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Ask the Drain Brains – Solving basement flooding problems

By Marty Silverman – General Pipe Cleaners

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Are You Keeping an Eye On the Future of Maintenance?

Dan Hounsell, Editor

Staffing issues. Budget woes. Communication breakdowns. Customer complaints. The list of challenges facing maintenance and engineering managers never seems to end, or even ease up a little. And as existing institutional and commercial facilities age and new facilities come online, a fresh batch of challenges arises.

Given this workload, managers could be forgiven for simply focusing their attention on existing and potential problems at the expense of keeping up with the future of maintenance. While that approach might be understandable, it's probably not wise in the long term.

One tactic for getting a handle on the future of maintenance, as well as for learning about maintenance management strategies and troubleshooting trends and technology, is tapping into the world of manufacturing maintenance. Why?

Michael Cowley, president of CE Maintenance Solutions and a columnist for *Maintenance Solutions*, pointed out the most important reason at the National Facilities Management and Technology Conference & Expo last month in Baltimore: Manufacturing figures out equipment problems more quickly because of the money involved in production downtime. A chiller breakdown in a university classroom building makes for some uncomfortable indoor conditions, at worst. But an equipment breakdown at a steel plant means a direct and immediate hit to the company's bottom line. The consequences are too dire to treat maintenance as anything but a vital component of success.

For this reason, managers would be wise to keep track of maintenance trends in the manufacturing world. But for managers who

need to justify this time commitment to themselves or others, consider some of the benefits institutional and commercial facilities already have realized from adapting strategies and tactics from manufacturing.

Many facilities that once relied solely on reactive maintenance have made the move — or started to, at least — to preventive maintenance. A select few have even adapted some practices of predictive maintenance. Both strategies

were developed and refined in manufacturing plants.

Front-line technicians in those plants also popularized the use of essential troubleshooting technology — infrared imaging and vibration analysis are just two examples — that institutional and commercial facilities have latched onto and are benefiting from.

To begin or continue tapping into the opportunities that exist in manufacturing, managers need to ask — and answer — some tough questions. How many of your professional peers are in manufacturing facilities? Do you benchmark your department's performance against that of their departments? When did you last spend time thinking or talking about the possible benefits to your facilities of strategies and technology common in manufacturing?

Such questions might be tough, but probably not as tough as the predicament managers could find themselves in if they choose to ignore the issue and its opportunities.

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

FIVE

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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

3 TIPS: Building a Better Maintenance Team

All of us that have spent some time in leadership and management positions have struggled to answer the question, “How do I build a better team?” Even if your team is pretty good to start with, we all have seen the need to do things better.

With a better and more skilled and qualified team, you can achieve goals faster, more safely and cost-effectively, and with better customer service. Also, a better, more competent organization will make your job easier and life much simpler. There is also the concept that we should develop our team so that someone is capable of replacing us when it becomes time for us to leave or retire.

The concepts I'll discuss apply to craft and skill employees, as well as salaried management staff, facility and manufacturing types, so keep an open mind as you read it and ask yourself, “How could I use some of these concepts to assist my team?” If you would like a copy of the presentation on this topic that I gave earlier in the year, contact me, and I will be happy to send you a copy.

I will focus on three critical areas of the team building challenge: interviewing and hiring tips; identifying performance and skill gaps; and changing an organization's behavior and culture

Interviewing and hiring

The obvious first component is the interviewing process, which managers tend to rush through or spend limited time doing correctly. We often don't take time to interview, so we pawn the task off on a subordinate. But too often, down the road a few years, we look back and ask, “What happened?”

To interview well, you must be prepared and understand the kind of individual you are looking for and the skill sets you would like this person to possess. The key to knowing the type of employee you are looking for is to develop solid job descriptions and requirements. This component is the foundation for the hiring process. Without it, you have no idea what you are looking for, and, as a result, most applicants will seem qualified.

With good job descriptions and requirements in hand, you will begin to eliminate the unqualified or marginally qualified applicants before spending time interviewing. A secondary bonus of having solid job descriptions and requirements is that it will be easier to assess a new hire's performance down the road. Remember, you must have something to compare current performance to if you want to know what needs to be changed or modified.

Now we are ready to spend time managing the interviewing and selection process. Here is a list of the key components needed in the interviewing process:

- Review resumes in detail, looking for accuracy and quality.
- Perform extensive interviews using peers and other members of management to assist.
- Check references closely, even searching social media sites if your company allows it.
- Contact previous employers and ask, “Would you rehire this person?”
- Validate their experience, looking for voids in work history.

To interview well, you must be prepared and understand the kind of individual you are looking for and the skill sets you would like this person to possess

- Ask about their vision for their future.
- Ask, “Where do they want to be in 5 years? Why do they want this job?”
- Are they a leader or self-starter?
- What is the attitude and demeanor?
- What questions do they ask you?
- If the job is technical, whether salaried or hourly, validate their skill level.

During the entire process, keep in mind that you only get to do it once. Do-overs do not happen. So be prepared, take time to do it right, and involve others in the process. If appropriate, use their future peers to assist in the hiring. Ask your current employees, “Are you okay working or sharing an office with the applicant?” This question normally brings out the truth if employees are reluctant to criticize or speak negatively about other people.

Identifying gaps

Now, the interview process is complete, and the applicant is a full-time employee. We have been running along for several years, but things do not seem to be as good as they

could be with your team and organization. What do you do now? The next important component for developing a great team is being able to locate lost opportunities in the team's overall performance. Focus on these items:

Work audits

- Can you measure objectively how your team is performing?
- What kind of performance measures or scorecards do you have in place?
- Can you measure productivity, quality, and timeliness of assignments?

Customer surveys

- How do the people you serve feel about your team's performance?
- How do outsiders feel about your team?

Personal performance appraisals

Managers should perform an appraisal on everyone annually, and more frequently for probationary employees. They should be done before raises and promotions, as well as after any significant change in performance.

Changing behavior, culture

Now you come to the stage that most people agree is most challenging — changing the organization's behavior and culture. You need to lay out a path and vision for taking your team to the next level. This is challenging because your ability to be the best leader you can be will determine your success.

Remember, it is your job to provide the direction, training, and motivation needed to make these changes a reality. You need to set the vision and create a new, exciting future for your employees. Consider these strategies:

- Lead, don't follow. Set the example, and be the example.
- Go before, not with or behind.
- Set the vision.
- Be part of the solution, not part of the problem.
- Communicate the vision and culture. Live, eat and breathe it.
- Set the goals for the organization.
- Operate with discipline and accountability.

Team building takes time and dedication. It will not happen overnight, so lay out a master plan, make assignments for who is going to do what, follow-up and review often — do not let it become the program of the month — constantly update your vision, and always strive for non-stop, continuous improvement.

Finally, expect a great deal from your people, but when you get what you expect, reward them. ■

Agree? Disagree? Have something to say?

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▲ Equipment de-energized during upgrade

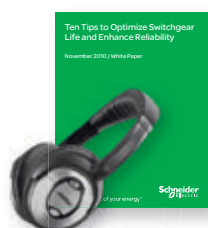
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The first step in developing a training program for operators and technicians of boilers, water heaters and their control systems is to review the maintenance history of the equipment.

Training Issues For Energy-Smart Boilers and Water Heaters

A strategic approach to structuring and carrying out training for operators and technicians can deliver tangible, long-term benefits

By James Piper, P.E.

Boilers, water heaters and their control systems have grown more complex and sophisticated over the past several decades. New-generation equipment in institutional and commercial facilities can readily achieve operating efficiencies unheard of even just 20 years ago. And the benefits do not end there. Today's equipment offers longer service lives, more reliable operation, and lower maintenance requirements.

But there is a catch. To gain any of these benefits, those who operate and maintain these systems must understand strategies for setting up, operating, and maintaining them according to manufacturer recommendations and the needs of a particular facility.

Maintenance that once was "good enough" is no longer good enough. Systems are too costly and complex, and energy costs are too high to settle for good enough. Managers and front-line technicians must strive for optimum performance, while minimizing energy costs. And interruptions in service in many applications have become so costly that managers must take all possible steps to avoid them.

One proven strategy for ensuring facilities get what they pay for with boilers and water heaters is to provide proper training for those who operate and maintain them. Without this training, technicians will not have the necessary technical and troubleshooting skills.

Needs assessment

The first step in developing a training program for operators and technicians is to perform a needs assessment that identifies training needs. Managers cannot simply assume they understand these needs. A training program based on vague or improperly defined needs will not provide the desired return.

Before managers commit to a training program, they must make certain that deficiencies in the current operation of boilers and water heaters are the result of a lack of knowledge and skills among operators and technicians, and not some other factor.

The first step is to review the maintenance history of the equipment. Are there an unusually high number of breakdowns or interruptions of operation? Are maintenance costs higher than expected? Are those numbers increasing? If operators are monitoring the efficiency of a particular unit, is it performing at the level the manufacturer says it should? It might be necessary to consult with the manufacturer to review operation and maintenance practices.

Next, managers can identify the skill sets technicians need to perform the operation and maintenance tasks. If the training program is to succeed, operator skill sets must match in-house task requirements. There is no point in training the maintenance staff on re-tubing a boiler if an outside vendor is going to perform that activity. Simi-

larly, failing to teach operators strategies for monitoring and adjusting a boiler's control system misses a major opportunity to reduce energy and maintenance costs.

The next step is to review the backgrounds and qualifications of operators and maintenance personnel responsible for the operation of the boilers and water heaters. While almost everyone can benefit from such a periodic review — particularly if they have developed bad habits over the years without realizing it — managers do not want to spend time and money to develop the skills and knowledge technicians already have. Just as importantly, managers cannot afford to overlook the skills operators need to deal with the latest generation of equipment installed on which they might have received little or no instruction.

The difference between the skill levels of operators and technicians now and where they need to be will determine the focus of the training program. Not all will be at the same level or require the same skill sets, so the needs assessment will help managers develop a range of suitable programs.

Justifying the program

One common reason that training programs for those operating boilers and water heaters often go unfunded or underfunded is that managers do not always justify their costs. The need for and the cost-benefit of training might seem evident to managers, but it usually is not to those who control the budget.

Many top executives consider maintenance training something that simply happens on the job. Few understand the complexity of today's boilers and water heaters or the economic consequences of improper operating and maintenance practices.

So managers must develop a cost justification for the training program. They are competing with other departments and programs for funding. If they cannot demonstrate the value of the training program in economic terms, they will not get proper funding. Without proper funding, they will waste time begging or stealing funds from other programs.

Managers can work with the equipment manufacturer to determine the energy-efficiency cost benefits the facility could achieve by keeping the system operating at peak, rather than current, efficiencies. They also can calculate the benefits of proper maintenance in extending the service life of the equipment. If managers can trace past system outages to the lack of proper system maintenance, quantifying the cost of those outages will help make the case for training.

Training options

One of the most appealing characteristics of training programs today is that they are available in a range of formats. Educators have long understood that some peo-

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ple learn best in instructor-led programs that are very structured, while others learn more effectively in hands-on workshops and still others learn best in individualized, self-paced programs. The key to success is understanding the subject matter of the training program and matching it to the learning styles of operators and technicians.

Managers also have a range of options for delivery, which allows them to more readily match the program to the operation of the facility. At one end of the spectrum is an off-site program, which can last anywhere from several hours to several days. If scheduling is an issue, vendors can set up programs within the facility. System manufacturers frequently use both of these delivery options, depending on the facility's needs. If certification is an issue, many local trade schools and community colleges offer programs.

The Internet has proven to be a valuable format for training programs. Students can proceed at their own pace and at their convenience. Vendors often organize courses to allow students to choose those topics that would most benefit them while bypassing the more basic ones.

Selecting programs

Just as there is a range of training formats available for boilers and water heaters, managers have options when it comes to program providers. Determining the most suitable provider for the facility depends on the manager's goals. For example, a number of different providers, such as those who conduct seminars or have on-line programs, can handle refresher training on the basics of boiler and water heater operations.

operators and maintenance personnel have to attend the same sessions? How often does the provider offer the program?

If the program is to be held in the facility, what does it cost to bring in the trainers? Does the facility have the necessary space and equipment? Can managers honestly expect operators and maintenance personnel to attend the sessions without interruption or being called away for an emergency?

Evaluating results

Managers can use two methods to assess the effectiveness of training for operators and technicians on boilers and

water heaters. The first one is easy: Solicit feedback from program participants. Do they better understand the systems they operate and maintain? Did the program give them the tools they need to more readily identify and correct issues with those systems? Employees can provide that feedback within a few days of completing the training program.

The second assessment is not so easy, and managers will not be able to complete it until time has passed.

Essentially, it asks one question: What did my investment in training provide in return? To answer the question, manag-

ers will have to monitor the operation of the system for increased efficiency and reliability. Is there a measurable increase in the system's operating efficiency? If so, what does that translate to in terms of annual energy savings? Has there been a change in system uptime?

The answers to these questions will give managers the ammunition they need to justify this and other training programs. ■

James Piper, P.E., is a national consultant based in Bowie, Md., with more than 25 years of experience with facilities maintenance and management issues.

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Bonus Info

- States and municipalities require boiler inspections. Some boiler and water heater inspection requirements are getting stricter, but they do not cover the entire system.
- By regularly updating data in the boiler log, operators will be able to identify trends that might help them detect developing problems they otherwise might overlook.

Read full article:
www.facilitiesnet.com/13626MS



More specific training, such as would be required to learn the details of operating and maintaining an advanced boiler-control system, are often best handled by training representatives from the manufacturer.

Managers can start the selection process by getting a list of references from the prospective vendor or provider and talking with people who actually went through the training to better understand their experiences.

For each program being evaluated, managers must consider a number of factors. If the program is held at a remote location, what are the travel costs? Can people attend different sessions, or will all

Managers should consider an updated approach to building management and operations, given that energy-using and control systems in many buildings have grown exponentially in complexity.



Retrocommissioning: Ongoing Challenges, New Approach

A more strategic and comprehensive strategy can deliver greater long-term savings for managers and their facilities

By Wayne Whitzell

The cost of powering institutional and commercial facilities represents a significant operating expense for any organization. Over the years, maintenance and engineering managers have considered many approaches to lowering utilities costs related to operating facilities. These approaches have ranged from piecemeal quick fixes all the way to capital-intensive retrofits financed through energy service companies (ESCOs). In the past several years however, one method, retrocommissioning, has increased in popularity due to its delivery of low-cost energy-reduction opportunities that yield significant savings and attractive paybacks.

Those familiar with retrocommissioning know it is an extremely cost-effective method for relatively quickly reducing energy costs in existing buildings without the need for capital investments. Unfortunately, for many reasons, retrocommissioning projects often do not sustain the energy savings they create over the longer term. This result means managers must repeat the process to recapture the energy-efficiency gains the original process was designed to provide.

This situation exists not because retrocommissioning is ineffective as an energy efficiency tool. Instead, it exists because procedures for building management, operations, and equipment maintenance really have not changed much over the past 50 years. Given that energy-using and control systems in today's buildings have grown exponentially in complexity and sophistication, the outdated, traditional approach to building management and operations no longer works.

Spotlight on roles

Addressing this challenge is vital to successful retrocommissioning and requires that managers first recognize their role — and that of others — in the building operations process and in maintaining the status quo.

Managers. They are responsible for assessing the skill level of and hiring building operations and maintenance personnel. But too few managers use formal training in assessing the expertise of candidates for that position, and

they might not understand the appropriate metrics for assessing job performance.

Instead, the accepted approach is that if a manager does not receive complaints about the comfort of building occupants, front-line technicians must be doing their jobs effectively. This performance metric is obviously wrong because it fosters an “uptime at any cost” mentality and, worse yet, ignores the fact that uptime does not translate into efficient performance of energy-consuming systems. It is quite the contrary. It is one of the primary reasons retrocommissioning reveals energy-savings opportunities in the first place.

Building engineers. Many building operations and maintenance personnel have no long-term or formal training in energy efficiency beyond basic information provided by the utility company or from vendors of energy-efficiency solutions.

Ongoing commissioning activities, which are extremely valuable in maintaining retrocommissioning energy efficiency in any large building, are not part of the curriculum when it comes to maintenance training. But even more damaging is the fact that too few building operations and maintenance personnel are competent in operating the control systems that govern the operation of energy-using equipment in their buildings.

Instead, in an effort to maintain the “uptime at any cost” scenario, many building operators simply override the control system to ensure continuous operation of building systems and minimize comfort complaints. Given the critical role that building automation systems (BAS) play in building energy efficiency, this is a recipe for an energy disaster.

Vendors. Energy-efficiency solutions, software and energy-efficiency products abound, and managers are the targets of vendors. Solutions range from capital-intensive energy performance contracts to prescriptive solutions that save energy only for certain systems. The list of fragmented solutions seems endless as manufacturers work to capitalize on the growing demand for energy-efficiency solutions.

Unfortunately, the universe of offerings too often causes managers and operators to specify and install energy-

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efficiency solutions on a piecemeal basis. Often, they do not give enough thought to a larger, more strategic energy and environmental plan that maps out a realistic strategy for the building. The outcome is marginal, largely undocumented returns from the investments and a missed opportunity to capture significantly greater returns from a more integrated approach.

Service contractors. Service contractors often oversee the BAS, and mechanical service companies maintain large pieces of HVAC equipment, such as chillers, boilers, and air handlers. In most cases, the activities outlined by contracts have not kept pace with the need for more energy-efficient equipment.

Service contracts for control systems are perhaps the most commonly underused resource available to the maintenance and engineering department, largely because most managers and technicians do not have sufficient knowledge or experience to direct the controls contractor toward tasks that offer energy-efficiency or system-performance value. This is especially dangerous when we consider that about 75 percent of the energy savings from any given retrocommissioning project is control-system related.

These conflicting objectives exist in most facilities, but there is a better way.

A better way

The average reduction in energy cost that results from a retrocommissioning project is 16 percent, with even higher returns in buildings that have 24/7 operating demands, according to a 2009 study of 643 buildings by Lawrence Berkeley National Laboratories. The study also found that simple paybacks for retrocommissioning seldom exceeded one year and normally provided a year-on-year return of 91 percent or more. These results rank

of uptime at any cost begins anew. Any thoughts of creating truly sustaining energy-efficiency gains from the retrocommissioning project begin to vanish.

The process of supported retrocommissioning offers a clear alternative to the current building operations approach, and it provides an opportunity to end to the

Service contracts for control systems are perhaps the most commonly underused resource, largely because managers often do not direct contractors toward tasks that offer energy-efficiency value.

erosion problem that undermines most traditional retrocommissioning projects. Because supported retrocommissioning directly addresses the conflicting objectives common in most buildings, it puts an end to dysfunctional building operations.

The process provides: long-term, remote monitoring of retrocommissioning project outcomes; mentored and focused training at building management and building operator levels; strategic energy and environmental planning; and regular measurement and results reporting.

A closer look at the process

The process of supported retrocommissioning uses a three-phase approach:

Assessment and investigation. The primary retrocommissioning opportunity assessment determines the scale of potential energy savings and identifies people and cultural obstacles to sustaining those savings. A comprehensive retrocommissioning investigation includes identification of individual measures, cost-effective energy-retrofit opportunities, demand-response potential, renewable applications, and opportunities for building certification.

Implementation. Implementing cost-effective retrocommissioning measures includes design and specification development, preparation of bidding documents, contractor selection, project management, and final-measure commissioning.

Supported retrocommissioning. This phase includes:

- continuous real-time monitoring, fault detection, and measurement and verification services for utility costs, and implemented energy measures.
- energy manager services that provide engineering and technical support to client staff in determining the validity of energy and environmental solutions beyond those examined during the retrocommissioning investigation
- energy-management training and ongoing commissioning to facilitate a management-level strategic energy and environmental plan and to engender sustainable maintenance practices at the building-operator level

- review and revision to BAS control system and service contracts for mechanical equipment to achieve performance-based activities that support the sustainable operation of systems and equipment
- quarterly site audits to perform reviews of maintenance activities, provide

incident reports, and service-contractor performance assessments

- an annual summary report of activities completed during the previous year, including total retrocommissioning energy savings, maintenance and operations savings, building operator training progress, deviations from projected savings, incident report summaries, avoided greenhouse gas accounting, and progress against strategic energy and environmental plans.

New challenges require a new approach.

The existing paradigm must shift if managers are to operate increasingly more complex buildings with the consistency required to lower energy costs. By moving beyond a traditional retrocommissioning project approach and embracing supported retrocommissioning, organizations can choose to embark on a low-risk path to long-term energy efficient building operations and an alternative to the status quo. ■

Wayne Whitzell is executive vice president with RetroCom Energy Strategies. He is a LEED AP and a certified Green Business Operator (GBO) with 20 years of operations and maintenance experience.

Bonus Info

- Managers who have retrocommissioned a chiller find the equipment's operating efficiency improves enough to recover the costs of the process in one-two years.
- Even chillers at 75 percent of their rated service life can be suitable candidates for retrocommissioning, as long as technicians have maintained them reasonably well and the units are in decent operating conditions.

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retrocommissioning as perhaps the most effective energy-efficiency tool managers can apply to an existing building.

Achieving the savings associated with retrocommissioning is the easy part. The difficulty begins when the retrocommissioning provider turns the project over to the operations and maintenance department. From that point forward, project energy savings begin to erode as the cycle

building-operator training and task review and mentoring, service-contractor quality assurance review and building systems condition assessments

- quarterly project performance report covering activities completed, energy-cost-reduction performance to date,

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PHOTOS: GEORGIA REGENTS MEDICAL CENTER

Project Profile

ABOVE & BEYOND

The Children's Hospital of Georgia is one of four buildings that make up the Georgia Regents Medical Center, which underwent a lighting retrofit that replaced more than 12,000 lamps and ballasts.

By Dave Lubach, Associate Editor

A lighting retrofit at Georgia Regents Medical Center exceeds expectations and paves the way for even greater energy efficiency and savings

Retrofitting the lighting system in any institutional or commercial facility is challenging for any maintenance and engineering manager.

But the challenge becomes even more daunting when the facility in question is a 1.6-million-square-foot regional medical center that provides round-the-clock service to the entire gamut of patients across several counties. The retrofit of the Georgia Regents Medical Center in Augusta required strong communication between in-house maintenance crews, contractors and the medical staff to ensure work was

completed as efficiently as possible without interrupting patient care.

"When you are changing out ballasts and lights, sometimes you have to kill the power," says Jimmy Taylor, the medical center's electrical services manager. "It's hard to do that when you're talking about being in a hospital, and you are going to tell the staff or department that you have to turn off lighting in the area.

"It was very challenging to come up with a timeframe. We needed to get it done, but we had to work around their schedule, which was sometimes tough because things run 24/7. That was one of the toughest challenges, working with the staff, but they worked well with us."

The search for savings

Before undertaking a lighting retrofit, the medical center in 2004 sought to earn Energy Star certification, placing it among the nation's top hospitals in terms of energy performance. A utility-management committee determined the retrofit, a three-year project which started in

2007, would be a significant step toward achieving that goal.

The medical center is a massive complex. Its four main buildings include: a 500-bed medical center; a specialized care center housing a 13-county Level 1 regional trauma center; a 154-bed children's medical center housing a Level 1 pediatric trauma center; and a medical office building housing more than 80 outpatient clinics. Some of the buildings are more than 50 years old. The medical center shares a power plant with Georgia Regents University, an affiliated nearby medical school.

The lighting retrofit, which included replacing almost 12,000 lamps and ballasts in the four buildings, arose from the need to address the issue of rising utility costs.

"The first big hurdle is, you have to get the information together and quantify how much it is going to cost and how much you are going to save," says Chris Miller, the medical center's director of facilities service support. "You have to go to leadership and plead your case. At the time, we had very good support, and they helped champion this for us. The biggest hurdle is getting the funding. Once we did get the funding, the second biggest thing was selecting the contractor, that partner we wanted to do this job with and come up with a game plan to implement it."



Closer Look: Lighting Retrofit

Chris Miller discusses the lighting retrofit's role in the Georgia Regents Medical Center becoming an Energy Star certified hospital

<http://bit.ly/YrHOfk>





The two-phase lighting retrofit took three years to complete. Because of a lean business model for facilities staffing, Miller outsourced the project so in-house staff could focus on the day-to-day operations of the medical center.

“It would have taken us a long time internally to use our resources, our manpower, to replace the amount of lights we replaced,” Taylor says. “It was a lot of lights. To get it done in the timeline we were looking for, we wouldn’t have been able to accomplish that.”

To find a contractor who also could provide service after the project was completed, Miller relied on established relationships with vendors and sought the advice of the medical center’s purchasing department. He also relied heavily on them for expertise about the most appropriate lamps to specify to meet the facility’s lighting needs.

To ensure contractors maintained a consistent level of activity during the project, Taylor and Miller developed a project schedule that would enable progress to continue without disrupting hospital operations and patient care.

“We had contractors here, and they needed to be working,” Taylor says. “So we tried to come up with a schedule with (medical) departments and the nursing staff so the guys could continue to work on a regular basis, instead of working a couple of hours here, then stopping, and having departments go by that schedule.”

“Sometimes, depending on what was going on, we had to break from the schedule, but (the hospital staff) worked well with us.”

Focus on the mission

Saving energy and money are essential elements of lighting retrofits, but those goals cannot interfere with a health care

facility’s core mission of patient care. So among his staff’s priorities during the retrofit was “maintaining good infection-control practices,” Miller says. “Our main job as a facilities department, regardless of our project, is making sure we’re not compromising our environment for patient care. The team worked heavily with the contractors to ensure that we took all the necessary infection-control precautions when we were in those areas.”

“That can be tricky sometimes. That involved a lot of coordination with the contractors, facilities staff, and nurse managers. It was really a combination of everyone working together, knowing where we


needed to be and scheduling those spaces.”

The in-house workers went to great lengths to educate contractors about systems and components that could not be compromised. For example, when working in the intensive care unit, turning off the wrong switch would have dire consequences.


“When you start working in different areas like stairwells in a hospital, you want to make sure guys turn the right breakers off and are diligent about turning the right things off,” Taylor says. “Our staff assisted with stuff like that to make sure the power was off before we started changing out lights and ballasts. We had to make sure stuff was labeled correctly. Not to say it was

Two buildings at the Georgia Regents Medical Center — a 500 bed hospital (left) and an office building housing more than 80 outpatient clinics — were the main targets of a 2007 lighting retrofit.






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An orthopedic office (left) and a lobby of the Georgia Regents Medical Center, which underwent a lighting retrofit in 2007 that resulted in annual energy savings of \$175,000.

a challenge, but it was something we had to take very seriously.”

Technology that saves

Before the lighting retrofit project, the medical center primarily used T12 fluorescent lamps. On the advice of vendors and the medical center’s purchasing department, Miller and Taylor chose to install the more compact T8 lamps and updated ballasts throughout all four main buildings.

“For the main hospital, we pretty much had 90 percent T12 light bulbs in our

facility,” Taylor says. “It was pretty easy (to determine which bulbs to use). We got some vendors to come in and see what kind of payback we’d get, and that made it pretty easy to go at that first to reduce our utility costs. Initially, we had about a 6.1 percent utility reduction, so it made it profitable to change those fixtures out.”

The initial investment for the medical center’s lighting retrofit was about \$433,000, which represented about 81 percent of the entire project, Miller says, adding that the project’s annual savings totaled

\$175,000 a year. The original return on investment was 2.4 years.

“We prepared some utility forecasts to really show the impact of what these types of projects would do,” Miller says. “And that was one of our selling points to leadership. We were probably more conservative on our initial estimates, and I think we exceeded our expectation by 10 percent more.”

Beyond the upgrade to lamps and ballasts, the medical center has completed additional lighting projects that have contributed to the savings. They include the installation of LED exit signs throughout the medical center and occupancy sensors in areas of the hospital that did not require around-the-clock lighting.

“Most of the places we replaced lights were running them 24/7, like hallways, so you get a maximum return,” Taylor says. “You are getting a bigger bang for your buck for lights that stay on 24/7.”

Instead of using T8s in the original retrofit, Miller considered installing LEDs, which then were emerging technology, but costly.

“We felt we could achieve the savings we wanted with the T8s and going with the conventional lighting,” Miller says. “But what we have done since then, because LEDs have become much more prominent, we have worked them in on many renovations we have done, and we are trying to move to LEDs where it’s affordable and aesthetically it provides a really good look.”

But wait, there’s more

Effective managers always look for ways to cut costs and improve energy efficiency. So even though the savings from the medical center’s lighting retrofit were higher than initial projections, Miller saw more low-hanging fruit.

“We are getting ready to embark on another lighting retrofit project,” he says. “We are actually going to be changing out 2,000 fixtures that will be retrofitted or replaced in our medical center. We’re also going to install over 50 additional occupancy sensors in specified areas.

“One thing I’m really excited about is we’re actually going to fit out one of our parking decks with all LED lighting fixtures. Over 490 fixtures in our parking lot will be LED. We’re really excited about that. We’re really making a big investment in that area with the LED fixtures.” The capital investment for the upcoming project is \$780,000, and Miller estimates it will generate annual savings of about \$51,000.

“We knew there was more out there, but we knew it would be a little more difficult to get,” Miller says. “That’s where us working with service providers helps us understand, ‘Where is that next level of savings, and how do we go about getting it?’ I’m sure even after this lighting project, we’ll be doing another lighting project because the technology is getting better and better.

“In a lot of what we’re doing, we’re changing out the T8s we put in the last project with newer T8s that are lower in wattage. It’s really revamping some of the old lighting.” ■



Among Coatings of Many Colors, Green Matters More

Impact of green considerations on paints and coatings prompts managers to rethink specification strategies

By Thomas A. Westerkamp

Specifying paints and coatings for use in institutional and commercial facilities has never been more challenging. Maintenance managers must select products that are cost-effective, aesthetically pleasing, and deliver long performance lives. But perhaps more importantly than any of these considerations, managers also need to specify paints and coatings that are environmentally friendly.

By understanding green-product information from organizations such as Green Seal and Greenguard, and the U.S. Green Buildings Council (USGBC), managers will be in a better position to select products that meet facilities' needs for paints and coatings and enhance overall sustainability.

Green groups

The main benefits of green products in the paints and coatings category are longer-lasting finishes, fewer facility occupant disruptions, improved indoor environmental quality, low harmful emissions, and conservation of both packaging and product resources. All of these benefits add up to lower life-cycle costs.

Green organizations provide certifications designed to promote sustainability and environmental awareness among paints and coatings specifiers. As a result, more specifiers now look for these certifications on the products they choose. Besides func-



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tional gains, these certified products also offer benefits related to life-cycle-costs.

Green Seal — www.greenseal.org — has a relatively wide coverage, e.g. environmental standards and certifications covering 32 categories and 375 products and services. In the category of paints and coatings, it offers three standards: GS-11, Paints and Coatings; GS-43, Recycled Content Latex; and GS-47, Stains and Finishes.

The Greenguard certification program — www.greenguard.org — developed by the Greenguard Environmental Institute is a third-party certification focused on indoor air quality (IAQ) — specifically

off-gassing of volatile organic compounds (VOC), formaldehyde, and other compounds. The standards are divided into areas of concentration and include IAQ for Building Construction Materials, IAQ for Office Equipment, IAQ for Electronics, and IAQ for Cleaning Products.

Both Green Seal and Greenguard are classified as independent, third-party providers but with close ties to ASTM and ANSI, which are national standard-setting organizations. They follow closely established testing procedures and protocols.

The Leadership in Energy and Environmental Design (LEED) — [http://](http://new.usgbc.org/leed)

new.usgbc.org/leed — is an international green-building certification rating system developed by the U.S. Green Building Council (USGBC). Its goal is to improve facility performance in: energy savings; water conservation; reduced carbon dioxide (CO₂) emissions; improved indoor environmental quality; and resource stewardship and impact awareness.

The LEED rating system includes credits for compliant paints and coatings. These credits vary depending on the LEED-certifying body, which include: USGBC, Canadian Green Building Council, National Association of Home

Builders, Master Painters Institute Green Performance Standard, Green Guide for Healthcare, and CalGreen, Part II of the California Building Standards Code. Each group has its own standards for paints and coatings. For managers to ensure their projects comply, it is important to know which certifying body is the controlling body for each specific project.

The International Green Construction Code (IGCC) 2012 — www.iccsafe.org/cs/igcc — is the latest release by the International Code Council (ICC) designed to promote green building standards. It integrates with the ICC family of codes to fill the need for a code that governs the impact of buildings on the environment. IGCC 2012 contains clear and specific requirements that are designed to promote safe and sustainable construction.

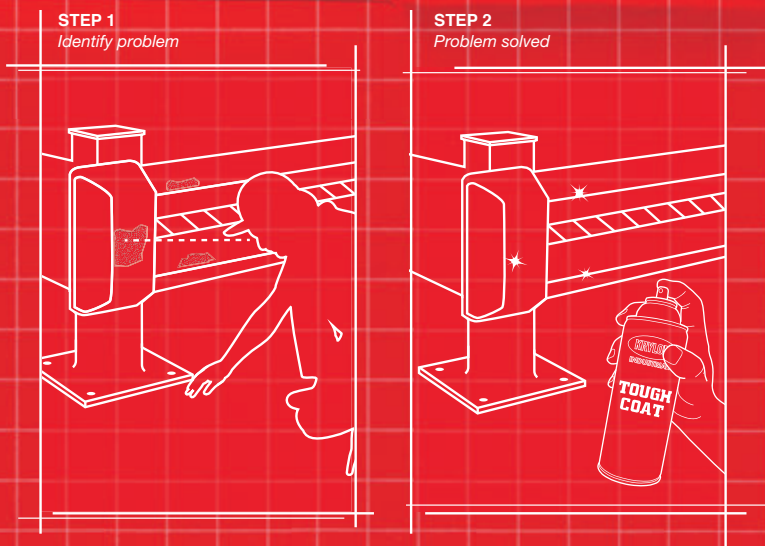
Green Globes — www.greenglobes.com — offers four sustainability programs: Design of New Buildings and Major Restoration; Management and Operation of Existing Buildings; Building Emergency Management; and Building Intelligence. As an alternative to LEED, it provides an interactive process, including online software, that is designed to simplify and accelerate evaluation of environmental sustainability.

One example of its guidance and assessment resources is the Continual Improvement of Existing Buildings (CEIB) program. The program assesses six environmental areas. The areas and weights are: energy efficiency (35 percent); water conservation (8 percent); resource recycling and waste management (11 percent); boiler emissions and water effluent (18 percent); indoor environment (18 percent); and environmental management (10 percent). When the user completes an online assessment, the software automatically generates a report containing recommendations for improvement in each area.

ASHRAE — www.ashrae.org — in cooperation with ANSI, USGBC, and the Illuminating Engineering Society, developed Standard 189.1 to provide minimum requirements for siting, design, construction, and operations planning designed to produce high-performance green buildings. It aims to balance environmental responsibility, resource efficiency, occupant comfort, and community impact. Managers can use the standard to measure compliance with the IGCC 2012, which regulates building construction and remodeling. The goal of 189.1 is to develop the present environment in a way that also gives weight to positive, future impacts.

More than 400 green building codes, standards, and rating systems offer credits for Greenguard certified products, including all of the above certifying systems. Greenguard certification ensures a product meets the most rigorous standards for low-VOC emissions. Specific application-related programs are available — for example, Greenguard Indoor Air Quality- and Greenguard Children and Schools-Certified. Greenguard Children and School-Certified rates building materials, furniture,

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Putting standards to work

It can be extremely difficult to ensure the green certification when specifying paints and coatings unless managers rely on reputable, knowledgeable sources. Consider the example of one lesser-known requirement: To minimize environmentally harmful emissions resulting from product transportation, managers must acquire a product within 500 miles of the point of use.

Given daily workloads, managers might be challenged to find the time to go through all the paint products to check for green certification from the right certifying body, that the specific product meets green requirements and works for each application, and the specific limits for each characteristic, such as maximum VOC allowable both for the product and additives. After all that, they still need to find a supplier — all at a reasonable cost.

To address the challenge, managers might consider a time-saving strategy: Make paints and coatings manufacturers or distributors the go-to resource to sort it all out, since manufacturers spend a great deal of money on research and development, testing, following testing procedures, and obtaining certification for their products.

SPECIFIER TAKEAWAY

To specify paints and coatings successfully, given their daily workloads, managers might consider making paints and coatings manufacturers or distributors the go-to resource to sort it all out, since manufacturers spend a great deal of money on research and development, testing, following testing procedures, and obtaining certification for their products.

Managers often ask this question: “Which certification(s) are required by this project’s architect and engineering firm, state or local building code body, or industry?” With the answer to this key question, the supplier can provide a product specification that complies with the appropriate codes and green certifications. Suppliers already have submitted their products for the testing and can recommend those that have the certification and labeling the application requires.

Fine-tuning the process

Paints and coatings manufacturers also can give managers a standard, universally recognized specification format, such as the one developed by the Construction Specification Institute (CSI). This format comprises a complete, detailed list of specifications for an application, including a list of the vendor’s product codes and descriptions that are certified to meet the applicable green-certification requirement.

One example of the certification process is the Green Seal certification GS-11. In addition to detailed testing and recording of physical and chemical properties, GS-11 includes print and electronic access to instructions for life-cycle management of the product. It covers three areas:

End of life. These requirements include instructions for purchasing only the needed amount, proper ventilation, recycling methods, and any available manufacturer take-back programs, including return of both the product and its packaging.

Packaging. They require 20 percent recovered material, except for the material

in a take-back program; a limit on packaging of 0.01 percent heavy metals content, or one part heavy metals per 100 parts of product; and a prohibition on phthalates.

Labeling. These include: instructions for contacting local authorities to determine availability of recycling options for leftover product and packaging; guidance on using applicable take-back programs; using the Green Seal certification mark without modifying language; and a certification statement that the product meets Green Seal performance standards.

While green specification for paints and coatings involves gathering and analyzing

a massive amount of information, sustainable construction and operations for facilities also raises awareness of the impact of facilities on the environment, both inside and outside. In the long run, a strong partnership between managers and the manufacturers of paints and coatings results in sustainable approaches that serve occupants better and protects the environment for the future, all with lower life-cycle costs. ■

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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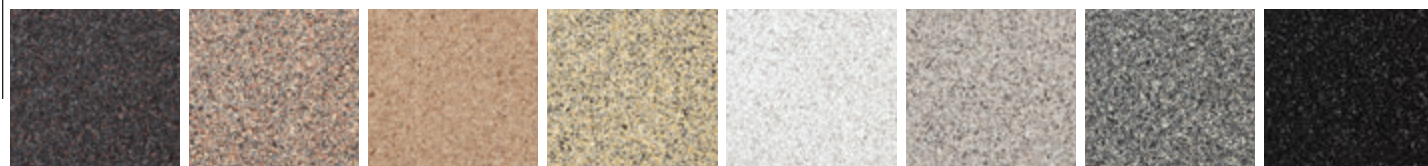


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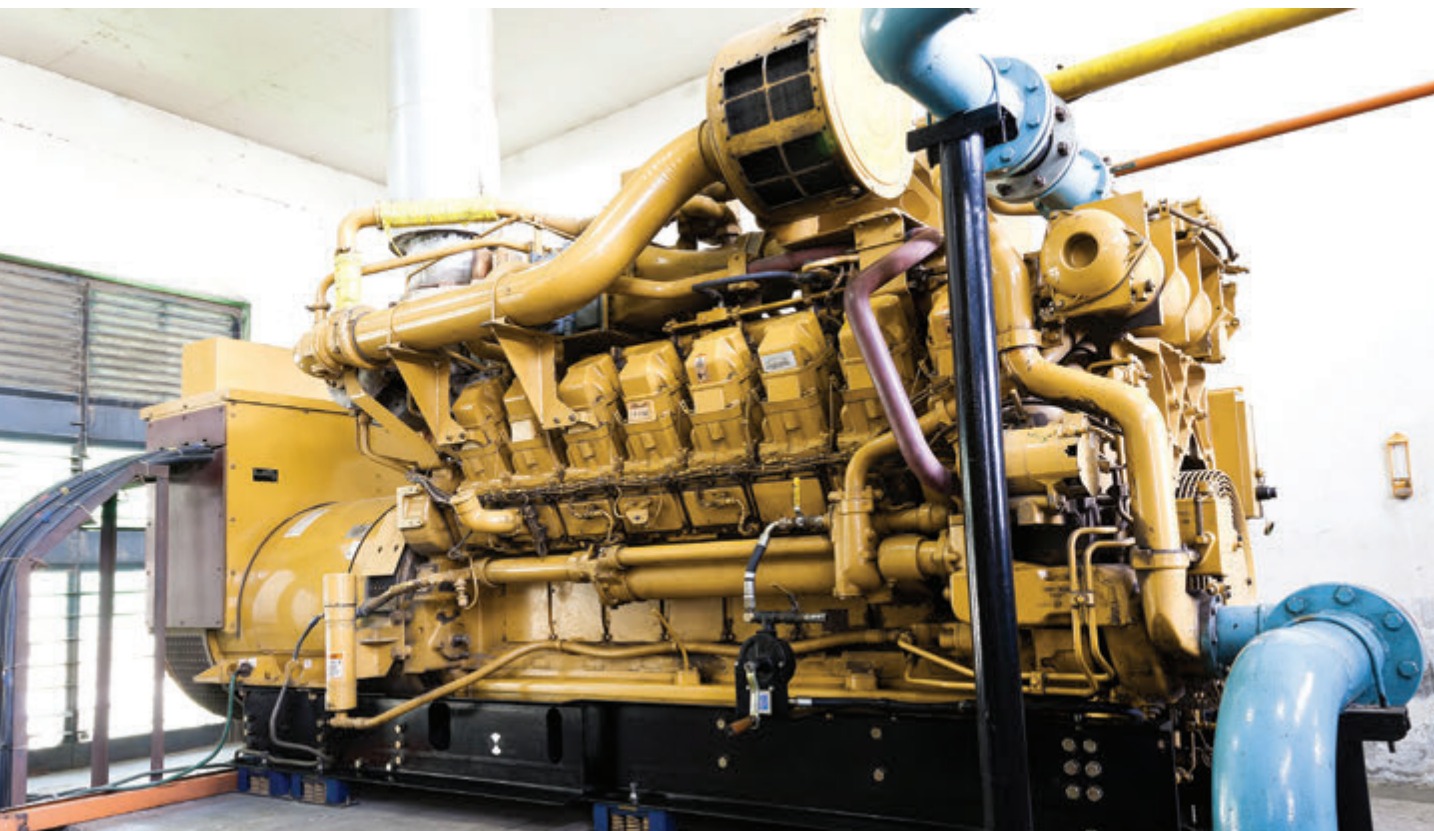
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Backup Power Systems: Maintenance Matters



Even code-compliant, modern facilities that feature redundant systems require proper testing and maintenance to ensure performance

By Greg L. Livengood, P.E.

The failure of a backup power system in an institutional or commercial facility could cause the loss of productivity, revenue and even human life. As a result of these high stakes, maintenance and engineering managers must ensure they provide a reliable flow of power to support critical systems and equipment, especially in emergencies.

In many facilities, a standby generator system supports crucial life-safety systems, such as egress lighting and fire alarm, that enable occupants to safely evacuate a building. In health care facilities, these systems also support essential life-support and other equipment.

In facilities with critical computer and technology loads, uninterruptible power supplies (UPS) are part of the standby power-distribution system. These sys-

tems include auxiliary equipment, such as transfer switches and fuel tanks.

But even modern facilities that are designed according to codes to provide backup power systems with appropriate levels of redundancy will have a high probability of failure if technicians do not properly test and maintain these essential systems.

Troubleshooting tips

Prior to the testing and maintenance of backup power systems, technicians need to investigate potential locations and environmental causes of failure. Is key equipment located below flood level? Is it located below seismically unsafe objects or in an area with insufficient air flow? Assuming the system's designers and installers resolved any location and environmental issues prior to installation, managers can focus on testing and maintenance.

Just as a chain is only as strong as its weakest link, a standby power-distribution system is only as strong as its weakest link. A 5 megawatt (mW) generator distribution system can fail because of an incorrect fuse, a loose wire connection, or a lack of fuel.

It is important that technicians address all system components both individually and as a system. Standby power systems typically contain cooling, fuel, battery/charging, engine, and distribution subsystems, which all have

In facilities with critical computer and technology loads, uninterruptible power supplies are critical components of the standby power-distribution system.

their own unique testing and maintenance requirements.

Focus on system failure

Among the most common causes of failure in generator and UPS distribution systems are these:

- incomplete system commissioning that fails to identify installation or control-logic errors
- equipment not returned to proper operational state after testing, maintenance or alarms
- generator failure to start, due to old, discharged or poorly maintained batteries
- battery charger breaker turned off
- low fluid levels or fluid leaks
- exhaust system failure due to wet stacking, or running generators under low load that causes the accumulation of carbon particles, unburned fuel, oil and condensed water in the exhaust system
- insufficient reserve of fuel or deteriorating fuel quality
- operational failure of ventilation louvers.

Reliability through prevention

The first step to having a reliable power system is proper factory testing of the equipment, followed by acceptance testing and commissioning of the complete system on site. Once installed, it is then critical that managers develop a comprehensive preventive maintenance (PM) program and that technicians follow it. Managers can use the following criteria to develop the program:

- manufacturer recommendations
- ANSI/NETA MTS-2011, Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems
- NFPA 70B, Recommended Practice for Electrical Equipment Maintenance
- NFPA 110, Emergency and Standby Power Systems
- Other codes and standards as applicable to facility type, such as NFPA 75,

Bonus Info

- Many uninterruptible power systems (UPS) can remotely send an alert if a problem occurs, and some can even conduct a controlled shutdown for networked computers upon receiving a warning.
- The lifespan of UPS batteries is typically three-five years, depending on conditions and maintenance. At that time, technicians must replace them to ensure the unit operates properly.

Find more info:

www.facilitiesnet.com/11987ms

Protection of Information Technology Equipment, and NFPA 99, Health Care Facilities

- other codes and standards as required by local and industry authorities having jurisdiction

These references give managers detailed recommended and required PM tasks that are too numerous to list. Also, maintenance and testing requirements vary depending on facility type and the critical nature of the supported loads.

PM program components

A typical PM program for standby power systems and equipment can include the following steps:

Weekly

- Check the coolant heater, coolant level, oil level, and charge-air piping.
- Visually inspect exterior of equipment for obvious damage or leaks.
- Check gauges and instruments.

Monthly

- Load test generators and transfer switch operation. For hospitals, the testing frequency must be 12 times per year with intervals of not less than 20 days and not more than 40 days as required by the Joint Commission.
- Visually examine fuel samples.
- Check coolant concentration.
- Visually examine belt tension.
- Check air filters and battery chargers.
- Drain fuel filter and drain water from fuel tank. Fix if this is a recurring issue.
- Drain exhaust concentrate.
- Check battery electrolyte levels.
- Check connections for corrosion.

Quarterly

- Visually inspect for loose connections, burned insulation and signs of wear.
- Visually inspect fuses for discoloration caused by heat from poor contact or corrosion.
- For hospitals, perform tests of stored emergency-power-supply systems.

Semiannually

- Clean crankcase breathers.
- Check radiator hoses.
- Visually check for liquid contamination from batteries and capacitors.
- Clean equipment enclosure.
- Inspect environment HVAC equipment and performance to check temperature and humidity.
- Conduct thermal scans of electrical connections to ensure all are tight and not generating heat, which is the first and sometimes only indication of a problem. Using this non-evasive diagnostic tool helps identify hot spots not visible to the human eye. Re-torque if the thermal scan provides evidence of a loose connection.
- Test entire transfer switching sequence.
- Exercise main and feeder circuit breakers over 600 volts (V).

Annually

- Provide a complete operational test of the system, including a monitored battery rundown test to determine if battery strings or cells are nearing

the ends of their useful lives.

- Flush and refill the cooling system.
- Change the oil and filter, as well as the coolant filter
- Change the air and fuel filters.
- Inspect the main and feeder circuit breakers less than or equal to 600V, and periodically exercise the components per manufacturer recommendations and test them under simulated overload trip conditions.
- Test the UPS transfer switch, circuit breakers and maintenance bypasses.

Biannually

- Test the main and feeder circuit breakers greater than 600V under load conditions.

Every three years

- Run a four-hour generator load test.

As needed

- Test components suspected of being defective or that have been subjected to unusual adverse conditions.

Only qualified personnel who have been adequately trained and adhere to requirements of the NFPA 70E, Electrical Safety in the Workplace, and other applicable safety requirements should perform PM work.

Additional safeguards

In addition to a PM program for backup power systems, managers also should consider additional recommendations designed to maximize system reliability and emergency-response efforts.

For example, managers can consider the use of remote monitoring systems. These systems monitor and provide audible and visual notification of trouble and alarm events before the facility actually needs the system to operate in an emergency. These monitoring sys-

tems also can provide notification when PM is required. Examples of available remote-monitoring features that address common causes of failure include:

- Alarms when not set in automatic, when the emergency stop engages, or when the output breaker is open
- Battery condition, backup time and test schedule, and charge levels. This is particularly valuable because more than

- Posting the PM schedule with automated PM reminders. Technicians should not delay PM efforts just because it is difficult to arrange an outage.
- Providing simulations of various potential emergencies to determine effective responses, identify points of failure, and train technicians
- Storing necessary spare parts on site

Prior to the testing and maintenance of backup power systems, technicians need to investigate potential locations and environmental causes of failure

90 percent of generator failure-to-start issues are related to the batteries.

- Block-temperature and coolant-level monitoring and alarms.
- Fuel level and load measurements
- Lube oil pressure
- Water temperature
- Notifying qualified personnel and the backup staff of emergency, alarm and trouble events. Many generator control panels now have web interfaces with automatic dialing,
- Securing equipment from access by unqualified personnel
- Maintaining code-required working clearances around equipment
- Providing adequate battery-powered illumination of critical-equipment locations

- Storing system record drawings at a readily accessible location.
- Storing equipment and system operation and maintenance manuals at a readily accessible location.
- Documenting and organizing all testing and maintenance events

Finally, it is imperative that technicians perform regular system testing and maintenance in order for managers to sleep well at night and be confident their power systems have the highest probability of operating when needed. ■

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Customer Service

How much time do you devote to training your staff on working with customers? What happens when you receive complaints or comments about someone on your staff? Three managers share their views on savvy customer-service practices



Steven H. Crenshaw,
Director of Facilities
Management,
Springhill Medical Center,
Mobile, Ala.



Ken Roey, Executive Director
of Facilities Planning and
Management and Acting Chief
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Tony Nettle,
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By Dave Lubach, Associate Editor

Customer service is often an overlooked aspect of the job for front-line technicians, supervisors and managers in maintenance and engineering departments. While making sure institutional and commercial facilities operate in a safe and efficient manner is always a manager's top priority, providing high-quality customer service can mean a great deal to a department's reputation and the organization's bottom line.

[Q] Where does customer service rank on the list of your department's priorities?

CRENSHAW: It is the highest priority we have. Obviously, we have a lot of priorities that rank right up there with customer service, such as the provision of essential services and the maintenance and construction of the building. But customer service is a topic we discuss at least on a weekly basis in shop meetings.

ROEY: It ranks at the top. Five years ago, we talked in terms of schools, in terms of other departments, and today we talk about customers. It's been a gradual shift over time in viewing our schools and our other colleagues as customers instead of just somebody else who needs a service.

NETTLE: At the very top. We have a program called "For Complete Customer Satisfaction," so it's the absolute most important thing for tenant retention. (The program) ensures that the leasing department, operations, property management department and construction department, along with supporting groups, take care of the tenant throughout all stages

of construction to tenant occupancy and then from occupancy to move out in a flawless manner. It creates accountability and provides the necessary oversight for the process to be successful. This allows our tenants to be treated in a first-rate manner with all departments.

[Q] How much time do you devote to training employees on how to deal with customers?

ROEY: We probably could spend more time, but we have spent a lot of time in the last couple of years through workshops and other training processes talking about customers and looking at it from the customer's perspective. I've personally led training with a number of groups around the department.

"If our staff can provide the service necessary to reach the quality level that they would want for their own family, then we're going to have good customer service"

We have some supervisor training, where we're taking aspiring leaders and trying to grow them into the next set of leaders, and during those sessions we talk about it. We

try to insert it wherever we do some sort of formal training opportunity. More and more, it's becoming the focus and not just another subject of the training.

NETTLE: We have training programs for all the employees, and we have several different ones based on what their interaction is. It's reinforced on a bi-weekly basis to all of the tech staff and in tech meetings that we have. Then, from an organizational level, we hold monthly meetings. It's hard to quantify because we have specific online training that we do, and we have meetings that we do. And based on individual growth, we then provide outside training, as well. It's pretty extensive.

[Q] How does your department deal with complaints?

CRENSHAW: We'd like to think (we respond) promptly and effectively. One of the things we do is, we've created a program where all the departmental managers, from nurses and managers, once a month, are assigned a unit where we actually sit down and talk to the patient. We talk about everything from the admissions process to things like how the nurses and doctors communicate to them. Hopefully, that stops complaints in real time. Each of the managers that make these rounds can do whatever they have to do to resolve the complaint. My department deals with them in such a way that if a manager goes into a patient's room and says, "My air conditioner has been noisy since I got here,

I just haven't reported it," we're obligated before the close of business that day to not only repair it, but the manager goes and visits that patient, as well, to make sure they are fully satisfied.

ROEY: We're learning about that. We do a lot of surveys. I personally survey the principals of the schools and get feedback from them one-on-one, both in general outcomes in person about specific people and what kinds of services they deliver. We have other types of surveys and reports we get from schools and other places. What we try to do is not personalize the negative feedback. That's feedback that would only go to the director of school facilities. It would be held at that level. We would want to correct the problem, but we don't want to personalize it so that people are afraid to share honest feedback. On the positive side, we want to celebrate the good things. So if somebody tells me, "Joe did a marvelous job," I'll publicize that as widely as I can, and in some cases, if it's something I think is quite noteworthy, I'll get to that person's supervisor directly, rather than an e-mail note. Probably 10 times more powerfully than negative feedback, positive feedback can be a real great example, a place to pull your people forward, (rather) than tearing them down.

NETTLE: We do a thorough investigation. We first look and see what the initial contact was to us — whether, in case one of our tenants, did they send in the request through the work-order system, or did they verbally communicate it to someone? The communication aspect is the first trail that we look at. Then we look at response time. We look at what was required to satisfy that response. We look at everything. We look at the tenant itself. We look at all those varying aspects and see where the breakdown was. Then we get the team together that responds for that particular property, then put in measures to ensure that a similar situation doesn't happen again, and we provide re-training in any areas where it's necessitated to make sure that we provide the best service the next time around.

[Q] When you do receive feedback how do you pass that information along to staff?

CRENSHAW: I'll take it in two examples. One, specifically, either positive or negative, that results in regards to a specific individual's actions, we will address that with the individual. There's an old saying, "Praise in public, criticize in private." If a person fails to follow up and fails to do the proper job, that can result in an oral warning right up to disciplinary action. If it's positive, then we may hold that person out as a great example and put a letter in their file. (For department units) in a shop meeting, we have results, and they are posted on the wall. So if a specific unit is good or bad, we identify that in a public forum, and nobody wants to be

bad. That's been one of the most successful things, to create peer competition or peer pressure to excel in their ratings.

ROEY: I will write up a formal visit report, and if it's coming to me, it will show up in the formal visit report, and it will be tracked by other means until it's resolved. If it goes to a lower department, then I'll expect that they may not have as formal a process as I have, but the expectation is that they'll get back to the customer with some type of resolution. I think it's very important that people know that you're acting on the feedback you're getting, and that it just didn't go into some inbox someplace, never to be heard from again.

NETTLE: Depending on how severe the incident was, whether it was positive or negative, we'll wait until we have a staff meeting. If it was more critically important, we will call a meeting to address it. We communicate it on an individual basis, then break it out to the group as a whole, regardless of whether it's positive or negative, to ensure that they have an understanding of what they did right and what they did wrong.

[Q] Describe a noteworthy customer service example, either good or bad, that you have experienced.

ROEY: We had a custodian who was a day building supervisor at an elementary school, and he was named supervisor of the year for the school system. When they had his ceremony to give him his certificate, the superintendent came to give it to him and they did it in the gymnasium of the school. Every student and staff member

of the school was in there, and when they brought him in there was wild cheering and clapping. They made all these cards, and there was this outpouring of joy about what a great person this supervisor was. It was very obvious he had created a personal relationship with his customers. It wasn't as the supervisor, it was as the person, and how they related to him, and how he related to the students and the staff. Creating that personal bond, to me is the key to creating a great customer relationship. On the flipside, many years ago, I was in the Navy at the time, and had a commanding officer's ship call me when we was supposed to be under way, and tell me the services I had provided from a couple of different shops had not allowed him to get under way. The equipment did not work. In the Navy, the absolute worst thing that can happen is to miss a commitment and not get under way on time. What I really felt bad about was that I didn't know that until he called me. If you don't have that relationship that at any time, you can't pick up that phone and talk to somebody as a friend or a person versus that's some anonymous provider, you're not going to very successful. It's all about that personal relationship and bond you create with your customers.

[Q] What is the most important lesson you have learned from your customer-service experiences?

CRENSHAW: We have a philosophy in our hospital, as well as our department, that if it's good for the patient and it's good for the hospital, then you can't make the wrong decision. The most important lesson that I have learned and try to teach is that we

want to treat every patient as if they were a family member. If our staff can provide the service necessary to reach the quality level that they would want for their own family, then we're going to have good customer service. What's the old saying, "If they have a good experience, they'll tell three people, but if it's a bad experience they'll tell 12?" We want to avoid those bad experiences, and we want to do everything necessary from a preventive standpoint to head those off.

ROEY: No news is terrible news. Because we're so busy, because we don't like people yelling at us, we tend to shy away from reaching out and over time have just said, "They'll let us know if there's a problem." That's just the farthest thing from the truth. The more that you can reach out and pull the information out of the customers and find out what's going on, both in terms of the delivery of your service and any issues they may have, even if it has nothing to do with the original work you did, the better off you are in developing that customer relationship. We really have to train ourselves to listen to feedback and realize that not everything goes right. If you want to get better, you have to understand that negative feedback and get better from it.

NETTLE: Communication. Everything usually boils down to communication, and having a proper understanding of the tenant's or the customer's needs, and making sure that the proper level of communication is established between you and the customer. ■

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Product Focus

Building a Framework For Inventory Control

Shelves, racks and bins form the basic but essential foundation of an efficient, cost-effective inventory-management program

By Frank Murphy

Of the many issues facing maintenance and engineering managers in institutional and commercial facilities, few are as troublesome and complex as overseeing the location of spare parts and equipment required to operate and maintain facilities and developing the system to successfully track these materials.

Each facility has parts that are unique to its particular operations and functions. A multi-building campus faces additional challenges that are related to the number, location and age of buildings, as well as the storage of the many parts in different styles, sizes and colors, many of which have changed over the years.

Successful inventory management requires storing parts in a manner that maximizes the use of available space, accents part-storage density, maintains parts in a minimum-yet-sufficient quantity, and stores them in a way that allows rapid access, effortless location, and simple checkout.

With the space limitations usually placed on storerooms for parts related to maintenance, repair and operations (MRO), it is important that managers use the proper storage equipment. Managers often ask, "What is the best method of part storage for my facility?" For many applications, most parts fit into modular drawer cabinets, as well as 12- and 18-inch-deep shelving. Larger parts naturally require larger storage fixtures.

Each storeroom has its own special requirements, depending

on the number, size, and type of parts being stored. No across-the-board best method exists, and bigger is not necessarily better. Space limitations exist, and expansion might be limited, if it is available at all. But managers can follow general guidelines for effective inventory management, depending on budgets and space requirements.

Steel modular-drawer cabinets

For managers tackling inventory management challenges, steel modular-drawer cabinets without a doubt offer the greatest parts-storage density of all available storage media. The ability to store parts in three dimensions — height, width and depth — enables these cabinets to provide the smallest possible storage footprint. The cabinets are popular because they can store a range of parts, both generic and original equipment manufacturer (OEM).

They also enable storeroom supervisors to neatly and securely organize a range of parts, from miniature light bulbs and overload heaters up to circuit boards, air cylinders, and temperature and pressure gauges. Adjustable partitions and dividers allow for parts size, and supervisors can place a text or barcode part-identification label on the divider. Plastic bin cups are available for the very small parts.

Cabinets are about 30 inches square, stand about 60 inches high — 44- and 39-inch heights also are available — and have 4-15 drawers. Typical drawer capacity is 400 pounds, and drawers vary in depth from about 2 inches to 13 inches. The number of drawers ordered for a cabinet determines its price.

Modular-drawer cabinets also reduce the amount of total square footage a department needs for storage, and they provide additional storage space on top of the cabinets for bulkier, lighter items. They present a layout that is efficient, cost-effective, attractive, and professional, and they expand easily. But they are more expensive than standard, steel shelving.

A closer look at shelving

Shelving can provide excellent parts storage if storeroom supervisors use the horizontal and depth features completely and effectively. Otherwise, they risk wasting shelf space. They can adjust the distance between shelves according to the height of the parts they hold. Managers should avoid buying shelving units that are bolted together, as well as the type available in retail hardware and home improvement stores. Managers considering the purchase of shelving should consider these guidelines:

- Buy closed shelving, where the backs and side are solid, not open. This construction contributes to the overall cleanliness of the parts.
- Use shelving that is 36 inches wide. Shelving that is 48 inches wide is acceptable, though more expensive.
- Use a common back panel for back-to-back installations.
- Install side and back cross braces to increase stability for open shelving that has no backs or sides.
- Use medium-duty, 22-gauge shelving, which has a 600-pound load capacity.
- Consider using in-shelf drawer units that are knee-to-shoulder

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The starter and adder system, with the option of back-to-back configurations, enables unlimited layout possibilities. The definite positioning system makes relocating or adjusting easy and safe. Assembly is tool-free, and the reconfiguration process allows the user to make unlimited changes with minimal effort. **Free Info: Circle 200**

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FASTENAL CO.

Managed-inventory system

The system assists in managing bin-stock items like fasteners, fittings, and cutting tools. Based on a contracted-service agreement, the company provides new bins free of charge and leverages local presence to keep them continuously filled. The bin labels are washable and removable, and they feature a color image of the product. The turnkey solution improves organization and productivity, reduces on-hand inventory without risking stock-outs, and frees up time and labor previously spent on tasks such as selecting, ordering, and stocking products. **Free Info: Circle 202**



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The cabinet is available with manual or self-closing doors and features parts manufactured from cold-rolled steel. A flush-mounted paddle-handle design allows fingertip operation and features a double-key set that can be padlocked.

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der level as a way to increase the density of parts storage.

- Buy shelving that is 72-87 inches high. Shelving higher than 6 feet requires supervisors and technicians to use a step stool or safety ladder.

Managers should not purchase shelving that is more than 87 inches high. Parts-storage and retrieval, visibility, and access (safety) are major concerns. Also, storerooms should feature bin boxes that are metal or sturdy plastic to increase part-storage density. Cardboard bin boxes are not durable. In addition, they absorb ink and label glue

over time, and parts information written on their front tabs becomes faded and illegible, and paper labels fall off.

Shelving-depth options

12-inch-deep shelving. A number of inventory-management applications use 12-inch shelving, but managers generally should avoid purchasing or installing it unless the clear majority of the parts to be stored on them — more than 80 percent — are less than 12 inches long. In some storerooms, such shelving works well, especially where smaller mechanical, electrical, bear-

ings, and OEM parts fit neatly on the shelf.

Frequently, when parts are too large or too long to be stored on this shelving, supervisors place them on the top shelf of the unit. But if the storeroom's ceiling is low, this tactic can present a real danger to fire-sprinkler head or light fixtures when supervisors move the parts. Parts longer than 12 inches usually are stored lengthwise, wasting valuable storage space on the shelf because no other parts can be stored there.

While supervisors can store parts too large to be neatly stored on 12-inch-deep shelving in other locations, this

step can lead to lost or damaged parts, decreasing consolidation and efficiency and increasing overall carrying costs.

18-inch-deep shelving. 18-inch-deep shelving provides the optimum storage depth for most parts in an MRO parts storeroom. These shelves provide the proper room to store parts behind one another, especially if parts are in OEM boxes. Supervisors also can subdivide metal or plastic bin boxes with dividers or bin cups. In applications using this shelving, part consolidation and organizing increased part storage density. Part consolidation contributes to reducing the number of like parts requiring storage while lowering the overall inventory value.

24-inch-deep shelving. Shelving this deep is the least useful for general-parts storage. They waste considerable shelf depth space if parts are not 22-24 inches long.

Bulk-storage racks

For storerooms with long, or larger and lighter-weight parts, managers should consider using bulk storage racks that are 24 inches deep, 96 inches wide and 72 inches high. These racks are available in several lengths, depths and heights not greater than 72 inches high. They can handle parts — including air filters, flexible ductwork, longer air or hydraulic cylinders, midsize gearboxes, conveyor belts, speed reducers, gear motors, and motors — that are too large, too bulky, or too heavy for smaller shelving.

Supervisors can place cross beams just above floor level so parts are stored off of the floor. Or they can store pallets on the floor under racks to support heavier parts.

Pallet racks

Pallet racks used for inventory management usually are found in warehouses. They store the larger, heavier parts, such as motors, gearboxes, pumps, motor-gearbox/pump combinations, machine parts, and large components or machine assemblies. Supervisors should ensure the heaviest items remain on the floor and be careful not to exercise storage beams.

Racks generally are 24-48 inches deep, have beam lengths of 6-12 feet, heights of up to 20 feet, and beam-pair loads with decks capable of holding several tons. Taller racks provide excellent use of vertical space and increase part-storage density.

Storerooms can use any combination of these fixtures to effectively and efficiently store MRO parts. A well-organized storeroom provides the department the support it needs to keep HVAC, lighting, plumbing and electrical systems in the best possible operating condition. Using these products, parts are available to technicians, who can locate them quickly and make repairs more efficiently. Supervisors can reorder needed parts in a timely manner, and the department can deliver cost savings for the organization's bottom line. ■

Frank Murphy, CPMM — ims@sosims.net — is founder and president of Inventory Management Services Inc., in Greenville, S.C.

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POWER MANAGEMENT

Power Play: Incorporating DC Power Into Facilities

Benefits related to energy savings, renewable energy, system reliability and maintenance make DC power an appealing option for facilities

By Brian T. Patterson

The quest for more efficient lighting systems in institutional and commercial facilities has spurred ongoing innovations in technology. Most solutions deepen the trend toward lighting and controls in becoming more highly dependent on solid-state, digital electronics and power conversions.

As a result, an increasing portion of the electricity used in lighting and related devices requires conversion of the building-available form of alternating current (AC) to direct current (DC). In many cases, this conversion can result in power-conversion losses of 5-20 percent, depending on the device being powered. Also, the power electronics required to make these conversions and to protect the downstream control and driver electronics decreases the reliability of the entire system.

On the power-generation side, a growing number of native DC renewable sources are being deployed on site in facilities, resulting in additional conversions because the power must be inverted to AC for distribution, then converted back to DC at the device level. The additional electronics employed in these conversions also decrease the reliability of the entire system.

Finally, recent weather, natural disasters, and faulty operations at major events also have drawn the attention of many maintenance and engineering managers to additional considerations concerning back-up power and off-grid — islanded — power. The relative simplicity and lower cost of DC power back-up systems have become an increasing focus in this regard.

In response to this new landscape for improved power-use efficiency and reliability, a growing number of managers

are looking to revamp the traditional systems for power generation and delivery.

DC: A powerful solution

Two critical aspects of the current electrical infrastructure involve solutions that improve energy efficiency by minimizing losses related to converting AC power to DC power.

First, if electrical systems can convert AC power upstream of individual devices, the means and size of these converters become more efficient and cost-effective.

Second, by avoiding the need to convert power generated or stored as DC to AC for building distribution — or otherwise using it in its native DC form —

facilities can avoid significant additional conversion losses. The simple axiom is to convert AC to DC once instead of multiple times, as well as to use DC power without conversion for on-site renewable-energy generation.

By making thoughtful, deliberate changes in the number and level of power conversions in systems with a keener eye on the needs at the device level, managers and their organizations can realize significant benefits:

Energy savings. While the amount of savings in electrical energy is somewhat difficult to completely capture, a Yale University research estimate puts the annual potential reduction at more than 8 percent of the total national electricity load, or about 400 million kilowatt hours per year. This estimate does not take into account additional energy savings resulting from lower cooling loads in buildings that use fewer electronic-conversion devices.

Renewable-energy integration. DC microgrids eliminate the need for multiple inverters and converters and,

as a result, facilitate simpler and more energy-efficient coupling of distributed alternative- and renewable-energy generators — solar and wind power, fuel cells, etc. — that natively produce DC power. Multiple distributed-source generators coupled onto a common DC bus can make it easier and more efficient to use site-based alternative energy, according to industry-sponsored research at the Electric Power Research Institute (EPRI). It also allows the harvesting of even small amounts of energy without

the cost of inverters and other expensive, difficult-to-maintain circuit-protection devices. Phase correction, filtering and line balancing typically are not important considerations when using DC collection and distribution buses.

Energy storage. Local energy storage will be essential to the more widespread use of non-dispatchable — intermittent — distributed-energy generators. The distributed-bus architecture of DC microgrids allows the simpler, more energy-efficient coupling of natively DC



From a building operation and maintenance perspective, the benefits of DC power grids in institutional and commercial facilities go beyond decreased energy use to include reduced labor costs, easier maintenance, and fewer facility interruptions.

electricity storage using such devices as batteries and ultra-capacitors.

Control and monitoring. Most modern controls, sensors and monitoring systems natively run on DC current and are digital or microprocessor based. So the use of DC microgrids greatly simplifies the electronics involved with electrical and energy-system control and monitoring by eliminating the need to convert AC power for operation.

System reliability. The intrinsic redundant, disaggregated topology of DC microgrid networks assures a higher level of service reliability. The public grid and individual microgrids can be isolated from one another during other dynamic and damaging linear-failure events and disturbances. The reduction in subsystem and device-level power conversion and inversion improves the mean-time-to-failure levels in equipment.

Electric-vehicle (EV) integration. As battery-powered and plug-in hybrid EVs begin to populate more facilities' fleets, plug-in charging and the potential use of EVs to provide supplemental storage or electricity back-up capability are likely to increase. As a result, electric power grids will need to accommodate this shift in energy distribution and use. Since these vehicles run on pure and modulated DC electrical systems, DC microgrids will more easily provide for their needs related to charging — including fast DC charging — and storage connectivity, again with fewer wasteful power conversion and inversion steps.

Spotlight on LEDs

Lighting can use up to 30 percent of electricity in facilities, according to the U.S. Department of Energy. Light-emitting diodes (LEDs) offers opportuni-

ties for greater system efficiency, design, aesthetics, operations, and maintenance. Adopting building-level DC power-distribution microgrids as part of the building infrastructure can benefit these areas.

For example, at the luminaire level, locally available DC power eliminates the need for a power supply to convert AC line voltage for use by LED devices, resulting in lower conversion loss and

improved efficiency at the fixture of up to 15 percent. Multiply these improvements by the number of lighting fixtures and other electronic devices in a building, and the savings add up quickly.

As luck would have it, many of the electronic components eliminated in that front-end conversion are responsible for limiting the life of LED systems. In most cases, it is not the LED that fails

Spotlight: EMerge Alliance

What is driving the movement toward direct current (DC) power in institutional and commercial facilities? An open industry association called the EMerge Alliance is leading the rapid adoption of safe DC power distribution through the development of EMerge Alliance standards.

The alliance's vision is to create open standards for room- and building-level DC microgrids for campuses and buildings, including the occupied space, data and telecommunication centers, building services and utilities — including HVAC, pumps, and air compressors — and outdoor power requirements, such as electric vehicle charging.

The EMerge Alliance standards are targeted to complement existing alternating current (AC) infrastructure and standards, with a hybrid DC power layer at the local load level. Larger building loads, such as HVAC equipment, motors and high-bay or industrial applications — are often DC-based — for example, variable-speed drives — and are ideally suited for DC microgrids.

Backed by a membership of more than 100 leading organizations, the alliance's technical standards committees define touch-safe voltages and limited-current potential at the user interface to enable plug-and-play device flexibility, while setting higher voltage levels for building-level power distribution and for larger-load devices.

In all cases, the alliance is crafting standards to facilitate energy savings at all levels by avoiding unnecessary power conversions and maximizing the opportunity for highly articulated digital control. Perhaps most importantly, the standards are designed to allow direct integration of site-based, renewable energy sources and storage devices without using costly, inefficient power inverters.

The alliance has completed standards for the occupied space and data and telecommunication centers, and EMerge Alliance Registered products are available to the market.

For more information, visit www.EMergeAlliance.org.

— EMerge Alliance

in the system but the power supply or other electronic components responsible for converting AC power to DC power and controlling power quality and performance. So another bonus is improved overall system reliability.

Effective building operation

From a building operation and maintenance perspective, the benefits of DC power grids go beyond decreasing energy use to include reduced labor costs and fewer facility interruptions. While the backbone distribution is done with higher voltage — Class 1 wired — AC or DC power, the final distribution is accomplished with isolated Class 2 wired and powered grid or wiring bringing 24-volt DC power throughout the occupied space. This makes several safety and maintenance practices much easier.

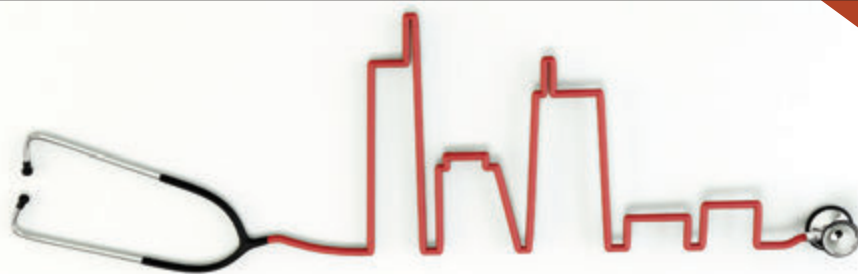
When technicians need to change modular walls, furniture or even just traffic patterns in an area, a modification in the lighting design often comes with it. These modifications typically require significant rewiring or new circuits and recommissioning of control systems. The process can include shutting off circuits and providing temporary lighting while the system is reconfigured.

But with a DC power grid, safe, low-voltage, hot-pluggable buses already are distributed throughout the space. Particularly in facilities using wireless control systems, the only required tasks are a physical reconfiguration of fixtures and possible software reprogramming.

Electricians can add or upgrade fixtures easily without new wiring, since power comes from the electrified ceiling grid already in place. At this low voltage, the power level is so-called touch-safe, so electricians can relocate luminaires without the need to shut down the circuit, a technique often called hot-swapping.

If the task is troubleshooting or repairing one fixture, safe and more efficient maintenance can take place without disrupting operations. Electricians can temporarily remove or swap out faulty fixtures and repair them at a remote site when convenient. They can be de-bugged while powered up on the bench in most cases, because the input power is touch-safe Class 2 — less than 100 volt-ampere at 24 volts DC. This benefit means electricians do not have to perform such maintenance while on a ladder, which can be awkward and unsafe. ■

Brian T. Patterson is the chairman of the EMerge Alliance. Patterson's extensive technical and work history in electronics, fiber optics and building technologies has resulted in his holding many patents in those fields. He is also the general manager of business development for the building products division of Armstrong World Industries, a founding member of the alliance.



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FREE INFO: Circle 152

Fastenal's FAST 10000SL™ Series Secure Locker System

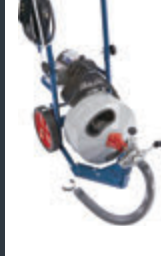
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www.fastenal.com

FREE INFO: Circle 153

Electric Eel Z5 Auto Cable Feed Drain Cleaning Machine



Auto cable feed advances and retrieves cable with the push of a lever. Cable guide spring keeps hands off rotating cable for added safety. Cleans 1-1/4-3-inch diameter lines up to 100 feet while running ½-inch diameter galvanized aircraft wire inner core cable. Built-in drum shaft slip clutch. Upright frame on 10-inch wheels with folding handle. Rear bar shields motor and allows for two position operation.

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FREE INFO: Circle 154

Toro® Groundsmaster® 4000-D



The powerful and nimble Toro® Groundsmaster® 4000-D boasts power and performance with its turbo-charged, 58 hp diesel engine, allowing the operator to tackle any job, large or small. Unmatched engine torque, patented hydraulic motors, and an innovative impact absorption system make the Groundsmaster 4000-D an extremely efficient motor. In addition to unprecedented power and performance, operators will also appreciate the low-noise technology gear motors, and a variable-speed cooling fan clutch that contribute to a quieter ride. Additionally, the air ride seat suspension, multi-sized beverage holder, and a 12-volt power outlet are all features that make a difficult job seem effortless.

Bloomington, MN
(800) 803-8676 • Fax: (952) 887-8693 • www.toro.com

FREE INFO: Circle 155

Water Detection

Dorlen Products Water Alert detection systems provide early warning of water leakage in unattended, inaccessible or critical areas. The system is activated by liquid bridging the adjustable sensors, and can be used in computer rooms, mechanical rooms and anywhere water leakage is a concern. It can be used as a single detector or a combined ceiling/floor monitoring system for facilities of any size.



www.wateralert.com

FREE INFO: Circle 156

New ClogChopper™ Cutters Revolutionize Drain Cleaning

The multi-function cutting tools from General Pipe Cleaners feature six self-sharpening blades that dig into encrusted debris and root masses, easily grinding up stoppages, scale, and crystallized urine without risking pipe damage. The spherical design maneuvers around tight bends and traps, thoroughly and safely cleaning metal, plastic, and clay pipes. The cutters are available in 1-, 1½-, 2-, 2½-, 3-, and 4-inch sizes, and they are excellent for clearing stacks, downspouts, and mains, as well as for drain-lining jobs.



General Pipe Cleaners, A Division of General Wire Spring Co.
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(800) 245-6200 or (412) 771-6300 • www.drainbrain.com

FREE INFO: Circle 157

Grasshopper CleanSweep™ Rotary Brooms

Grasshopper True ZeroTurn™ maneuverability takes CleanSweep™ Rotary Brooms into places ordinary debris sweeping mower attachments can't get to, speeding debris removal in congested areas as well as long stretches of sidewalks, driveways and curbs. These versatile broom implements for FrontMount™ mowers are also designed for efficient snow removal, clearing up to eight inches of snow and slush right down to the pavement. Choose from either 48-inch and 60-inch fixed-angle (25 degrees right) models or the 60-inch bidirectional model, which can be adjusted hydraulically 25 degrees left or right from the operator's seat or raised and lowered electrically up to two inches. (Install gauge wheels and standard deck mount bushings to use bidirectional model for dethatching.)



One Grasshopper Trail, Moundridge, KS 67107
(620) 345-8621 • Fax: (620) 345-2301 • www.grasshoppermower.com

FREE INFO: Circle 158



PAINTS & COATINGS

KRYLON INDUSTRIAL Industrial paint

Rust Tough™ Rust-Preventative acrylic alkyd enamels offers state-of-the-art corrosion protection and can be applied directly to metal without using a primer. The fast-drying formula resists scratches and abrasions with superior durability, making it perfect for steel, aluminum, bar joints, conveyors, and other machinery. Available in a variety of colors, the enamel provides excellent gloss and color retention, with superior durability and one-coat coverage.

Free Info: Circle 500



A MULE-HIDE PRODUCTS Roofing edge metal and accessories

These products for single-ply roofing systems makes putting customized finishing touches on TPO, EPDM and PVC roofs faster and easier. The product line includes metal-edge detail products, drainage systems, scuppers, collector boxes, pitch pans and roof accessories. Besides a selection of standard sizes, custom-fabricated products are available. All products are designed for quicker and easier installation, eliminating the need for on-site metal fabrication and helping installers increase productivity and reduce labor costs. Contractor-friendly features include pre-punched holes and pre-notched grooves and lap joints.

Free Info: Circle 505

B NETAFIM TECHLINE Irrigation dripline

The Techline® series features emitter flow rates as low as 0.26 gallons per hour (gph) for optimal water absorption in dense clay soils, allowing the irrigation to percolate through the clay slowly and efficiently out to root zones, resulting in more precise coverage and less waste. The product line also includes a built-in check valve to prevent low-head drainage; pressure compensation for even and precise watering; a continuously self-flushing anti-siphon to eliminate clogging; and a physical root barrier that prevents root intrusion without using chemicals.

Free Info: Circle 508

C ACUITY BRANDS INC. LED luminaires

TPS2 LED luminaires from Hydrel use a dedicated optical system and internal electronic ballasts and drivers to deliver enhanced light output for outdoor lighting applications. The luminaires feature a more compact, axial design that allows light to weave into decorative displays and other flood-lighting applications. They can replace 50-150-Watt, high-intensity-discharge floodlights. They feature a robust diecast housing, a durable powder-coat finish, an infinite-adjustment taper lock yoke design, and six LED precision NEMA distributions as well as internal and external glare control options.

Free Info: Circle 506

D CUSHMAN Scissor lift

The Titan T-1145 seats two passengers, provides up to 17 feet of working height, and comes equipped with a fully electric, zero-emission 48-volt powertrain. The lift has a load capacity of 1,750 pounds and a towing capacity of 5,000 pounds. Other features include a 19-inch slide-out deck extension, swing-out battery tray, front and rear bumpers, DC-to-DC converter, four-wheel hydraulic brakes, and headlights with turn signals. The lift is built and tested in accordance with American National Standards Institute A92.3. Its quiet operation is suited for indoor use and limits customer disturbance.

Free Info: Circle 507

E ZERO INTERNATIONAL Door seals

The acoustical door seals are designed and made with adjustable features to guarantee easier installation, more reliable performance, and sound class ratings up to 53 sound transmission class (STC) for demanding noise-control applications. It is engineered to function efficiently through millions of cycles and provides privacy for office buildings, hospitals, schools, and hotels.

Free Info: Circle 509

PPG INDUSTRIES

Pitt-Glaze® WB1, a single-component, water-borne acrylic epoxy, provides maximum protection and service life in high-traffic areas. Its durability helps minimize the number of required coats. With its low volatile organic compound (VOC) content and low odor, the brand is ideal for use in renovations and new construction in

commercial and institutional facilities. The re-coatable and impact- and mildew-resistant finish protects against moisture penetration, frequent cleaning, corrosion and general physical abuse. The epoxy comes in white, pastel and neutral base.

Free Info: Circle 501



RUST-OLEUM CORP.

Zinsser® Peel Stop® triple-thick, high-building binding primer is an interior-exterior product formulated to lock down peeling paint and seal weathered surfaces. It penetrates to seal, fill and level worn and weathered substrates to provide a more uniform surface for the topcoat. It offers easy flow and leveling and can be applied up to 30 milli-inches wet without sagging. The primer dries white for added hide and to the touch in 30 minutes so that it can be top-coated in as little as two hours. The low-odor, low-VOC, water-based formula can be used under or over any oil-base or water-based topcoat.

Free Info: Circle 502

SHERWIN-WILLIAMS

Latex- and water-based Emerald™ offers premium performance and environmental benefits, and it self-primers for a high-quality finish achieved with fewer coats. The paint prevents stains from penetrating to provide easy cleanup of surfaces and resists water streaking and spotting. Emerald is Green-Guard indoor air quality certified, emits minimal odor, and features anti-microbial properties that inhibit the growth of mold and mildew on the paint film.

Free Info: Circle 503



SPRAYON PRODUCTS

LU™214 food grade low temperature is a multi-service lubricant for extended service under extremely low temperature conditions, to -78 degrees. Its blend of quality pure synthetic oils are treated with the most effective extreme pressure, corrosion inhibitors, anti-oxidant, anti-foam and anti-wear additives.

Free Info: Circle 504



For more information on paints and coatings, see article on page 13

Case Study

Hot-Button Issue: Mats Melt Snow, Avert Slips and Falls

East End Disability Associates (EEDA) cares for people with developmental disabilities on Eastern Long Island in New York. The organization also provides housing, educational, medical, and recreational services to more than 650 disabled people.

With so many individuals to care for, maintaining a slip-free environment during the snowy winter months can be a challenge.

"We have several ramps on our properties, and they become extremely dangerous when snow melts and freezes over them," says Vicki Johnson, EEDA's purchasing manager. "We get a lot of snow in this area, and our residents and staff have to be very careful to avoid slips and falls."

In the past, EEDA's staff used chemicals and salt to melt snow. But the messy slush was tracked indoors and created slippery conditions inside the buildings. The salt also started to deteriorate exterior surfaces, and repairs started to cut into the organization's bottom line.

HeatTrak snow-melting mats have a non-slip pattern that provides an additional level of traction and accident prevention, protecting individuals from avoidable injuries, and protecting facilities from the high costs associated with them.

As a result, Johnson turned to HeatTrak as an alternative solution to ice and snow removal. After reviewing needs and layout options, EEDA purchased four mats, including three custom-

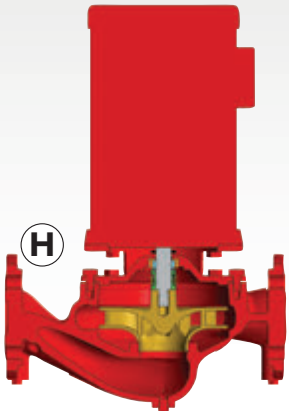
sized to fit the building's configurations. They also installed HeatTrak's DS-2B temperature-snow sensor controller, which automatically operates the mats when there is a snow or freeze and makes it easier to keep surfaces clear.

Slip-and-fall accidents can be extremely devastating and costly. Falls are the leading cause of accidental injury. One slip-and-fall accident can cost a facility up to \$22,000, according to the National Safety Council.

"We haven't had any incidents of slips or falls, which is obviously the most important thing," Johnson says. "Our staff is also very happy that they no longer have to go out in the middle of the night after a snowstorm to start shoveling. I would recommend HeatTrak to anyone."

Free Info: Circle 510





F CHASE SECURITY SYSTEMS INC.
Light guard

The security fluorescent light guard is designed to protect light fixtures against vandalism or accidental damage. The guard can be fastened securely with four clips to the existing ceiling grid, eliminating the need for onsite drilling. The grid pattern is designed to allow maximum light coverage without compromising protection. The wire enclosure is easily unfastened at one end for general maintenance.

Free Info: Circle 511

G TESTO INC.
Digital vacuum gauge

The 552 confirms the evacuation of air conditioning, heat pump and refrigeration systems. It requires no cleaning and is not susceptible to contamination from oils. The absolute pressure sensor delivers accuracy to plus or minus 10 microns. The unit is designed to withstand a 6-foot drop. Additional features include: battery life to 2,400 hours; high-limit alarm; and display of water evaporation temperature. For owners of the 570 digital manifold, the 552 can be connected to the 570 to data log or print evacuation data.

Free Info: Circle 514

H XYLEM INC.
Centrifugal pump

The Bell & Gossett series e-90 features a high hydraulic efficiency and closed-coupled design and can mount either vertically or horizontally for a range of applications. It features a vacuum cast bronze impeller and a silicon-carbide mechanical seal. The pump is available in eight sizes, providing wide hydraulic coverage up to 300 gallons per minute (gpm) flow. It uses an industry-standard 56J motor in 1/3-3 horsepower (hp) speed and 1/2-5 hp two-pole speed. Additional features include bronze-fitted or all-bronze material construction, an ASTM B584 bronze impeller, and an EPR-carbon-silicon carbide mechanical seal.

Free Info: Circle 517

I RIDGID
Pipe cutters

FC-Cutters are available in two options: 1½ and 2 inches in diameter. They can cleanly cut ABS and foam core PVC pipes. The product features an extended handle for leverage and easier rotation, so the cutters only need to be snapped on to a pipe and rotated once for a precise cut. Each cutter comes with an extra blade.

Free Info: Circle 518

J BOBCAT CO.
Mower attachment

The front-mounted attachment cuts grass before it is driven over, allowing for working visibility of the area to be mowed. Powered by a direct-drive hydraulic motor, three overlapping blades eliminate skips for clean cutting action, discharging cut materials to the rear. The unique frame design allows the mower to oscillate independently to follow uneven terrain, delivering a close, clean cut. The attachment is ideal for mowing roadside ditches and large acreages. It features cutting widths of 71.5 and 89.5 inches.

Free Info: Circle 519

K MILWAUKEE TOOL CORP.
Compact wrenches

The M18 Fuel™ compact impact wrenches are available in two sizes and three anvil style options for various applications and user preferences. The tools feature a Powerstate brushless motor, Redlink Plus™ electronic intelligence and a Redlithium 2.0/XC4.0 battery pack to deliver up to double the runtime, and 50 percent more torque. All products include a multi-voltage charger to charge all M12 and M18 batteries.

Free Info: Circle 512

L LOCHNIVAR
Water heater

Armor Wall Mount models are available with inputs of 125,000-199,000 Btu per hour and offer up to 96 percent thermal efficiency with a 5-to-1 turndown and a compact, wall-mounted design that fits tight installations. The unit is equipped with an advanced Smart System™ operating control and interface to maximize hot-water delivery and provides a built-in cascading sequencer to allow for water heaters with different Btu per hour inputs to be installed together to maximize turndown capability. The model can be installed with direct-vent air intake and exhaust runs up to 100 equivalent feet using PVC, CPVC, polypropylene or AI29-4C stainless steel vent pipe.

Free Info: Circle 515

M USG CORP.
Cement roof board

Securock is designed for use in low-slope roofing systems. The board is environmentally sustainable and its lower weight reduces energy and emissions. The board can be used with a variety of membranes and systems, including fully adhered and mechanically attached systems, as well as liquid-applied membranes and cold mastic modified bitumen. It scores a maximum 10 for mold resistance on ASTM D3272 and meets Factory Mutual Class 1 and Underwriter's Laboratories Class A fire ratings.

Free Info: Circle 513

N SUBARU
Engines

The EX Series features five models with power ranges from 4.5-14 hp and uses high performance chain-driven overhead cam technology. The engine is designed with an efficient pent-roof-type combustion chamber, using a high compression ratio, producing higher power and torque while limiting exhaust emissions and fuel consumption. The automatic decompression system reduces the required recoil pulling force by 30-40 percent compared with overhead-valve engine designs, helping make starts faster and easier with no perceptible kickback. The series is covered under a five-year limited warranty.

Free Info: Circle 516

AD INDEX

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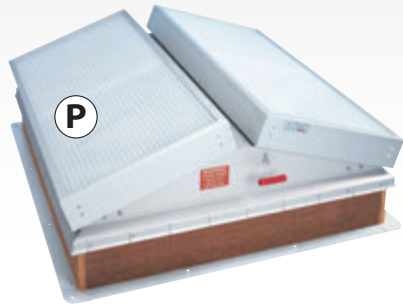
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**MAXLITE****Frosted LED**

Q The 11-Watt LED A is a versatile, fully dimmable lamp that is designed for a broad range of commercial applications. It saves up to 90 percent in energy while replacing a 60-Watt (W) incandescent lamp and delivers a substantial efficacy of 72 lumens per W. The lamp's LEDs are matched for color and Color Rendering Index to ensure consistency and quality. The lumen maintenance is enhanced by the housing, which acts as a heat sink to provide thermal heat conductivity and maintain a low junction temperature.

Free Info: Circle 521

DANFOSS**R Scroll compressor**

The SH485 40-ton unit is designed for large R410A chiller and rooftop units. The intermediate discharge valve introduced in the compressor adapts to varying loads and ambient conditions, optimizing the system operation throughout the year. The unit offers up to 24 percent higher part-load efficiency in manifold configurations and helps OEM systems meet stringent new energy standards in air-conditioning applications. The unit's compact dimensions simplify the design of systems with manifold configurations, providing energy savings, lower sound levels, and increased lifetime and lower maintenance costs to end users.

Free Info: Circle 522

DETEX CORP.**S Door system**

The automatic swing-door system is designed to meet the life safety and security requirements of commercial buildings, specifically healthcare facilities at the entrance, surgical areas, cross-corridor doors, and anywhere complete access without hands-on door contact is required. The system's components include the AO19 automatic door opener that operates light or heavy doors in low-energy applications and has controls mounted and pre-wired in one unit, as well as electrified Advantex® panic hardware, keypads, and card readers. The system can be used for interior and exterior applications.

Free Info: Circle 524

AAMSCO LIGHTING**T Backlit mirror**

The Mirror-Lux® ADA is available with LED lamps and is part of the designer collection of modern mirrors that are backlit through an inner frosted glass insert. The mirror is accented with lighting fixtures that produce clear light in various Kelvin temperatures with either LED or T5 fluorescent lamps. The fixtures remain virtually undetectable until the lights in the mirror are illuminated. The mirror comes in three standard sizes that meet the Americans With Disability Act requirements, with custom sizes and shapes available.

Free Info: Circle 525

TACO**U Pressure sensor**

The DPS629 monitors differential pressures of air and compatible gases and liquids. The design uses dual sensors that convert pressure changes into a standard 4-20 mA output signal for two-wire circuits. Its smaller size and fewer moving parts make for improved response time and reliability. Terminal block, zero, and span adjustments are accessed under the top cover. Designed to meet NEMA 4x IP66 construction, the unit is applicable for flow elements, heat exchangers, filters, pumps and coils.

Free Info: Circle 526

TRANE
Chiller

The Series S® CentTraVac™ features Adap-tiSpeed™ technology that delivers efficiency for centrifugal chillers in the 180-390 tonnage range. It was designed for replacement and retrofit applications, with a bolt-together design and smaller footprint for easier installation into tighter spaces. The AFD3 adaptive frequency drive offers a 24-pulse variable-speed drive and can reduce harmonic distortion to 5 percent or lower to handle electrical dips, surges, and imbalances to maintain reliable operation on any utility power source, including renewable power. The specific-speed compressor features a mixed-flow impeller design.

Free Info: Circle 520

BILCO CO.
Fire vent

The Lumivent® features flat polycarbonate panels incorporated into a sloped cover design to meet UL 793 and International Building Code requirements. The sloped design encourages burning embers to roll off the covers than burn through, per the intent of fire protection standards. Compliance to both standards provides a high level of defense. The unit is designed to open automatically in the event of a fire to remove smoke, heat, and toxic gases from a burning building, improving inside air quality and visibility to allow building occupants to escape safely.

Free Info: Circle 523

Case Study**Power Player: Analyzer Helps Technicians Troubleshoot Electrical System**

Stan Benoit is responsible for keeping dozens of complex imaging systems at peak performance for five hospital campuses and 31 satellite facilities for Geisinger Health System in Northeastern and Central Pennsylvania.

Downtime is costly, both in terms of patient well-being and the organization's finances. The X-ray, mammography, and other systems cost millions, and a failure involving any of them can idle technicians and surgical teams. When complex CAT scanners, MRI, and cardiac-catheterization systems experience problems, the first question is usually, "Is it the electronics, or is it the power?" followed by, "Whose problem is it?"

Benoit, a certified radiology equipment specialist/radiology and oncology maintenance supervisor, is a 23-year veteran of medical electronics, but he was not an expert on power quality. And without hard facts, he found it difficult to orchestrate the system's maintenance teams.

After acquiring a Fluke 434 power-quality analyzer, Benoit started learning more about power quality and was able to do basic tests on three-phase power and share the resulting data with colleagues.

Benoit has used the 434 on X-ray, CAT, and MRI equipment, and linear accelerators. In addition to troubleshooting, he also uses it to check power quality before installing new imaging systems. And in many cases, he uses it to demonstrate that power quality is probably not the cause of a failure.

The analyzer's color graphics allow the user to share and analyze waveforms and trends in real time. Benoit also uses the unit's PC interface to download the data into his computer and



generate a complete report to suit his audience.

"I have to talk about this stuff with doctors and administrators," Benoit says. "I have to make (the information) clear to them."

When troubleshooting, Benoit first uses the three-phase scope display to check the shape of the voltage waveform. The phasor display then helps confirm connections are good and gives a quick snapshot of system balance.

To track intermittent problems, Benoit often uses the dips-and-swells mode, as the autotrend capability immediately analyzes voltage and current without any setup, identifying changes in as little as one-half line cycle. When in this mode, the imaging system can run through its paces, cycle nearby equipment, or transfer to backup power systems and observe the effects.

If nothing turns up in dips-and-swells mode, Benoit can use transient mode, which can capture and display even shorter events — down to 5 microseconds.

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