need to be aware that the success of mulching efforts depends on the type of turf that has been planted. Some trailing grasses, such as Bermuda grass, interlace a dense layer of stems that can prevent grass clippings from reaching the ground, where decay occurs.

The impact of drought

Managers seeking to ensure their departments' mowing activities contribute to their organizations' overall sustainability efforts need to be aware of the impact of drought on these activities. During times of drought, equipment operators need to increase the height of the mower blade's cut. Increasing this height by 1 inch will improve the lawn's ability to tolerate stress during dry periods tremendously.

Operators should mow frequently enough so they remove no more than one-third of the grass blade mowing, since removing more than that amount at one time can cause extreme stress to the lawn and can result in early browning.

Regardless of drought, though, managers need to take into consideration the height of the turf grass. The height of cut

Operators should mow frequently enough so they remove no more than one-third of the grass blade, since removing more than that amount at one time can cause extreme stress to the lawn and result in early browning.

SPECIFIER TAKEAWAY

The selection of turf grass is one of the single most important decisions managers must make. They should base the selection on the property's location and the way the turf is used and maintained. Selecting turf grasses that are not suitable for a specific area results in continual stress for the plants and makes them more susceptible to diseases and pests. The result is increased maintenance costs.

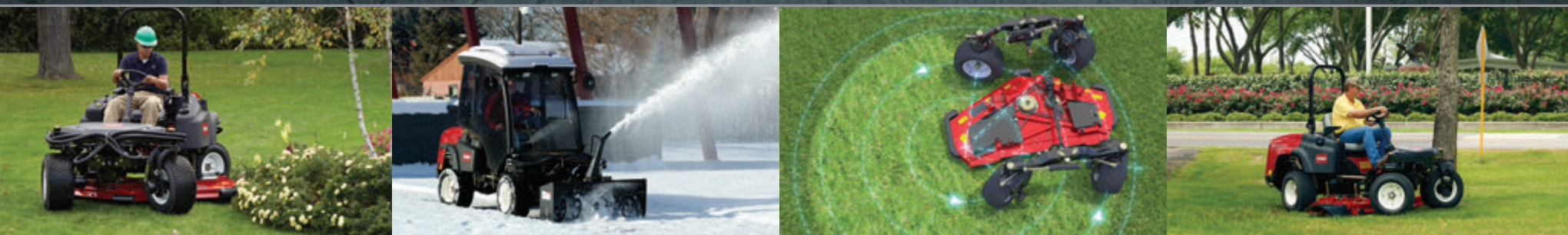
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plays an important role in determining the maintenance needs of turf areas.

Generally speaking, the greater the height of cut, the less maintenance required. This situation is primarily due to the fact that taller grass promotes deeper root growth into the soil. Turf grasses that are cut below their optimum heights become stressed and more susceptible to diseases, especially root rots. Conversely, shorter heights of cut promote shallower root systems. Deep root systems naturally have greater access to water

and nutrient reserves, increasing their ability to tolerate environmental stresses. Shallower root systems require greater attention via supplemental water and nutrients in order to keep the plants healthy and to minimize potential negative effects of adverse environmental stress.

Cut considerations

Paying attention to the height of cut when mowing turf grass presents managers and equipment operators with a number of

additional considerations. Besides producing larger and deeper root systems, greater heights of cut also restrict the amount of light that reaches the soil surface.

Because many weed seeds require light for germination, the increased shading from a greater height of cut actually suppresses weed germination and growth, which then results in being able to cut down on the use of herbicides or other weed-control measures. This result can be particularly helpful in controlling warm-

season annual grasses, such as crabgrass, and in turn can reduce the need to use pre-emergent herbicides for their control.

Recommended turf heights depend on the species of turf grass in question. For example, it is essential to not cut St. Augustine grass too short. Also, always avoid mowing wet grass.

When any disease occurs, raise the cutting height. A low cutting height reduces the leaf tissue available for photosynthesis, the process by which the plant produces energy for growth. An active disease eventually reduces the leaf canopy, and photosynthesis decreases even further. Raising the cutting height increases the green plant tissue available for photosynthesis, and the result is more energy for turf grass growth and a faster subsequent recovery from the disease.

If an area of the lawn has an active leaf disease, equipment operators should mow this area last in order to prevent the spread of the disease. Likewise, washing the

Generally, the greater the height of the cut for turf grass, the less maintenance will be required. This situation occurs largely because taller grass promotes deeper root growth

mower with water after mowing the diseased area will help remove diseased leaf clippings, and it will remove the disease-free turf from the blades.

Managers who ensure a landscape has the proper turf and monitored its conditions carefully can deliver benefits to both the bottom line and the environment. The correct turf and proper maintenance can help managers stay ahead of potential problems, such as over-watering or under-watering, decay, and disease.

By implementing these relatively simple procedures, managers can produce healthier and more attractive landscapes, even under the most difficult weather conditions. By working with a contractor when necessary to select the most appropriate turf grass and implement the most beneficial maintenance practices, managers can make certain landscapes look their best year round. ■

Ken Hutcheson — KHutcheson@uslawns.com — is president of U.S. Lawns, a commercial landscape company with 260 franchise locations nationwide. He has more than 30 years of experience in the green industry.



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EQUIPMENT RENTAL: Options and Opportunities

By paying attention to details and partnering with a rental company, managers can lay the groundwork for successful projects

By Dan Hounsell, Editor

Renting specialized pieces of equipment has become an essential strategy for success in institutional and commercial facilities. The rise of rental has been driven in large part by the need among maintenance and engineering managers to become more judicious in the way they allocate precious budget dollars. Act too hastily by purchasing a big-ticket piece of equipment — whether it's an aerial work platform or a portable generator — and the department could be locked into a long-term financial burden.

By contrast, equipment rental offers an opportunity to use equipment through a financial commitment that is much shorter and often more beneficial to department's budget. The arrangement only works, however, if managers pay attention to key points in the process. Ignoring them or underestimating their importance can result in problems with long-term repercussions.

"A maintenance manager a lot of times will look at what they actually have available to them and try to make it work for whatever they're trying to accomplish," says Tom Hubbell with the American Rental Association. "What they could be saying is, 'How do I get the right tool at the right time for the job at hand?'"

Assessing needs and options

Some situations that call for equipment rental arise unexpectedly — power outages, for instance. In other cases, such as light construction projects, managers can plan for them well ahead of time. In either case, though, the first consideration is whether rental or ownership is the best strategy.

"We look at how often we rent (the product) and its cost," says Sean Arnold, Director of Maintenance, Hernando County School District, Brooksville, Fla. "Is this something we do multiple times in a year or once a year? That's all taken into consideration. Also, if we were to purchase it, what's the cost? What are all the other factors — fuel, maintenance, those kinds of things — that go into the ownership of the equipment? If it has a life span of five or ten years, we don't want to be paying for it for 20 years."

Beyond these ownership issues, managers also should consider additional factors that go into the total cost of ownership.

"You also have to figure out your opportunity costs," says Donald Turner, facilities maintenance director for Okaloosa County, Fla. "You've tied up your resources with that (equipment use), and they're unavailable for use for other purposes. You have to figure out how much of this is good for the company. Or is the better option to just rent the piece of equipment when needed? That's always part of the decision process."

The decision to rent a piece of equipment brings managers another set of issues.

"What are all the tasks that the equipment will be used for?" Turner asks. "What equipment is available for rent in my market area that could do all of those tasks? Which pieces of equipment do I have experienced operators for? What are the rental costs for each piece of equipment for the time period the equipment will be needed? Which pieces of equipment are available during the time I need it? The answers will point you in the right direction."

Given the varying nature of facilities, each manager needs to decide on a specific piece of equipment that meets a particular facility's specifications.

"Will it fit into the area we're trying to get to, or do we need something that has a longer boom because we'll be outside that area?" Arnold asks. "Also, is this piece of equipment something that we have to transport ourselves, or can it be delivered

to the site? And do we have the capability of transporting it? Is it sized properly for the conditions we're using it in?"

Facilities in which occupants or visitors are near a given work area can present additional challenges.

"Will the equipment be too loud to operate when the school is in session?" Arnold asks. "If kids are trying to take a test or study in class and we're outside the window making a lot of noise, maybe that's the wrong piece of equipment, or maybe it's a scheduling issue. Maybe we have to schedule the work on a weekend. But it increases the over cost if we have to do that."

Turner says in his many experiences renting equipment — from portable air compressors and backhoes to jackhammers and skid steers — he has focused on three priorities:

Worker safety. "We opt to rent or lease equipment because we don't own the proper type, size, or class of equipment needed to safely perform some necessary task. We won't risk our worker's safety by trying to force the wrong equipment to serve in an inappropriate function."

Cost. "The cost of renting or leasing any piece of equipment is always a consideration, even in the best of times. Renting or leasing prices and terms can vary a significant amount from one firm to another, so researching what equipment is available in the area and the associated



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costs to use it is among the first steps in the decision process."

Availability. "Job-site production is a key factor in making a final decision on exactly which piece of equipment to rent. Optimizing the rental outcome is a reflection of the fit and price of the equipment options and their availability relative to when the equipment is needed on site."

Role playing

Successful equipment rental experiences generally require that managers go beyond the traditional business transaction with the rental company and view the experience as a partnership, where both parties discuss the project in-depth to determine the best course of action. The relationship can even extend beyond the company's showroom to the actual job site.

"Sometimes, we'll bring them out to the area where we need the piece of equipment to see the application in which it's going to be used," Arnold says. "Then they can give us some recommendations. We also want to know that if something were to break down, is there another piece of equipment available?"

Hubbell advises managers to come to such discussions prepared with as much information as possible about the project.

"The other part of the equation, now that you've told (the rental company) the application, is the environment," he says. "You might have told the rental person that you want this, this and this (type of equipment), but you forgot to tell him that it's got to fit through a 4- by 8-foot door. And some of these places need to be dust-proof and things like that. Or the equipment might need tire socks so it doesn't leave any marks on the floor." Such information is crucial to ensuring technicians end up with the most appropriate piece of equipment.

Managers must be attentive when taking delivery of a piece of equipment to ensure the rental agent and the operator discuss the equipment features and functions. They also need to pay attention to the rental company's approach to equipment maintenance.

"The way one firm maintains the equipment it offers is very important," Turner says. "Equipment from some firms just seems to perform better with fewer down days. I suspect that those firms inspect and maintain their equipment better. I never minded a rental company performing a thorough inspection on a piece of equipment I rented, and making me pay for any damage from abuse or overuse. I figured that if they did that on the equipment I rented, they did it on all the returned equipment, and I was getting better quality and more reliable equipment from them."

Putting it in writing

While paying proper attention to the actual equipment is essential, the rental agreement and its contents also present managers with important — and often tricky — issues.

"I would look at damage waivers to understand what is covered from an insurance perspective. I'd also be clear on the hours of usage," Hubbell says. "What am I actually renting, and how long am I renting it for?"

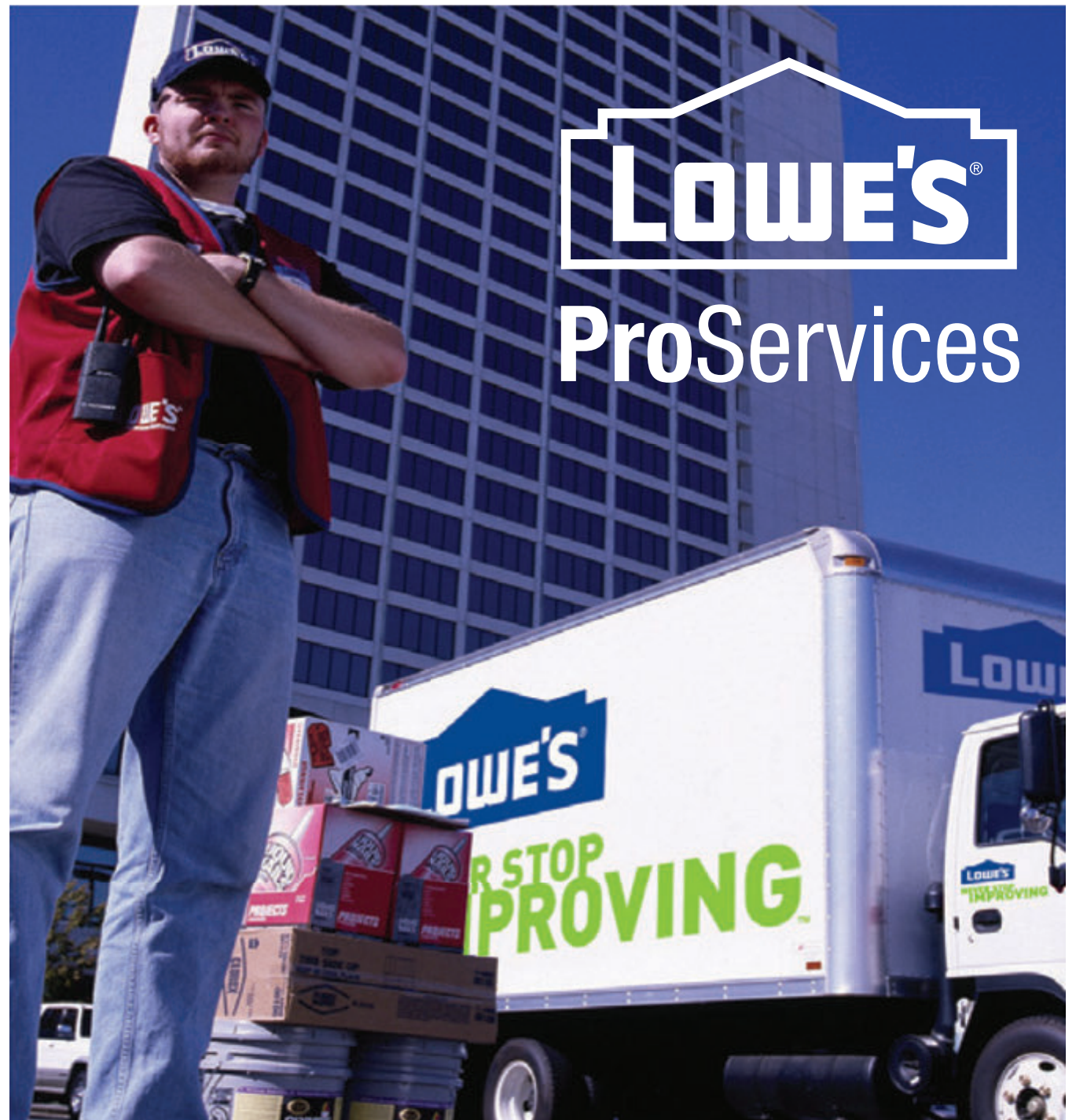
"For example, some things come with hour meters, and you don't want to get surprised on any charges. Sometimes, they don't realize there's a clause in there that a day means this amount of time for this piece of equipment."

Items not covered by the agreement often are as important as those that are.

"What's excluded?" Turner asks. "What's covered is not necessarily what's important. It's what's excluded. When you go through what's excluded, you might find something very important and expensive that is excluded from the warranty on any piece of equipment."

Finally, a successful rental experience requires managers to plan accordingly to maximize the financial investment.

"For instance, one of our annual rentals is for a large crane unit with a man basket," Arnold says. "We use it for replacing burned out lights at our football stadiums. It's a piece of equipment that obviously we don't own because it's very expensive, but we know that every year, we're going to have this job, so we rent this crane prior to football season to replace the light bulbs and ballasts at all of the school stadiums. Since it's so expensive, we carefully plan out the logistics for each hour, making sure our goals are realistic." ■



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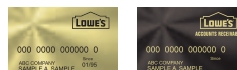
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Product Focus

Restroom Spotlight: Dispensing Hygiene

With an attention to dispensers and touchless technology, managers can make restrooms healthier and curtail costs

By Thomas A. Westerkamp

Much of the focus on restrooms in institutional and commercial facilities goes to plumbing systems and components, given their role in water conservation, cost control, and sustainability. But maintenance and engineering managers also must not lose sight of the key role hand dryers and paper-product dispensers play in restroom issues such as hygiene and waste control.

By tracking advances in no-touch technology, as well as its benefits and challenges, managers can specify and install dryers and dispensers that help their organizations become more sustainable, as well as control costs.

To touch or not to touch?

Each time a restroom user flushes a toilet, the resulting spray of water releases thousands of microbes — E. coli, hepatitis C, and influenza virus, to name a few — into the air and onto floors, partitions, walls, countertops, fixtures, and dispensers. It takes just one hour for germs on a sink handle to multiply by a factor of 16.

Restroom upgrades that incorporate touchless hand dryers, dispensers, and fixtures can improve sanitation and reduce odors, and they can provide a more cost-effective operation of restrooms. Upgrades involving waterless urinals can curtail water use further.

Beyond these potential benefits, these projects can generate additional savings related to improved employee health and, therefore, lower rates of absence. A healthy employee also is more productive than a sick one and does not spread illnesses.

While occupants are not able to see the germs, they can see dingy surfaces and smell unpleasant odors. Odor, poor cleanliness and empty dispensers rank as the most common restroom complaints.

Managers can eliminate sources of these complaints and, at the same time, improve hygiene and reduce costs by replacing manually operated sink faucets, toilet flush handles, and paper hand cleaners with touchless products. No-touch restroom products that have gained a high degree of

acceptance include electronic flush toilets, electronic flush or waterless urinals, electronic faucets, electronic soap dispensers, and electronic, no-touch hand dryers. Managers also can consider touchless toilet-seat raisers that users can activate by foot control and automatic deodorizers triggered by timers or motion sensors.

Touchless product options for restrooms go beyond fixtures and dispensers. Paperless toilet-bidet combinations also can improve restroom hygiene and minimize paper waste, and no-touch restroom cleaning equipment choices include all-in-one pressure washers, vacuums, supply carriers, and trash-removal units. Also, newer no-touch capacitance sensors create a magnetic field around a fixture in all directions, providing better reliability than single-spot sensors.

Spotlight on hygiene

The most frequent targets of managers looking to improve restroom hygiene are dispensers of toilet tissue, paper towels, facial tissue, napkins, soap, and deodorizers. If these restroom products require hand contact, they present the risk of cross-contamination. The use of touchless restroom products includes these dispensing products and products designed for the disposal of used products in containers with touchless lids.

For years, managers have tried various tactics designed to remind restroom visitors that it is essential for them to wash their hands with soap after using the restroom. Tests on hand-swab samples show that not washing hands at all leaves the largest amount of bacteria on the skin, while washing with water only leaves a significant amount of bacteria on the skin. Washing with soap and water and taking a few extra seconds to do a thorough job leaves users' hands bacteria free.

Managers also can pay closer attention to housekeeping practices in their efforts to improve a facility's restroom hygiene. Trained custodians should use the standard methods to clean all restroom fixtures and surfaces. Three factors determine cleaning success: the cleaner used,

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The dispenser is part of the Diplomat™ line of stainless steel products. Made from 25 percent post-consumer and 35 percent pre-consumer stainless steel, the dispenser's line includes a dual-curve geometry design. The unit is designed for high-traffic restrooms in commercial settings. All energy required for the production of the accessories series is offset through the Energy for Tomorrow program. **Free Info: Circle 154**



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the amount, and the application method. Manual cleaning methods leave germ-laden mops and brushes, while using a low-pressure power-spray washer and vacuum tends to leave surfaces cleaner and drier.

By testing restroom air and surfaces for contamination, managers can be proactive in their efforts to monitor and improve restroom hygiene, and they can use the results to fine-tune cleaning methods. Testing consists of collecting samples from the air, fixtures and surfaces with swabs and having the samples tested by a laboratory or using a hygiene meter for in-house testing.

A swab hygiene tester is a ready-to-use dilution-and-delivery device. The swab is contained in a tube with a reagent in the handle. After swabbing a surface, the tester places the swab in the tube and injects a reagent from the handle into the tube and mixes for five seconds. The mixture then is ready for testing.

Managers also can consider using a luminometer — an electronic hygiene monitor — to measure adenosine triphosphate (ATP), a universal energy molecule found in all animal, plant, bacterial, yeast, and mold cells. The luminometer is a 3- by 7-

by 1½-inch, handheld, battery-operated device that can track 100 programmable locations and store 500 tests. One set of batteries is good for 3,000 or more tests. When the instrument's reagent contacts a sample, the sample emits light. The amount of light emitted is directly proportional to the amount of ATP present in the sample.

The instrument measures the amount of light generated and in about 15 seconds converts the reading into the amount of contamination in the sample. The higher the reading, the more contamination the surface contains.

The advantage of using this instrument for in-house sampling is that custodians who perform the assessment immediately after cleaning can obtain results and take corrective action, quickly validating cleaning methods and ensuring the safety and health of restroom users. Hospitals, restaurants, food processors and food stores use this method to ensure water and surface cleanliness and the effectiveness of standard operating procedures for sanitation.

Once custodians have determined the effectiveness of their cleaning methods, they can adjust these methods, if necessary, until they obtain the desired results. Managers can document the best methods, perform any needed re-training, and test and certify custodial employees to ensure they obtain the necessary skills to provide clean, sanitary restroom environments.

Paper-waste control

Managers seeking to improve the sustainability of restrooms also can take advantage of changes in paper products that go into touchless restroom dispensers. Manufacturers of toilet and facial tissue, diapers, paper towels and napkins increasingly are using partial or 100 percent recycled paper in their products.

More economical jumbo rolls of 1,500 sheets are replacing standard rolls of 1,000 sheets. Also, rolls are placed in locked

Upgrades including touchless hand dryers, dispensers, and fixtures can improve hygiene, reduce odors, and enhance the comfort of restroom visitors

dispensers or on bars that are difficult to turn, making it difficult to remove many sheets at once and, as a result, discouraging theft. Additional advantages include fewer empty dispensers and a drop in the need to replace empty rolls as frequently.

Buildings in the U.S. also are beginning to install paperless toilets based on products already used internationally. The paperless toilet eliminates the need for paper use through the use of a wand located in the bowl, which dispenses warm water for cleaning and warm air for drying.

Finally, advances in touchless, warm-air hand dryers offer a range of advantages that include shorter drying cycles, no use of paper, and no need to reload paper or cloth towel dispensers, thereby eliminating the cost of paper and being more hygienic. ■

Thomas A. Westerkamp is a maintenance and engineering management consultant and president of the work management division of Westerkamp Group LLC.

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[Case Study]

Facility Managers at Northwestern Memorial Hospital Deliver Rx for Hand Hygiene and Maintenance Issues

In 2010, Northwestern Memorial Hospital (NMH), one of the country's premier academic medical centers, launched a major hand washing campaign aimed at employees, patients and visitors: Clean hands every time. It sounds easy enough, but according to a hospital press release, two-thirds of Americans fall short in adopting the habit of washing their hands. 80 percent of infections are transmitted through touch. If hands are kept clean, the transmission of germs from person to person is greatly reduced.

While hospital administration was encouraging its employees, patients and visitors to do their part to prevent the spread of viruses, Northwestern Memorial Hospital's Director of Facilities Engineering, David Stout, was also beginning his own campaign — a major hospital refurbishment program that would include equipment and product upgrades to the hospital's restrooms. "A primary focus has been reducing maintenance needs while improving sanitation in the hospital's hundreds of staff and public washrooms," says Stout. Additionally, "The paper towels were getting flushed down the low-flow toilets, causing blockages," said Stout. "The continuous plumbing calls combined with the high levels of restroom maintenance were taking up a considerable amount of time and costly resources. That's when we got serious about looking into heated air electric hand dryers."

Debunking hygiene myths

As high-speed, energy-efficient hand dryers have grown in popularity over the last eight years, so have the scare tactics used by the industry's competitors, touting dryer hygiene as a concern. Over the last 40 years, numerous scientific researchers have validated the hygienic safety of heated air as a drying medium. These independent, third party studies were conducted with careful methodology at major academic or medical institutions.

In 2000, Dr. Franklin R. Cockerill III and his colleagues at the Mayo Clinic in Rochester, Minn., conducted a randomized trial to determine the effects of four hand-drying methods for removing bacteria from washed hands. In a year-long study of 100 people who volunteered to have their hands contaminated with bacteria, researchers found that hand washing got rid of the same amount of germs regardless of drying style. Results were reported in Mayo Clinic Proceedings (75:705 - 708). Scientist P.D. Meers and K.Y. Leong's letter to the Journal of Hospital Infection stated "[There is] no bacteriological reason to exclude [hand



dryers] from the clinical areas."

NMH's Infection Control board was tasked with analyzing high-speed hand dryers including the newer trough-style models to identify which was the most hygienic and cost effective. The board ruled out the trough style dryers due to hygiene and maintenance concerns of the trough area where users place their hands to dry. Per the board's approval, the facilities staff installed over 100 XLERATOR® high-speed, energy-efficient hand dryers the first year, thus meeting the hospital's rigorous standards for hand hygiene.

Unlike conventional hand dryers, which average 30 to 45 sec-

onds of drying time, XLERATOR dries hands three times faster (completely in 10-15 seconds) and uses 80% less energy than conventional hand dryers. XLERATOR represents a 95% cost savings when compared to paper towels, reduces maintenance and improves restroom hygiene. XLERATOR is also the only hand dryer to be MADE IN USA Certified, the first hand dryer to be GreenSpec® Listed and helps facilities qualify for multiple LEED credits.

Cost Savings Analysis

Stout's cost savings analysis, which compared the facility's current paper towel use to the installation of (30) XLERATOR high-speed dryers revealed an initial annual savings of over \$20,000. Cost savings and benefits also came in the form of reduced transportation costs, paper towel storage and waste reduction. "After installing the dryers our plumbing issues were eliminated and our bathrooms were cleaner," said Stout. He concluded, "We look at this product like it was tailor made for us."

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[Boilers]

Weil-McLain® continues to create Simplified Solutions for Our Complex World™. As North America's leading boiler manufacturer, with three new product introductions in 2013, Weil-McLain is again proving to be a leader in product design and engineering while keeping a focus on solutions.



SlimFit™

In February of this year, Weil-McLain introduced the Aqua Logic™ Indirect-Companion Water Heater. Partner the Aqua Logic with Weil-McLain's WM97+™ Wall Mount Gas Boiler for a complete system. WM97+ boilers have been designated as one of the Most Efficient Energy Star qualified products in 2013. The Aqua Logic gives you class-leading domestic hot water production with advance controls for personalized scheduling all with simple plug and play installation. This complete system is in one compact foot print, designed to fit almost any application.

Continuing with the tradition of providing trusted quality, product flexibility, and value, Weil-McLain debuted their ECO™ wall mount gas boiler in May. Constructed with a durable stainless steel fire tube heat exchanger, an easy to use control with LCD screen and optional accessories to match virtually any installation, the ECO was designed to optimize operation resulting in significant fuel savings. It was also designed with components that are positioned for fast and easy service for future maintenance requirements. The ECO has a rating of 95% or higher for Annual Fuel Utilization Efficiency which



ECO™

exceeds Energy Star requirements and is eligible for tax credits and rebates.

In June, Weil-McLain was proud to announce an extension of their Commercial High Efficiency Condensing Boilers by introducing the SlimFit™ line available in three sizes 1,000 MBH, 1,500 MBH and 2,000 MBH. It is easy to install with fast and easy out of the box installation. The packaged boiler is on wheels and the compact design requires minimal clearance — it fits through most typical doorways. The advanced control system easily integrates with existing systems and displays information on a color touch screen LCD. The SlimFit boiler is easy to own because it is durable and reliable, ready for a lifetime of smooth operation. With a combustion rating above 96%, the SlimFit satisfies the same needs that could be provided by a larger system but without the inefficiency. The SlimFit is the right fit for retrofits

because of the slim design and ease in disassembly. The left and right configuration option also minimizes the footprint and simplifies the piping requirements. The SlimFit can fully integrate with older non-condensing boilers to increase efficiencies by creating a hybrid system. This is a solution for any new or existing commercial and/or institutional setting.

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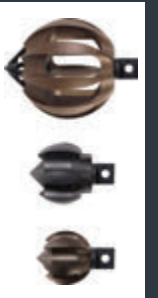


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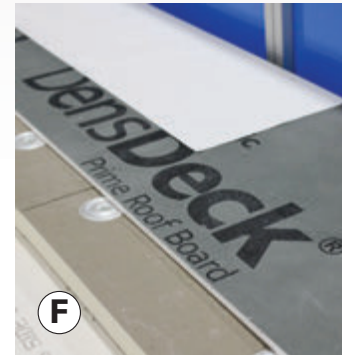
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The KJ-3100 clears blockages in 2-10-inch drain lines with 3,000 pounds per square inch working pressure and 5.5 gallons per minute flow. Powered by a 16 horsepower gasoline engine, the unit is mounted on a two-wheel cart that fits through standard doors and tight turns. The 3/8-inch jetter hose is 200-feet long. **Free Info: Circle 203**

C BRADY CORP. Safety software module

A confined-space assessments and permitting module is now available for the LINK360™ EHS and lean software platform. The update creates a paperless confined space assessment and permitting solution. The software's confined-space functionality allows engineers to create assessments, route them for approval, and store them online with accessibility for future review and modifications. It also allows personnel to fill out permits, request permitted entry, print permits for use and scan signed-off permits online with accessibility anywhere for future reviews and audits. Customers also can reduce ambiguity and time spent by creating an entry permit with only necessary and accurate information. The software also provides photos to help users visually identify entry points and hazards. **Free Info: Circle 201**

D DITCH WITCH Utility tractor

The RT120 Quad is engineered to tilt and dig a vertical trench on uneven ground. The machine includes a quad track system that provides improved stability and traction. Each track frame weighs 1,500 pounds to provide a low center of gravity for increased stability and the drawbar. The tractor has a ground clearance of 15½ inches to improve performance around bar ditches, creek beds and uneven terrain. The Deutz®-diesel-engine-powered unit has four-wheel drive capability with three-speed, shift-on-the-fly transmission and standard rear steering. **Free Info: Circle 202**

E HUBBELL LIGHTING LED fixture

The Hazardous Kemlux III series delivers up to 105 lumens per watt of 5,000K Circuit light. The fixture's modular design provides six mounting options. The radial design with fins of durable copper-free, cast aluminum allows it to operate in -40-40 degrees Celsius ambient environments and keeps the LEDs cool, resulting in an estimated 100,000 hours of life at L70. The fixture has high output LED counts of 18, 24, and 36 up to six individual light engines, providing fail-safe redundancy. Total wattage ranges from 43-86 watts with a lumen output ranging from 4,405-9,004 lumens. **Free Info: Circle 204**

F GEORGIA-PACIFIC GYPSUM Roof boards

DensDeck® Prime features a 90-day limited warranty for exposure to normal weather conditions in one-half- and five-eighth-inch parapet wall applications. The boards allow adhesives to be applied uniformly and consistently, and back-mat enhancements provide a strong bond between the board and the insulation layers when low-rise adhesives are used. The face mat overlaps the backside of the board to provide a cleaner joint and smoother appearance when membrane is laid over the cover board. The board's design makes it easier to score, cut and handle. **Free Info: Circle 205**

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NeverWet protects surfaces with a superhydrophobic treatment that repels water, mud, and ice. The class of coatings causes liquids to form nearly perfect spheres, which shoot off the surface and keep items clean and dry. The treatment causes water droplets to form a contact angle of up to 165 degrees, more than three times the contact angle of an untreated surface. The treatment applies clear and dries to a flat, light haze and may leave slightly chalky feel. It can be exposed to water in as little as 30 minutes after the final application of top coat and is fully cured in 12 hours. **Free Info: Circle 206**

Case Study

Sensing Opportunities for Lighting Savings

When the opportunity arose to implement a major lighting retrofit at Pepperdine University's Drescher campus in Malibu, Calif., Les Thomas, the university's manager of energy services, chose Energy TriPak® wireless sensor controls from Lutron Electronics Co. to maximize energy efficiency.

Thomas reduced labor and installation costs by working with the local utility and contractors. By complying with the program's guidelines, the costs were 100 percent covered by incentives.

In addition to a fixture retrofit, Thomas identified two control opportunities:

- Install occupancy sensors to turn off lights in unoccupied offices and classrooms.
- Reduce HVAC costs in unoccupied classrooms by leveraging the occupancy sensors in a cost-effective way.

Thomas proposed a lighting control solution that included wireless occupancy sensors, switches and relay modules in each area to ensure lights turn off when the space is empty. In many rooms, wireless wall switches provide three-way control.

He also recognized the opportunity to reduce energy used by the HVAC system. To capture this

opportunity, wireless contact closure modules (CCOs) were installed with the remote variable-air-volume (VAV) boxes, regulating air supply in each classroom. The CCO modules communicate directly with the same wireless occupancy sensors that control lighting.

Now, when the classrooms become unoccupied, lighting and cooling loads turn off automatically. The wireless CCO modules communicate with the wireless occupancy sensors through ceilings and walls, making it possible for the contractor to deliver an integrated solution within budget. The contractor installed the entire project over two weekends, minimizing disruption to campus operations.

Project stakeholders estimate the occupancy controls throughout the retrofit reduced lighting energy usage by 20-30 percent. And by integrating the VAV boxes wirelessly to the occu-



pancy sensors, the solution reduces overall HVAC energy use in the classrooms by an additional 14 percent.

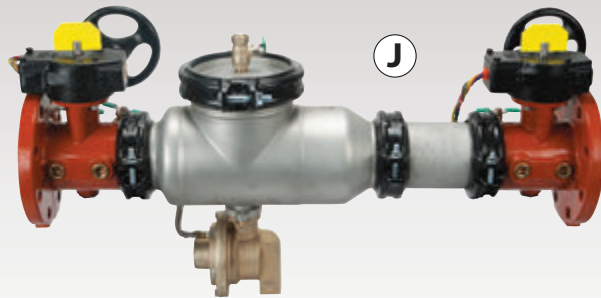
"Pepperdine's centralized building management system allows us to easily evaluate when lights are on and off and where the HVAC use is affected," Thomas says. "The occupancy sensors are doing their job to lower costs and reduce energy waste."

"Generally, if I'm not getting any negative feedback, I know everyone is happy. If the lights were turning off when people were in the space or students were cold in the classrooms, I would definitely know. Any time we can strike the perfect balance, we know we've made the best choice."

Free Info: Circle 207



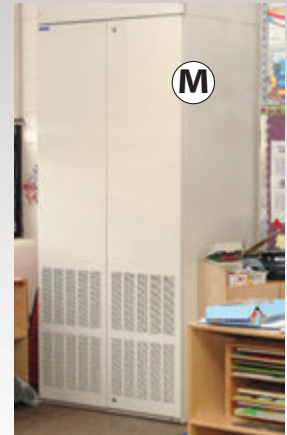
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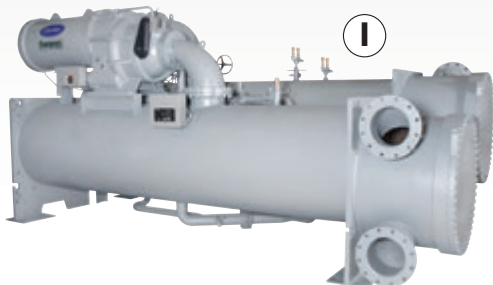
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H BEHR PROCESS CORP. Exterior paint

The Marquee exterior paint and primer line offers longer-lasting color, ultraviolet protection, and the ability to resist rain as early as 60 minutes after application. Specialized polymers in the 100 percent acrylic formula form a non-stick surface to prevent dirt adhesion and maintain the appearance of exterior surfaces under challenging weather conditions. The line is available in 64 different colors. **Free Info: Circle 208**

I CARRIER CORP. Centrifugal chillers

The Evergreen® 19XR and XRV lines offer single- and two-stage compression options from 800-1,600 tons. The product is designed for flexibility and is capable of being configured to meet individual building and system design needs. The chillers can achieve Integrated part load values as low as 0.31 kilowatts per ton, exceeding ASHRAE 90.1 efficiency standards by as much as 23 percent. **Free Info: Circle 211**

J ZURN INDUSTRIES LLC Backflow preventer

The Wilkins 300AST stainless steel large diameter unit is lightweight, corrosion-resistant and equipped for small spaces. The preventer is for use in most existing low-pressure systems without the need to acquire a pump. Features include: a machined check positioning sleeve, eliminating weld-seam leaks; checks that are retained securely, providing stable pressures with faster test results; a flow clean sensing package to eliminate debris build-up in the sensing line; and a short lay-length that allows for installation into smaller spaces and easy replacement. The preventer is available in four categories: double check assembly; reduced pressure assembly; double check director assembly; and reduced pressure detector assembly. **Free Info: Circle 209**

K MAXLITE INC. LED luminaires

The MaxLED® line has expanded to include Par30 and Par38 lamps that offer improved styles, beam angles and color temperatures. The 11-watt (W) Par30 includes a spot beam angle, and the Par38 is a 16-W lamp with a 15-degree spot beam angle designed to replace a 75-W incandescent bulb. The Par38 is available in a 3,000-degrees-Kelvin-correlated color temperature for accent display lighting applications. The lamps are dimmable and available with a standard medium base for easier installation into existing medium, screw-base fixtures. The lamps are constructed with solid aluminum bodies that act as heatsinks to keep the LED junction temperature below specification. **Free Info: Circle 210**

L EMERSON NETWORK POWER Uninterruptible power supply

The Liebert® APM transformer-free, on-line uninterruptible power supply (UPS) allows power capacity increases with the addition of internal FlexPower™ modular assemblies. The FlexPower modules allow the system to add capacity or redundancy in 15 kW increments up to 45 or 90 kW within a single cabinet without powering down connected equipment. Input voltages of 480 volts (V) and 600 V are available on both 45 and 90 kW UPS configurations. The UPS operates at up to 94 percent efficiency, with a virtually flat efficiency curve from 50-100 percent load. **Free Info: Circle 212**

M MODINE MANUFACTURING CO. Pump system

The redesigned Airedale ClassMate vertical DX cooling and heating system comes equipped with the CF™ microchannel evaporator coil to improve efficiency. No plenum is required for additional hot-gas reheat, hot water, or electric heat coils. All coils fit inside a standard unit, reducing installation time and the need for optional equipment. The system includes a one-piece door with air vents on the side for quieter operation. The system is available in four capacities from 2-5 cooling tons in two cabinet sizes. Improved fan capabilities overcome high static pressures and allow for more flexible applications and installations. **Free Info: Circle 213**

N MILWAUKEE ELECTRIC TOOL CORP. Cordless saw

The M18 Fuel™ Sawzall® reciprocating saw kit features 1.125-inch stroke length and can handle up to 3,000 strokes per minute. The saw is 18½ inches long, weighs 8.9 pounds and comes with a PowerState™ brushless motor, a RedLithium™ XC 4.0 battery pack and RedLink Plus intelligence hardware and software. The battery performs in below-zero temperatures. A battery gauge displays remaining charge for less down time. The tool also features an adjustable shoe, an integrated LED light, and a hang hook for storage. **Free Info: Circle 214**

Air Filters Increase Hospital's Air Flow, Reduce Bottom Line

The air-handling unit (AHU) at the University of Louisville (Ky.) Hospital was originally installed to provide airflow to the oncology area of the hospital. Over the years, additional ducts were incorporated, and now the AHU provides airflow to five areas of the 404-bed hospital, which serves as the leading academic and research facility in the area.

Looking for an alternative to replacing its costly motor, John Gildehaus, the hospital's director of engineering, asked American Air Filter (AAF) Solutions to assess the hospital's filtration system and recommend viable solutions.

The AHU uses variable inlet guide vanes to control the flow of the supply fan. The variable inlet vanes, in their fully open state, could not supply enough airflow capacity, due to the high static pressure in the system. The work output of the fan and its motor contribute directly to the airflow exiting the AHU.

With the additional load, the AHU was deprived of the necessary air for proper ventilation. In order to pull more air into the system, the 100 horsepower fan motor would need to speed up or be replaced — an

extremely expensive purchase for the hospital.

AAF saw an opportunity to remove a stage of filtration to evaluate if there would be improved airflow and reduced energy consumption. A life-cycle valuation analysis was generated to illustrate the potential energy-saving benefits, based on moving to a two-stage filtration system with the parameters provided by the hospital.

The AmerSeal Cube filters were removed from the system, eliminating the pre-filter stage. VariCel II filters were replaced with VariCel VXL filters, eight-panel high efficiency filters designed for use in difficult operating conditions. The high capacity AstroCel I HEPA filters were upgraded to MEGAcel™ I HEPA filters with Helior® filtration technology, providing

Case Study



higher efficiency and lower energy consumption. The hospital then allowed AAF to monitor the changes in pressure drop across the filter section over the next 12 months. With reduced resistance came increased airflow, eliminating the need for a costly upgrade to the motor.

"After our 12-month study, the filters have proven to be efficient and cost-effective," Gildehaus says. The hospital increased airflow, decreased energy consumption, and realized labor savings from the reduction in filter changeouts. The original system configuration had an annual cost of \$16,730. The new configuration produced an annual cost of \$9,277. The result was savings of \$7,259.

Free Info: Circle 215



SCAG GIANT-VAC
Landscape vacuum

The Giant-Vac collects debris through a 26-inch intake and shreds it as it passes through the four-blade, welded steel impeller and steel housing. The reduction of debris maximizes the amount that can be held in the eight-bushel bag. A deflector baffle inside the bag distributes the debris inside the bag and allows it to fill properly. The vacuum system features a one-year warranty for commercial buyers. The system is also available for a 90-day rental. **Free Info: Circle 216**

MEDECO
Key programmer

The Logic mobile programmer is a remote device that allows users to update credentials via a mobile phone connection. The programmer is designed to grant temporary access at remote locations or to activate a key at a future date and time when and where it is needed, reducing the risk of lost keys and inappropriate entries. The programmer makes the entire Logic system more secure by requiring dual-authentication to gain access. Only a person with a correct Logic key and a mobile programmer setup to access a secure Logic web manager system can gain access to areas preset by the administrator. **Free Info: Circle 217**

SOUTHWORTH PRODUCTS
Pallet loader

The PalletPal Roll-In level loader is a manual palletizer that allows the forks of an ordinary hand pallet truck to roll into the loader, in between the platform's outer beams and center support beam, while the pallet ends up on top of the scissor-lift platform. A powered foot switch allows for easier adjustment of the platform to the most comfortable height for workers. The loader has a 2,200-pound capacity, a lowered height of 3¼ inches, a 31½-inch raised height, and a 48-by-53-inch platform. **Free Info: Circle 218**

HONEYWELL POWER
Fire-alarm communications

The IPGSM-4G panel allows installers to select IP, GSM (cellular) or both for fire alarm reporting to a central station. The panel is compatible with most brands of control panels and connects to both ports on the panel's digital alarm communications transmitter. This version's biggest upgrade is its ability to operate over 2G, 3G or 4G networks, automatically choosing the best available cellular signal in the area. It installs without additional panel configurations. An installer can configure it for IP or GSM as the sole communication path or, for maximum reliability, IP as primary with GSM as backup. **Free Info: Circle 219**



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The Modulex EXT series is designed for hydronic heating systems. Each 160,500 Btus per hour thermal module operates independently to increase turndown, and the simultaneous low-fire operation helps maximize operating efficiency. The design establishes built-in redundancy for uptime reliability. If one module fails, the remaining burners continue to fire, and the unit remains operational. Installation of the unit has been simplified as multiple supply and return piping, gas piping, and venting locations allow units to be installed in most configurations. The unit is rated for -20-105 degrees ambient temperature, allowing the unit to be installed outdoors with no modifications. **Free Info: Circle 220**



RINNAI Tankless rack system

The system is designed to make the installation of multi-unit condensing tankless water heaters easier. The system is available in freestanding or wall-mounted options for indoor or outdoor applications and can be shipped fully assembled, including gas and water manifolds, to any location in the country. Individual racks can hold between two and six 199,000-Btu condensing units, which have an energy factor of 0.95. For larger tankless systems, multiple racks can be banked to give commercial customers up to 25 units and nearly five million Btus of input capacity. The freestanding version of the fully assembled system fits through a standard 32-inch doorway, even with attached water heaters. **Free Info: Circle 221**

WEIL-MCLAIN Condensing boilers

The SlimFit™ line is available in three sizes — 1,000, 1,500 and 2,000 mega Btus per hour. The packaged boiler is easier to install and the compact design requires minimal clearance and fits through most typical doorways. The control system integrates with existing systems and displays information on a color touchscreen LCD. The unit has a combustion rating of 96 percent and is a popular retrofit option because of its slim design. The left and right configuration option also minimizes the footprint and simplifies piping requirements. **Free Info: Circle 222**



For more information on boilers and water heaters, see article on page 10

S HILTI INC. Rotating laser

The PR 2-HS has an accuracy rating of plus or minus 0.02 inches at 32.8 feet under bright light. The operating range is 6-2,000 feet diameter with the included laser receiver. The tool is built with shock-absorbing improvements and designed to resist a drop from a tripod at standard working heights. With an IP 66 rating, the tool is dust tight and water resistant. Calibration service is provided with purchase to offer protection from harsh job conditions. **Free Info: Circle 223**

T TELKONET INC. Energy management center

The EcoCentral Virtual Engineer™ communicates with intelligent wireless thermostats, occupancy sensors, door and window contacts, outlets, and light switches to form a secure wireless mesh network that communicates between rooms, floors, and buildings. Management center has the ability to control buildings, zones, rooms or individual devices, visualize facility data points, facilitate intelligent load-shed actions, enable logical profile shifting, evaluate equipment performance, and monitor total energy savings. **Free Info: Circle 224**

U ACUITY BRANDS INC. Occupancy sensor

The LSXR fixture-mount sensor from Sensor Switch offers up to four interchangeable lenses and an integrated, adjustable mounting bracket, making it ideal for high-mount and low-mount lighting control applications. It offers up to four quick-change lenses designed for varying applications and mounting heights. The ability to change lenses eliminates the need to replace the entire sensor. The sensor can be ordered standalone in a variety of powering and dimming options through local electrical distributors, or it can be ordered pre-installed on many luminaires from the manufacturer. **Free Info: Circle 225**

V CHICAGO FAUCETS Lavatory faucets

The 3510 Series features nine manual models, which feature a modern look and are easier to install. The faucets have a 0.5-gallons-per-minute flow rate. The manual mechanism features separate levers for precise water flow and temperature control. The dual-function flow design, where the top-level controls water volume and the side lever controls water temperature, allows the user to find the ideal temperature and leave the faucet set to that temperature across multiple usages. The temperature can be adjusted and quickly returned to the preferred setting. **Free Info: Circle 226**

W GARLAND CO. Reflective roof surface

Sunburst™ mineral surfacing is available as a factory-applied option on select StressPly® high-performance membranes, for one-step installation of waterproofing protection and reflective surfacing. Factory-applied Sunburst minerals provide a reflective surface that reduces rooftop temperatures, while providing extreme hail, wind and weather protection. The surfacing is an optional upgrade with StressPly Plus FR Mineral and StressPly E FR Mineral membranes, and it comes standard on StressPly EUV FR Mineral and StressPly Max FR Mineral. StressPly membranes have numerous application options, including hot, cold, self-adhering, and torch. **Free Info: Circle 227**

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Tim Rowe
vice president
of marketing
communications
tim.rowe@tradepress.com

EXECUTIVE OFFICES

2100 W. Florist Ave.
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(414) 228-7701
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ADVERTISING SALES

Brad R. Ehlert
senior vice president of client solutions
brad.ehlert@tradepress.com

Brian J. Terry
publisher
(414) 228-7701, ext. 529
brian.terry@tradepress.com

Greg Lynn
northeast regional director
(203) 359-4221
greg.lynn@tradepress.com

Scott Holverson
midwest & western regional director
(928) 554-4100
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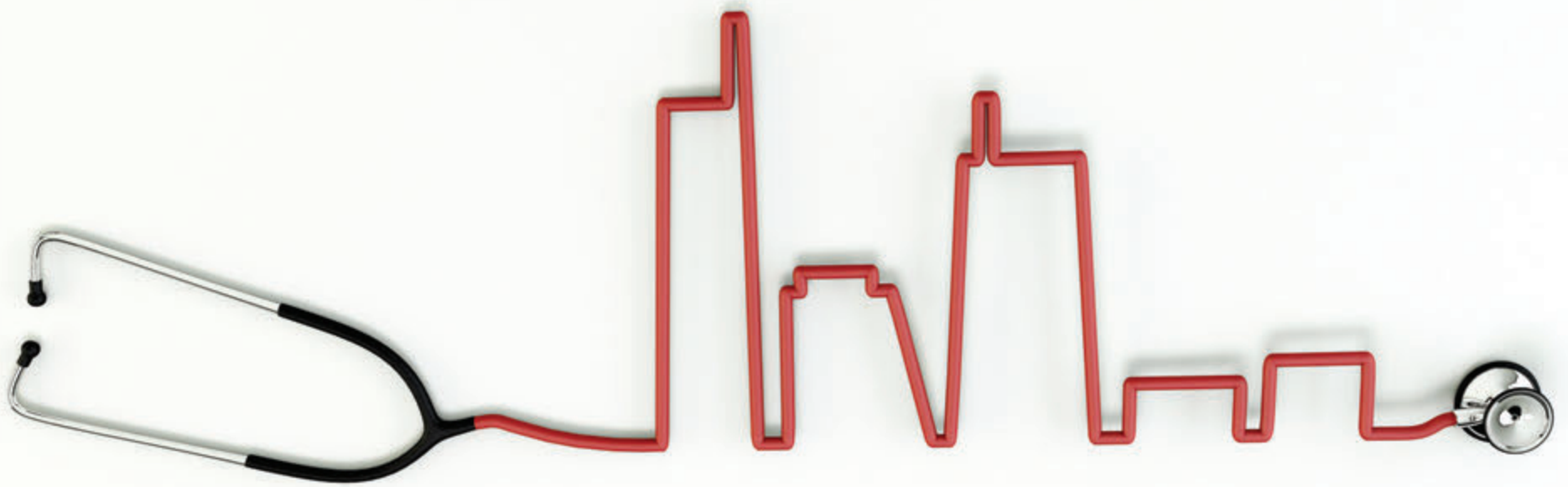
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