

# FACILITIES ENGINEERING

*Journal*

**AFE**

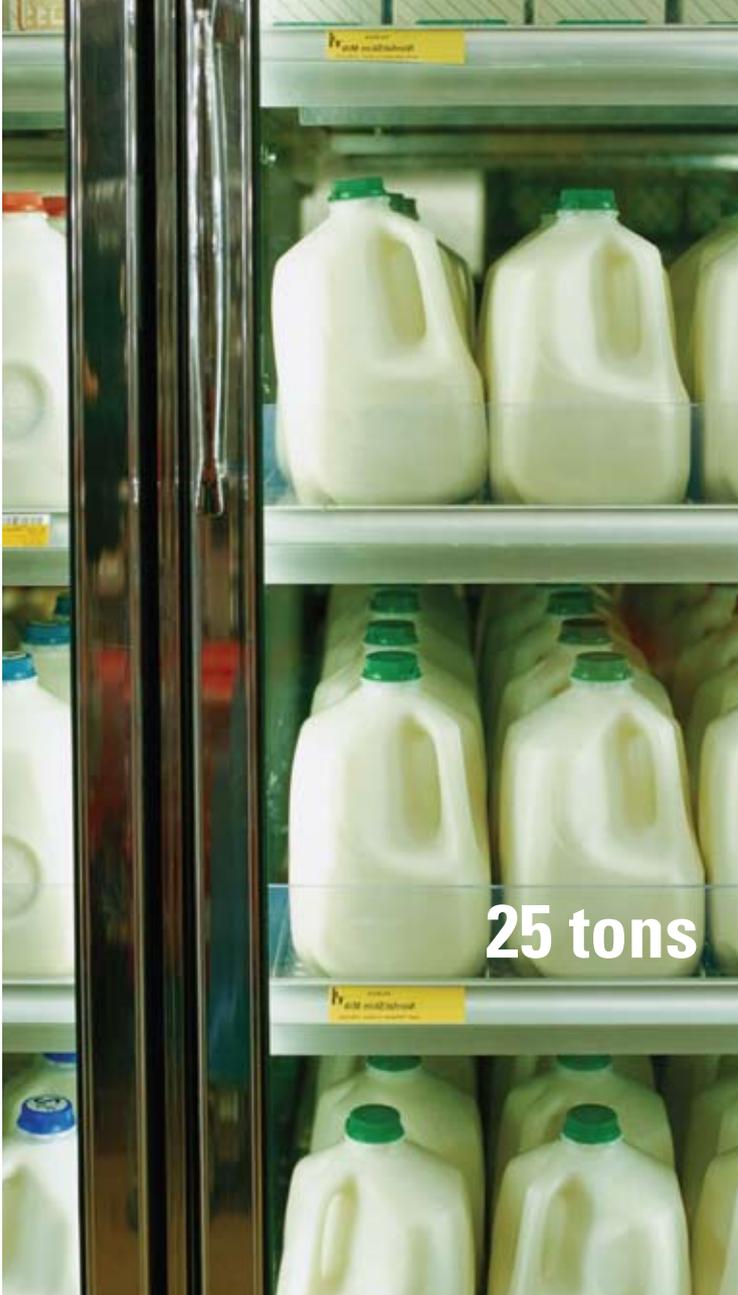
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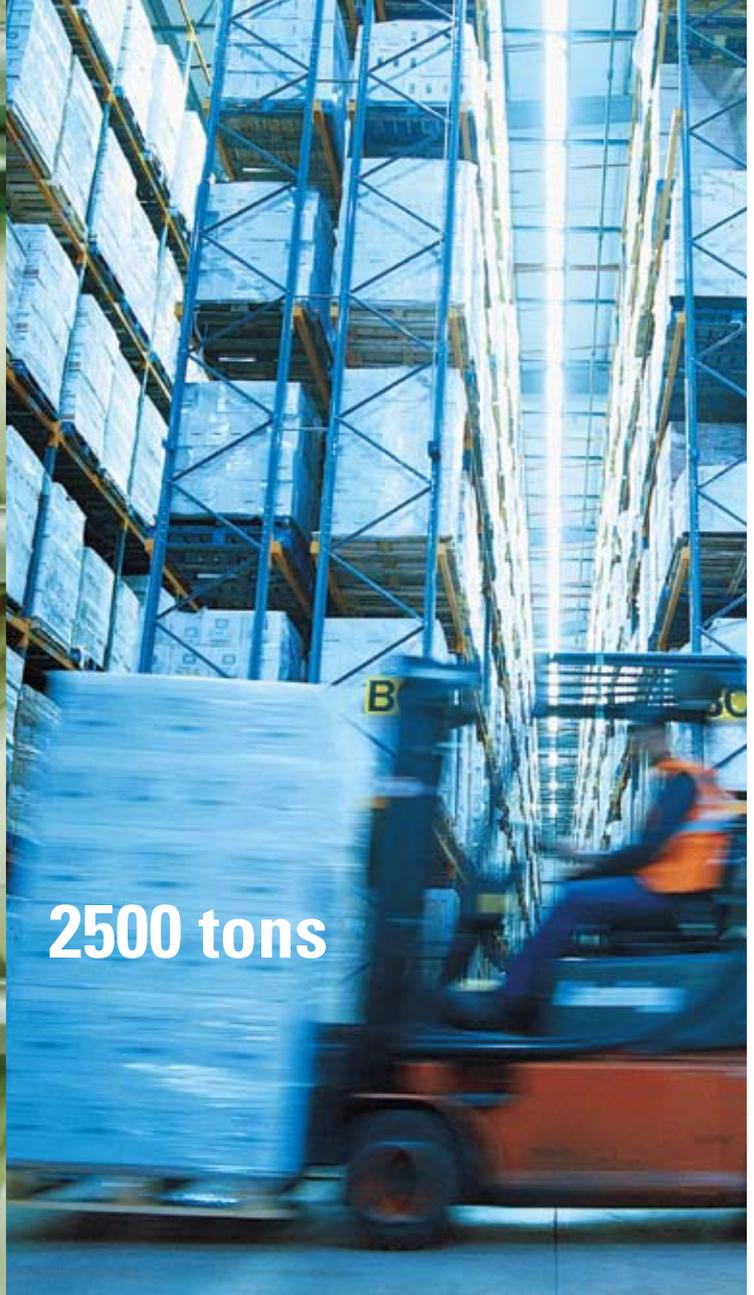
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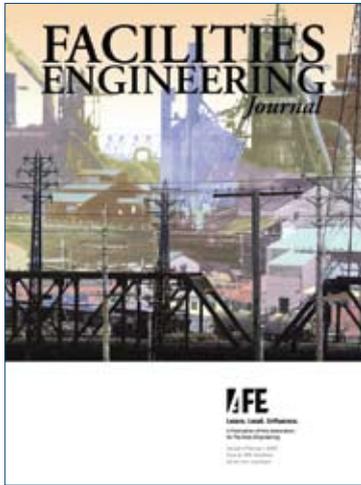


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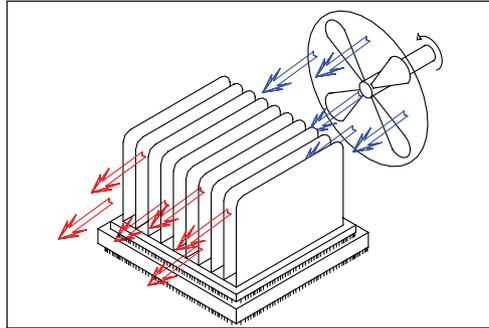
January/February 2009  
Vol 36. No. 1



On the cover:  
Whether your facility is in a dense area like this, alone on lots of acreage outside a small town, or somewhere in between, chances are good that sometime 2009 you will have to cope with an issue relating to safety, energy or personnel. Because AFE strives to provide its members with valuable, relevant information, this issue of Facilities Engineering Journal addresses all three of those topics – and more.

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# A Message from the CEO

## Laurence Gration, CAE

Tell Your Friends What AFE is Doing for You, and  
What You Are Doing for AFE



I have been in the association business for a very long time, on both sides of the world, but I am constantly amazed at the amount of output by the volunteers of AFE. Clearly a great deal of praise goes to the Board of Directors and the chapter leaders who keep the association moving forward, but there are hundreds of others who working on committees large and small, with platforms both large and small.

There are people who dedicate themselves to doing more with less and ensuring AFE is technologically on the cutting edge, and there are others who review books and articles for the journal or the online library. Others present webinars for us, others write, others simply sit

and speak at meetings of other organizations, sharing the message and communicating the most back to us.

And there is always more. The more we grow the more we need...

For many years now AFE has been concentrating on expansion of services, expansion of benefits, and better communications. This will not change, but in 2009 we are expanding the program to get more members, and more volunteers so we can grow the organization.

In 2009 we are launching a "Member Get a Member (or 2)" program to try and spread the workload, but also to spread the word of the great work you all have been doing.

Tell all your friends what AFE is doing for you, and more importantly what you are doing for AFE. Stand up and be proud of what you have accomplished, of the great work that you do everyday in this great profession. Share the message, and share the benefits.

Go out and get a member to share with, and the result will come back manifold.



Laurence Gration, CAE  
Chief Executive Officer

Editor's note: The benefits of membership are spelled out at [www.afe.org/benefits](http://www.afe.org/benefits)

## AFE Says Goodbye to Eric Bergtraun, CPE, FAFE

**E**ric Bergtraun of Los Altos, California, AFE's longest holder of its prestigious Fellow Award, active chapter/region member, and a passionate supporter of students, died in late December. He was 83.

In his honor, Silicon Valley Chapter 39 is establishing memorial scholarships for its student chapters at California Maritime Academy, San Jose State University and California Polytechnic State University. Details will be announced as they become available.

SJSU has been awarding the "Eric M. Bergtraun Facilities Engineering Excellence Award" to worthy students for over a decade.

Eric joined our association in the early 1960s when it was known as the American Institute of Plant Engineers. He was wholeheartedly busy, as shown in a chronology of just a few of his citations: In 1972, he was the AIPE Plant Engineer of the Year. In '73, he earned the national "Mr. Membership" award for recruiting the most members. In '74, he became a Certified Plant Engineer and was named a Fellow of the association. In 2001, he received the AFE Lifetime Achievement Award.

For Chapter 39, his contributions are countless. For example, he has been vice president and president, newsletter editor and historian. He helped create the chapter's annual "Day With a Facilities Professional" to expose young people to the field.

Eric also was a member of IEEE.

He wrote the chapter on safety for the "Standard Handbook of Plant Engineering, Second Edition", published in 1995 by McGraw-Hill Inc. Also that year, he wrote a chapter on maintenance for an edition of the "Kirk-Othmer Encyclopedia of Chemical Technology" put out by publisher John Wiley.

For many years, he contributed articles to Facilities Engineering Journal and conducted presentations at Facilities America conferences.

Eric was one of the founders of the Northern California Plant Engineering & Maintenance Conference. The Silicon Valley/San Jose Business Journal quoted him for a story about trade shows in 1996.

He retired in 2000 from National Semiconductor Corp. in Santa Clara, California, where he managed the plant maintenance, in-house construction and water treatment departments for nearly 25 years. Before that, he had worked at headquarters of Fairchild Semiconductor in Mountain View, where he managed the plant engineering, facility and production maintenance, and service departments.

All those accomplishments are noteworthy – but take on further significance when viewed in light of Eric's roots. Eric was born in Vienna, Austria and fled with his family in 1938 upon the German occupation. He was almost 14 years old when he arrived in Shanghai, China.

According to an in-depth biography of him that appeared in AFE Chapter 39's newsletter in February, 2007, Eric left school at age 15 and learned to be an electrician. He worked for a Danish motor company repairing and rewinding electric motors.

"At the outbreak of the Pacific War the Japanese occupied Shanghai and all stateless refugees had to move into the Hongkew Ghetto in the city's northeast, where food was scarce and disease rampant. Eric and his family lived there for three years. At that time, Jewish engineers shared their knowledge with the young people and Eric was a willing student, and said he 'got a good education,'" according to that bio, written by newsletter editor Carole Lucido.

"Eric had also been an active Scout in the British Boy Scouts and at the outbreak of the Pacific War continued underground until the



*Photo courtesy of Carole Lucido*

end of the war when he became Scout Master in the British Boy Scouts and led scout troops on tours of the Allied Navies. When the Americans came to Shanghai, Eric worked for the American Army. About that time, Eric got a job with Caltex, an overseas corporation of Standard Oil of California and Texas Oil of New York. He became a plant electrical engineer and drum factory supervisor. When the American Consulate sent word that the family could go to America, Eric's quota number came first. He promised his parents that he would go ahead to San Francisco, get a job there, and arrange a home for the family. They were to follow one year later.

Eric arrived in San Francisco at age 23. His earliest jobs were working as an electrician on ships, then shop foreman for an electric company.

As described in the chapter newsletter bio: "Eric knew he wanted to continue his education. He wanted to be an engineer and soon learned that his only option at night was Heald Engineering College. But first he had to earn a high school diploma."

Eric attended classes five nights a week from 6-10 p.m. for a year to get that diploma. Then, he spent seven years earning his BSEE from Heald. "He learned that he liked facilities management and continued his education, enrolling in evening classes in facilities at the University of California Extension, San Francisco," the newsletter bio states.

Eric juggled time not only on behalf of AIPE/AFE. He also was chairman of the synagogue library committee at Congregation Beth Am in Los Altos Hills. And, according to an obituary from a San Jose newspaper, "Eric had a great love of Scouting his whole life and as a Scoutmaster for Troop 510 he began what would become a lifetime of mentoring, eventually being awarded the highest award in Scouting, the Silver Beaver." The U.S. Holocaust Memorial Museum in Washington, D.C. holds a Boy Scout scarf worn by German Jewish refugee children. It was donated by Eric. He was involved with the Bay Area Holocaust Victim Oral History Project, too.

Eric is survived by his wife, Polly, two children and five grandchildren. Also as remembered in his obituary: "Eric was a lover of fine arts, opera, good food and jokes – good and bad, with an infectious laugh that spread to all around him. But above all, Eric was a great family man,"

At the time of his memorial service, the family asked that in lieu of flowers, donations may be sent to The Congregation Beth Am Library Fund ([www.betham.org](http://www.betham.org)) or The Holocaust Center of Northern California ([www.hcnc.org](http://www.hcnc.org)).

# Updates

## New Membership Focus: Young Professionals

Continuing its outreach to the next generation of people working in the facilities field, AFE has established the Young Professional Member category. This special group is for people under 30, as they grow their careers eventually advance to full membership.

YPMs (Young Professional Members) will have all the same membership benefits as a full member, but with added incentives to make this your strongest possible career move into facilities engineering. Coming in 2009:

- The Young Professional Guide for Gaining Management Support. It will help justify support and financial backing for your company to participate in technical committees and conferences.
- Young Professional Presentations. We encourage young professionals to participate in the Young Professional Presentation program, which will let you present your work at a national AFE technical conference. The program integrates young engineers into the regular technical sessions and allows them to give presentations covering continuing and in-process design or research works, as well as completed projects.
- Young Professional Receptions at AFE Conferences. The Young Professional Committee will host receptions at AFE conferences throughout the year. These receptions are often attended by key AFE leadership and industry professionals, providing young professionals with valuable networking opportunities. Receptions are also a great time to network with your peers and find out what other young professionals are up to!
- Young Professional of the Year Award. AFE will be presenting the prestigious "Fred King Award" to a young professional member for notable achievement in the advancement of facilities engineering. Many of the biggest names in the profession started out as young professionals in AFE, and now young professionals will be just as rewarded (if not more) as those already established in the field.

And AFE's other resources can't be beat for someone just starting out. For example, when a young professional need advice or seeks input from a colleague, our member-to-member network can't be beat – and it's open 24/7 at [www.afe.org](http://www.afe.org).

Likewise, the online CareerCenter is a must-visit site because it's constantly brimming with "help wanted" ads from employers in a wide range of locations and industries.

AFE is known for its ongoing education resources, which are valuable to facilities professionals of all ages. We encourage YPMs to check out our credential programs, too, as a means of getting ahead. Becoming a Certified Plant Engineer, Certified Plant Maintenance Manager or Certified Plant Supervisor distinguishes you. It gives you a career edge because it identifies you as someone with specialized knowledge in engineering, operations and maintenance, as well as business management; strategic leadership; and professional ethics.

## Online Dues Payment is Fast, Easy

Because it is faster, easier, and more efficient, AFE is encouraging members to renew their dues online. "Doing your renewal online is automatic," said AFE CEO, Laurence Gratton. "That means you are in control of your own account. Online simply makes renewal faster, easier and more accurate." To renew online, members start by entering their user name and your password in the Membership Renewal page of the Web site. Those visiting [www.AFE.org](http://www.AFE.org) for the first time should be aware that an account has been already set up for you and can be accessed by putting in your six-digit membership number and the default password AFELIVE. Those that have been to their Web account before will simply log on in the usual way. Once in the system you can change your name and password. This can be done by visiting the 'Login' section of the home page and then following the simple instructions on your account.

## Volunteer Support Activities Grow

Many developments have been occurring to improve how-to advice for participation as a volunteer leader.

Numerous members participated in a recent series of conference calls set up specifically to get input about how to help chapters improve and grow. The agenda for those calls included elections, reporting, insurance, rosters, dues payments, websites, membership campaigns, and the chapter manual.

Also, CEO Laurence Gratton reported progress in getting relevant resources available electronically. These include the officer transition book, tips on how to reactivate a chapter, financial data forms, sample meeting agendas, and the latest version of the association's bylaws.

One of the more popular documents provides samples of what to say when you speak to prospective members, or welcome new members to a meeting.

For more information contact Jai Coleman at (703) 234-4124 or [jcoleman@AFE.org](mailto:jcoleman@AFE.org).

## Self-Improvement Courses Cover Many Topics

Reminder: If you're looking for easy, reasonably priced ways to broaden your horizons, check out AFE's ed2go offerings at <http://afe.org/education/general.cfm>. Your family members, co-workers and friends are welcome to use this link, too – these online courses cover a wide range of interests, so they're open to everyone. Many courses relate to computing topics. Others teach things like starting your own consulting practice, skills for making great decisions, and conducting a successful job search. Plus, there are courses about: theme park engineering, project management, distribution and logistics management, communication, leadership, overcoming shyness, accounting, business, personal finance, real estate investing, analysis and valuation of stocks, digital photography, event management, assisting aging parents, math, teaching English as a second language, writing, starting your own arts and crafts business, legal matters, art, languages (French, Italian, Spanish) genealogy, grammar, grant writing, handling medical emergencies, hypnosis, guiding kids on the internet, music theory, Six Sigma/TQM, speed reading, outdoor survival techniques, supply chain management, team building, and wine appreciation for beginner.



## AFE SPOTLIGHT: Jerry Biron Has Been Helping AFE Grow for Over a Decade

As a sales engineer working for an electric testing company back in 1997, Jerry Biron of the San Francisco Bay area figured a group of facilities professionals would be a good pool of prospective customers.

He says he became an AFE member “initially for selfish purposes.”

“When I first joined my intent was to build contacts for my business...I wanted to contact facilities engineers,” he said.

His local chapter wasn’t very strong, and its membership seemed to consist of other vendors like him, looking to the people who might use their products and services.

He recalls the conclusion he reached: “I could drop out or I could use it as an opportunity to open doors for me.”

Jerry opted for opportunity.

When calling on a plant engineer who might be interested in his company’s offerings, for example, Jerry would ask what was going on in the plant engineer’s job, what challenges that person was facing, what resources he or she could use. And he’d remember to mention something about the local AFE chapter. He would extend an invitation to join him at the next chapter meeting or come along on a tour to get to meet some fellow facilities professionals. He didn’t just push, he said; rather, “I’d try to be of service to them.”

Jerry also learned from his “mentor”, the late Eric Bergtraun. “He taught me to integrate the AFE message into everything I do.” A decade (and employer change) later, Jerry is still using that strategy successfully. It has become part of his identity.

In fact, he’s developed a very effective way to get people to remember him for both his roles: a business card with his work contact information on one side, and his AFE contact information on the other. Anyone he meets gets the combined message. “I don’t hide what I do.”

He doesn’t mind double duty at all. “You have to give a little to get a little; you have to put in time and effort...,” he said.

Jerry’s belief in AFE’s value deepened the longer he stayed involved. His participation grew from the local to regional to national level. For several years, he has been a vice president on the national board of directors, representing AFE Region IV. That region covers a portion of California, Oregon, Nevada, Washington, Alaska and Hawaii.

He’s enthusiastic about the year’s outlook for his region, noting plans to reactivate Central California (Sacramento) Chapter 151, and promoting Portland Chapter 123 and Yosemite Chapter 155 at upcoming trade shows.

When AFE underwent a sweeping reorganization in 2007-08, Jerry, still an RVP, became one of three members of the new Committee of Representation. This year, he is its chairman. That means he is a liaison among all the RVPs, the heads of all the councils, and the Committee of Expertise (whose members are past national presidents). He said he intends to conduct all meetings very efficiently, to do things in a businesslike manner. And also to remember one thing: “Members come first.”

This list identifies AFE's newest members, available at press time, by state and chapter.

#### **ALABAMA**

Chapter 86: Brett Reed, Lincoln

#### **ARIZONA**

Chapter 51: Ken Shea, Scottsdale

Chapter 160: Michael Ackman, Carlsbad, New Mexico; Jeffrey Peckron, Tucson

#### **CALIFORNIA**

Chapter 15: Jim Bisson Jr., San Francisco; Cliff Blythe, Lafayette; Dale Franklin, Pleasanton; Dan Janowski, San Jose

Chapter 17: Dennis Melton, Irvine; Rick Smith, Sacramento

Chapter 39: Karen Bangs, Pismo Beach; Glenn Caldwell, Pleasanton; Michael Minafo, Moss Landing

Chapter 65: Karl Knutson, San Diego

Chapter 118: Ronald Lawrence, Ventura

Chapter 151: Leo Harshbarger, Sacramento

#### **COLORADO**

Chapter 70: Peter Law, Vail; Bill Wikoff, Denver

#### **CONNECTICUT**

Chapter 79: Matt Twerdy, Bloomfield

#### **DELAWARE**

Chapter 34: Kenneth Okonkwo, Newark

#### **DISTRICT OF COLUMBIA**

Chapter 168: Joseph Caprara, Woodbridge, Virginia; Dares Charoenphol and Victor Mikhaylov, both of Arlington, Virginia; Richard Edmonds and John Netzel, both of Washington; Michael Holly, Manassas, Virginia; Kelly Rodriguez, Vienna, Virginia

#### **FLORIDA**

Chapter 69: David Dunn, Orlando; James White, Champions Gate

Chapter 81: Atanga Humphry, Plant City; Michael Stallman, Daytona Beach

Chapter 134: Donna Thiel, Jacksonville

#### **GEORGIA**

Chapter 42: Leslie NeSmith, Perdue Hill, Alabama; Lamar Scott, Molenca; Doug Singleton, Rockmart; Michael Sweeney, Atlanta

#### **HAWAII**

Chapter 72: Pete McEvoy, Hilo

#### **ILLINOIS**

Chapter 1: Madhu Bevini, Aurora; Brad Cesario, Glenview; Zachary Fijal, Brookfield; Erin Serkaian, Chicago; Ronnie Thompson, Emmons, Minnesota

Chapter 105: John Palak, St. Charles

#### **INDIANA**

Chapter 127: Jim Cattin, Peru

#### **IOWA**

Chapter 132: William Miller, Dubuque

#### **LOUISIANA**

Chapter 67: James Baumann and Toby Dodson, both of Denham Springs; Mark Firmin, Brent Gautreau, Buthove Thomas and Wynn White, all of Baton Rouge; Conrad Murphy, Krotz Springs; James Scott, Jarreau; Thomas Young, Prairieville

#### **MAINE**

Chapter 119: Michael McNeil, Rockland

#### **MARYLAND**

Chapter 3: Kelsy Van Camp, Hunt Valley

#### **MASSACHUSETTS**

Chapter 33: Thomas Demanche and Brandon Fagan, both of Boston; Andrew Kelly, Hudson

Chapter 74: Gary Rudman, Milford; Christopher Sullivan, Randolph

Chapter 88: Scott Perkins, West Bridgewater

#### **MICHIGAN**

Chapter 84: Nick Miller, Grand Rapids

Chapter 110: Jamie Crowley, Jackson

#### **MINNESOTA**

Chapter 13: Kay Bergstrom, Burnsville; Daniel Dale and Nathan Schmidt, both of Minneapolis; Roy Fernandez and Michael Piper, both of Eden Prairie; S. Asim Gul, Chanhassen; Randy Johnson, Saint James; James Kulseth, Rosemount; Steve Northrop, Saint Paul; Brian Parenteau, Superior, Wisconsin; Jeffrey Pierce, Faribault; Thomas Renick, White Bear Lake

#### **MISSOURI**

Chapter 26: Elizabeth Hise, Saint Louis

#### **NEBRASKA**

Chapter 137: Thomas Potter, Omaha; Craig Thelen, Lincoln

#### **NEW HAMPSHIRE**

Chapter 140: Alison Huber, Raymond; Michael Kammer, Manchester; Mike Mondoux, Exeter

#### **NEW JERSEY**

Chapter 19: Stephen Greet, Garwood

Chapter 94: Loreto Villanueva, Whiting

Chapter 106: Joseph Wyatt, Hillsborough

Chapter 125: George Wittman, Toms River

#### **NEW YORK**

Chapter 4: Brian Bogar, Orient; Jason Morgan, Woodside

Chapter 20: Matthew Raynes, Greenport; Michael Schwarz, Troy

Chapter 21: Mary Julian, Lancaster

Chapter 28: Tim Blackburn, Rochester; Keith Krzyzanowski, Lancaster; Robert Ludwig, Amherst

Chapter 80: Derrick Chen, Simone Galotti and Edilberto Valdez, all of New York; Jennifer Merritt, Flushing

## **NORTH CAROLINA**

Chapter 23: Luke Allen, Eden; Roger Bault, Kernersville  
Chapter 59: Charlie Lamm, Wilson  
Chapter 62: Thomas Crow, Darrel Lunsford and Matthew Steine, all of Charlotte  
Chapter 68: Dale Blann, Raleigh

## **OHIO**

Chapter 29: Bill Mast, Delaware  
Chapter 32: David Hartman, Westlake  
Chapter 90: Sandra Lagos, Sunbury

## **OREGON**

Chapter 123: Philip Pui-Lit Lee, Portland

## **PENNSYLVANIA**

Chapter 6: Barbara Brown, University Park; Michelle Fleming, Philadelphia; Gary Green, Cherry Hill, New Jersey; L. Christopher Heilner, Elverson; James Pilgren, Levittown; Robert White, Runnemede, New Jersey  
Chapter 7: Karl Kaluhiokalani, Pittsburgh; Terry Stephenson, Youngwood

## **RHODE ISLAND**

Chapter 63: Richard Andrade, Swansea, Massachusetts; Alfred Cabral, Warwick; Christopher LeBlanc, Fairhaven, Massachusetts

## **SOUTH CAROLINA**

Chapter 59: Michael Darby, Anderson; Ken Smith, Six Mile  
Chapter 186: Michael Bolig, Folly Beach

## **TENNESSEE**

Chapter 77: Shannon Heinen, Arlington  
Chapter 116: Myra Hair, Maryville  
Chapter 138: William Dalessandro, Rockvale; Keith Stager, Nashville

## **TEXAS**

Chapter 22: Marcia Brown, San Angelo; Paul Durand and Stephen Henry, both of Dallas; Cameron Taylor, Fort Worth  
Chapter 25: Brian Coffman, Houston; Ed Metoyer, Channelview  
Chapter 169: Terry Balz, Danny Hughes, Michael Kocsis and Phillip Newton, all of Temple; Dickie Hill, Little River; Joe Knight, Belton; Jerry Lloyd, Bryan; Frank Moreno, San Antonio; Patrick Spinn, Holland

## **UTAH**

Chapter 109: Lynn Leifson, Provo

## **VIRGINIA**

Chapter 96: Shaun Cummings, Reston  
Chapter 174: Roger Bennison, Roanoke

## **WISCONSIN**

Chapter 12: Eric Berglund, Milwaukee; Jeffrey Carr, New Richmond; Donald Loback, Oak Creek; Anand Sankey, Kalamazoo, Michigan  
Chapter 66: Mark Johnson, Chippewa Falls  
Chapter 99: Steven Putz, Fond Du Lac  
Chapter 161: Peter Davis, Platteville

## **MEMBERS AT LARGE**

Victor Cheung, Hong Kong  
Toni Darmawan, Indonesia  
Mark Adam, Canada  
David Baker, Canada

## **STUDENT MEMBERS**

Billy Christian, Hartford, Kentucky  
Ricky Godbolt, Largo Maryland  
Craig Kenda, Bay Shore, New York  
Randy Kondor, Canada  
Saul Labbe, Baton Rouge, Louisiana  
Brian Yu, Concord, California



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## Certified Plant Engineers

The following have earned our prestigious CPE credential: Zachary Fijal of Pigott & Associates, Brookfield, Illinois; Philip Jerzyk, Bandag Inc., Taylor Ridge, Illinois; Brian Parenteau, Charter Films Inc., Superior, Wisconsin; Daniel Waltenburg, Knight & Caravan/Knight FM, Bay City, Michigan; and John White, Bandag, Muscatine, Iowa.

*The CPE exam covers electrical engineering, mechanical engineering, civil engineering, economics/management, environmental engineering, maintenance, OSHA, energy, controls and instrumentation, and HVAC.*

## Certified Plant Maintenance Managers

Congratulations to the following for successful completion of our CPMM requirements:

- Frank Aiesi, Elsay/MGI Pharma Biologics, Lexington, Massachusetts
- Anthony Andreula, Midland Park, New Jersey; Terry Balz, Temple, Texas; Forrest Creasy, Temple, Texas; Carl Dixon, Columbia, South Carolina; Gary Green, Cherry Hill, New Jersey; Dickie Hill, Little River, Texas; Danny Hughes, Temple, Texas; Michael Kammer, Manchester, New Hampshire; Joe Knight, Belton, Texas; Michael Kocsis, Temple, Texas; Christopher LeBlanc, Fairhaven, Massachusetts; Jerry Lloyd, Bryan, Texas; Phillip Newton, Temple, Texas; Patrick Spinn, Holland, Texas; Joe Whatley, Rogers, Texas; and James White, Champions Gate, Florida, all employees of Aramark
- Eric Ayanegui, Cintas, Houston, Texas

- John Bahun, Orchard Park, New York; Joanne Chapman, Portland, Oregon; Alan Dawson, Dearborn Heights, Michigan; Thomas Elias, Sioux Falls, South Dakota; Dean Sherfield, Indianapolis, Indiana; Curtis Simmons, Paulsboro, New Jersey; Tara Turner, Detroit, Michigan, all employees of the U.S. Postal Service
- John Barros, Scott Correia, Christine Damato, Dick Haynes, Neal Leon, Larry Leverone, Michael Losier, Patrick Reed, Rick Rivela, Robert Ryan, Bill Terrio, David Thompson, and Erick Van Savage, all employees of UGL-Unicco
- Michael Blanton and James Simpson, both of Gaffney, South Carolina; and Andrew Smiley, Spartanburg, South Carolina; all employees of Nestle
- Ben Dabalos, VMware Inc., Tracy, California
- William Harris, Scottsdale Healthcare, Queen Creek, Arizona
- Carl Lawson, Armour Eckrich Meats, Junction City, Kansas
- Donald Pulliam, Guilford Mills-GFD Fabrics, Greensboro, North Carolina
- Tim Ristow, Oshkosh Corp., Pickett, Wisconsin
- Gregory Rush, IAP World Services, Billerica, Massachusetts
- Martin Sawyer, Mass Mutual, Southampton, Massachusetts
- Joseph Slominski, Coshocton County Memorial Hospital, Dover, Ohio
- Denese Wayman, Westminster at Lake Ridge, Woodbridge, Virginia
- Steve Wheeler, Phoenix, Arizona and Alaina Zemojtel, Tempe, Arizona, both of the Salt River Project
- Brian Wilson, Evonik Degussa, Spanish Fort, Alabama

*The CPMM exam covers maintenance management, preventive maintenance, inventory and procurement, work orders/workflow planning and scheduling, CMMS, training and work cultures, predictive maintenance, reliability centered maintenance, total productive maintenance, maintenance financials and return on investment, safety, indoor air quality, and documentation.*

## Certified Plant Supervisors

Best wishes to the following, who can proudly add the CPS designation after their names: D. Bassham, Walker, Louisiana; James Baumann and Toby Dodson, both of Denham Springs, Louisiana; Mark Firmin and Brent Gautreau, both of Baton Rouge, Louisiana; Conrad Murphy, Krotz Springs, Louisiana; Anthony Rigos, New Rochelle, New York; James Scott, Jarreau, Louisiana; Donna Thiel, Jacksonville, Florida; and Buthove Thomas, Baton Rouge, Louisiana, all employees of Aramark; and Darryl Carter, Philadelphia, of Unicco.

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# When NIOSH Investigates a Worker Complaint at a Conduit Plant

## Report recommends steps for hearing conservation, respiratory protection, establishment of a health and safety committee, and more.

**O**n August 8, 2006, the National Institute for Occupational Safety and Health received a confidential employee request for a health hazard evaluation at Republic Conduit in Louisville, Kentucky. The requestors expressed concerns about workplace exposures to acids, unsafe confined space entry procedures, inadequate personal protective equipment (PPE) for acid exposures, and work-related throat irritation. Two NIOSH industrial hygienists and a nurse epidemiologist conducted an initial site visit to Republic Conduit on November 13, 2006. During the site visit we interviewed workers and conducted a walk-through tour of the facility. We observed that workers were exposed to one or more of the following chemical and physical hazards; acids, metalworking fluids (MWFs), welding fumes, zinc oxide, hexavalent chromium (Cr(VI)), and noise.

Based on our observations during the initial site visit, we conducted a second visit to Republic Conduit during March 5–8, 2007, to sample airborne for acid mists, Cr(VI), MWFs, and metals from welding fumes; conduct noise dosimetry; and review the health and safety programs.

Republic Conduit occupies a 400,000-square-foot building that was constructed in 2005 and is part of Tenaris, a global manufacturer and supplier of tubular products. At the time of this evaluation the plant had 168 production employees. All production workers at Republic Conduit wear safety glasses, hearing protection, safety shoes, and hard hats. Some workers wear Kevlar, leather, or nitrile gloves, based on their job requirements.

### PROCESS DESCRIPTION

Republic Conduit receives rolls of sheet metal that

are slit into strips, with the strip width corresponding to the desired circumference of the conduit. The strips are manually aligned, and the ends welded to ensure a continuous feed of sheet metal strips through the mills. As the sheet metal strips move through the mills on conveyors, the mills form the strips into tubing, weld the seam, and cut the tubing to the desired length. At the time of this evaluation, only two of the five mill lines were in operation. Synthetic MWF (a mixture of 6% neat fluid added to water) is used to cool the tubing during the forming and welding process.

Smaller diameter conduit is galvanized by pickling in an acid bath (nitric, sulfuric), then electroplated with zinc. The galvanized pipes are dipped in a chrome bath and dried in an oven. A chrome coating is then sprayed inside the ends. The interconnected galvanizing and electroplating tanks are enclosed by vinyl strip curtains and fans over the pickling and coating tanks capture and exhaust the acid mist through a scrubber.

Larger diameter conduit is cleaned by dipping in an enclosed, ventilated hydrochloric acid (HCl) tank, and then coated by dipping in molten zinc. After coating, excess zinc is blown out from the interior of the conduit using high pressure steam, then the conduit is sprayed with diluted chromic acid. The conduit ends are threaded and recoated with zinc (remetalized), then heat treated. Workers in the threading area used aerosol spray cans to apply a zinc coating on parts of the tubing that were not adequately treated during remetalization.

At the time of this evaluation two or three workers were at the hot dip tank. These workers manually add 60 pound bars of zinc to the kettle and stir the molten zinc, requiring them to be close to the kettle. Zinc fumes captured by a canopy hood at the hot dip tank pass through a bag house filter.

### ASSESSMENT

After the walk-through tour of the plant, we developed a sampling strategy based on potential worker exposures and addressing the requestors' concerns (see Table 1). Based on our discussions with Republic Conduit management personnel and employees we determined that exposures would probably be

*Continued*

# Of the 35 personal noise exposure measurements, 33 exceeded the NIOSH recommended exposure limit.

greater on day shift and that there was no difference in the production processes conducted during day and night shifts, hence we collected personal breathing zone (PBZ) air samples on day shift employees only. We also collected two general area samples for HCl in the hot dip enclosure, two samples for elements near mills, and one in the threading area. We sampled employees according to their workplace exposures so that those working near the mills were sampled for MWFs and elements from welding fumes, personnel working around acids were sampled for inorganic acids which included HCl, sulfuric, and nitric acid. Personnel working near chromic acid tanks were sampled for Cr(VI). Most employees on who PBZ air sampling was conducted were also sampled for noise. All samples were collected during a full shift (generally 8-10 hours) with the exception of two short-term exposure limit (STEL) area samples for HCL collected in the hot dip enclosure. We also used ventilation smoke tubes to observe air flow patterns around enclosures for hazardous operations.

During our initial site visit, Republic Conduit representatives provided us with a roster of employees

working at the facility. We chose every fifth employee from the roster for interviews about health symptoms. Employees were chosen from the hot dip, galvanizing, maintenance, and welding areas from first and second shift. We reviewed OSHA's Form 300 Log of Work-Related Injuries and Illnesses for 2006 and the written guidelines for the confined space entry and respiratory protection programs.

We provided a survey form to all 168 production workers on three shifts asking about their workplace exposures, use of PPE, hazard communication, and confined space entry procedures. Participation was voluntary and 69 (41%) of the 168 production workers completed the survey.

## RESULTS AND DISCUSSION

### Air Sampling

Only one mill was in operation in the morning during the two days we conducted air sampling and noise dosimetry. Generally, two mills are in operation at the same time during the entire day, which may result in a higher release of welding fumes and MWF mist. We collected a total of 16 PBZ air samples for MWFs. One MWF sample collected on a mill operator exceeded the NIOSH REL-TWA of 0.40 mg/m<sup>3</sup>. The remaining 13 samples measured exposures below the REL. Another mill operator and end finisher had exposures that equaled the REL. In addition to the MWFs the total thoracic particulate mass includes other particles such as elements from welding fumes and ambient dust. The extracted MWF represents the airborne concentration of MWF, however the NIOSH REL applies to the total thoracic particulate mass.

We collected a total of 21 PBZ air samples for acid mists and two general area samples. Sampling results for acid mists did not exceed applicable occupational exposure limits (OELs). Nitric acid has the lowest detection limit and was the most commonly detected acid. The highest airborne concentration of nitric acid was 0.1 mg/m<sup>3</sup>, which is much less than the OSHA permissible exposure limit/time-weighted average (PEL-TWA) or NIOSH recommended exposure limit/time-weighted average (REL-TWA) of 5 mg/m<sup>3</sup>. With the exceptions of one PBZ air sample (0.29 mg/m<sup>3</sup>) and one short-term exposure limit (STEL) area sample (3.1 mg/m<sup>3</sup>) HCl was not detected. These sample results were below the NIOSH REL and OSHA PEL ceiling limit of 7 mg/ 3. Sulfuric acid was also not detected or was detected in trace concentrations at less than 0.09 mg/m<sup>3</sup>, which is below the OSHA PEL-TWA or NIOSH REL-TWA of 1 mg/m<sup>3</sup>. Line breaking and replacement of components such as pumps and valves were not performed

**Table 1: Summary of Employees Workplace Exposures**

Department	Exposures
Maintenance	Acid Mists (HCL, Sulfuric, Nitric), MWFs, Cr(VI), Noise
Hot Dip	Acid Mists, Cr(VI), Zinc Oxide, Noise
Welding/Mills	MWFs, Welding Fumes, Noise
Threading	Zinc Oxide, Noise
Lab Tech	Acid Mists, Noise

by maintenance personnel during this evaluation. There is a potential for higher exposures to acids while performing those tasks. Prior to this HHE, three workers had been splashed with HCl when a pressurized line ruptured.

We collected four PBZ air samples for Cr(VI) from welding fumes on mill operators, two on end finishers, and two on end welders. A treated quartz filter was used in this area to prevent the Cr(VI) from being reduced to Cr(III). We collected a total of 15 PBZ air samples on employees working near the hot dip and galvanizing areas and on two maintenance workers. The highest airborne concentration of Cr(VI) 0.3 µg/m<sup>3</sup> was obtained on a sample collected on a galvanizing line worker. All other Cr(VI) samples were less than 0.1 µg/m<sup>3</sup>, which is below the NIOSH REL-TWA of 1 µg/m<sup>3</sup> and the OSHA PEL-TWA of 5 µg/m<sup>3</sup>.

We collected a total of 15 PBZ air samples on employees working near the mills, threading, or hot dip areas. We also collected two GA air samples by the mills and threading area. The air samples collected on employees potentially exposed to welding fumes or zinc were analyzed for 31 elements, primarily metals. The predominant metals detected, iron and zinc, were present in all 16 air samples. The concentrations of iron ranged from 0.02 to 0.38 mg/m<sup>3</sup>; concentrations that were much lower than the NIOSH REL-TWA of 5 mg/m<sup>3</sup> and the OSHA PEL-TWA of 10 mg/m<sup>3</sup>. Zinc concentrations which ranged from 0.01 to 1.5 mg/m<sup>3</sup>, were below the NIOSH REL-TWA (for zinc oxide dust or fume) of 5 mg/m<sup>3</sup> and OSHA PEL-TWA of 5 mg/m<sup>3</sup> for zinc oxide fume. Other elements detected in quantifiable concentrations (but well below their respective OELs) included aluminum, barium, calcium, copper, magnesium, manganese, molybdenum, silver, and titanium. Although an exposure limit for total welding fumes has not been established by either OSHA or NIOSH, NIOSH recommends maintaining exposures to welding fumes as low as technically feasible.

## Noise

Of the 35 personal noise exposure measurements, 33 exceeded the NIOSH recommended exposure limit of 85 dBA, which is equivalent to a noise dose of 100%. The noise dose for 29 noise measurements was greater than 200% (two times greater than the NIOSH REL). The noise dose for 16 measurements exceeded 500% (five times the NIOSH REL). Because OSHA measures noise using a different criteria than NIOSH, only six measurements exceeded the OSHA permissible exposure limit and 29 measurements exceeded the OSHA action limit. Although the NIOSH REL for noise is not a legally enforceable regulatory standard, NIOSH considers it to be more protective in the prevention of hearing loss than OSHA's noise exposure limits. Table 2 provides a summary of noise measurement results for each job title.

Metal impact is a substantial source of noise in the production area. Specifically, metal conduit rolling into or dropping onto other pieces of conduit during processing causes impact noise. Impact noise also occurs when conduit strikes stop plates (end finisher) or other pieces of metal on the production equipment. The production equipment itself also generates noise when it is running.

In the hot dip department a high level of impulse noise is created when the steam cannon is activated. Of particular note were the noise exposures of the operators and extractors in the hot dip department, which ranged from 99 dBA to 102 dBA based on NIOSH measurement criteria. Sound level and octave band measurements taken in this area show that peak levels are sometimes greater than 136 dB when the steam cannon is activated. Because of noise monitoring equipment limitations, these values may actually underestimate the true peak noise level from the steam cannon.

Most employees wore one of the following four types of hearing protection: E-A-R® Classic® (NRR 29), Moldex Purafit® (NRR 35), Howard Leight

Laserlight® (NRR 32), or Bilsom® Thunder® T3H (NRR 27) earmuffs. We observed that some workers did not wear earplugs properly. Specifically, the foam ear plugs had not been inserted deeply enough into the ear canal. Improperly worn or inserted earplugs reduce the effectiveness of the earplug.

We observed that some workers were not wearing any hearing protection. When asked about the reason for not wearing hearing protection, one

**We observed an accumulation of dust in the threading area, indicating that the local exhaust ventilation system was ineffective or needed maintenance.**

*Continued*

**The symptoms reported by the 13 workers interviewed and those on the OSHA 300 Log of Work-Related Injuries and Illnesses were not associated with a specific causative agent. However, some of these symptoms (e.g., eye, nose and throat irritation, skin irritation, and respiratory system distress) are consistent with acid exposure and could be caused or exacerbated by short-term exposure to acids, even if exposures are not above the occupational exposure limits.**

worker responded that the noise did not seem too loud and was not as loud as noise levels experienced in a previous job. We also observed some contract welders near the zinc kettle and steam cannon who were not wearing hearing protection.

Audiometric testing is done offsite by BaptistWorx when workers are hired and then repeated on a yearly basis. Republic Conduit began operations and hired most of the workforce in 2005 and 2006. At the time of our evaluation most workers had only received baseline hearing tests. However, 56 production workers had a baseline audiogram and subsequent yearly audiogram. Of these, five workers had a standard threshold shift. OSHA defines STS as a change in an employee's hearing threshold, relative to the baseline audiogram, of an average of 10 dB or more at 2000, 3000, and 4000 Hz in one or both ears. The occurrence of a STS indicates that workers exposed to high noise levels are not adequately protected either because they are not wearing hearing protection or are not properly wearing hearing protection.

### **Ventilation**

We used smoke tubes to visualize airflow currents. Smoke released near doors in the administrative and breakroom areas flowed rapidly into the production area, indicating that the production area was under negative pressure relative to those two areas. This is a favorable condition because it means that air contaminants released in the production area will not flow into the administrative area. Smoke released near the galvanizing tanks flowed up to the exhaust fans. Smoke released by the hot dip enclosure and the remetalizer flowed into their respective enclosures, indicating they were both under negative pressure. Despite missing several enclosure panels, which may reduce the effectiveness of the tank's exhaust ventilation system, smoke released into the chromic acid tank flowed into the enclosure. The tank farm

located within the plant near the hot dip area was under positive pressure, an undesirable condition because if a leak occurred the vapors could disperse into the rest of the plant. The HCl hot dip enclosure had a variable air flow exhaust system to maintain the enclosure under negative pressure when conduit was transferred in and out of the tanks.

We observed an accumulation of dust in the threading area, indicating that the local exhaust ventilation system was ineffective or needed maintenance. The mills are not enclosed, and local exhaust ventilation is not used. Republic Conduit had applied for a construction permit in September 2006 to install an exhaust system on the mills and was awaiting approval by the Louisville/Metro Air Pollution Control District.

### **Respiratory Protection Program**

The written respiratory protection program was not site specific. For example, it did not specify the type of respiratory protection required for hazardous operations such as cleaning tanks or entering the HCl hot dip enclosure. Additionally, the respirator program noted that the use of supplied air respirators was required for line breaking, but a source of Grade D breathing air was not available at the facility.

### **Employee Interviews**

During the initial site visit, November 2006, we interviewed 13 (21%) of 71 employees working first and second shift in the hot dip, galvanizing, maintenance, and welding areas. Employees interviewed reported a job tenure of two months to one year. Two of the workers interviewed reported acute upper respiratory symptoms and exacerbation of asthma symptoms related to a brief exposure to acid during a leak. Four other employees interviewed reported back pain, skin irritation, lacerations, and smashing injuries. Along with health symptoms, general safety issues such as personnel not following proper procedures for confined space entry and lockout/tagout were reported.

The symptoms reported by the 13 workers interviewed and those on the OSHA 300 Log of Work-Related Injuries and Illnesses were not associated with a specific causative agent. However, some of these symptoms (e.g., eye, nose and throat irritation, skin irritation, and respiratory system distress) are consistent with acid exposure and could be caused or exacerbated by short-term exposure to acids,

even if exposures are not above the occupational exposure limits. Of the 21 entries for injuries or illnesses on the OSHA Logs in 2006, two of the mechanics reported throat irritation from exposure to chemical vapors. Other entries included six crushing/smashing injuries, six lacerations, four sprains/strains, and two fractures. The occupation most often listed for these injuries was end finisher.

**Employee Survey**

During the March 2007 site visit we provided all production employees a survey form with questions about workplace exposures and use of personal protective equipment. Although the survey had only 41% participation from the workforce and, thus, may not represent the entire workforce, we were able to obtain useful information from it.

Workers were concerned about potential hazards within their work areas. Mill operators were concerned about welding fumes; threaders and hot dip operators about zinc oxide; and workers at the galvanizing line about acids. Thirty-five of the respondents said they have smelled acid in their work area,

and 16 said they have had skin contact with acids. All respondents said they wear assigned PPE. With few exceptions, respondents said they were familiar with Material Safety Data Sheets and that they had been informed about chemical hazards in their workplace. Other concerns mentioned to us by several surveyed workers included employees not following lockout/tagout rules; containers being unlabeled or mislabeled; forklift operators driving too fast; kerosene or gas powered heaters being used in inadequately ventilated work areas; entering acid tank farms without pre-entry air testing and without training on the potential tank entry hazards; and removing conduit from acid baths without donning the proper PPE. Some individual employees mentioned that smoke would fill the facility during maintenance on the screw feeders on the hot dip kettles, and that the spill warning light was not functioning on the hot dip pit. Although we did not check the validity of all of these comments, we are providing this information because some of these concerns may warrant management attention.

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**Table 2: Range of Personal Noise Dosimetry Measurements**

Department	Job Title	Number of Measures	OSHA AL <sup>a</sup>	Percent Dose OSHA PEL <sup>b</sup>	NIOSH REL <sup>c</sup>
Galvanizing	Bundler	2	90.8–113.3	73.7–97.3	620.0–961.5
Hot Dip	Extractor	2	160.2–217.3	131.9–191.9	2536.4–5961.1
	Operator	1	205.6	186.5	4215.7
	Laborer	1	90.8	45.4	649.3
	Loader	2	66.9–123.1	51.4–116.5	356.2–837.1
Maintenance	Maintenance	4	19.8–95.9	8.5–79.0	93.3–1491.1
Shipping	Material Handler	6	55.1–77.9	33.4–49.3	214.3–565.3
Threading	Packaging Op.	2	48.0–73.7	23.7–39.5	170.1–876.7
	Saw Operator	2	77.9–104.2	57.4–77.9	418.7–552.4
	Inspector	1	58.2	38.4	303.0
Welding	Bander	4	83.5–211.4	67.8–197.2	578.5–1635.5
	End Finisher	3	41.2–155.8	33.0–141.4	148.1–1712.8
	Mill Operator	2	44.8–69.7	16.3–39.0	155.1–317.3
	Utility	1	15.0	59.9	46.7

a OSHA AL = A dose = 50% (an 8-hour TWA of 85 dBA, using a 5 dB exchange rate).  
 b OSHA PEL = A dose = 100% (an 8-hour TWA of 90 dBA, using a 5 dB exchange rate).  
 c NIOSH REL = A dose = 100% (an 8-hour TWA of 85 dBA, using a 3 dB exchange rate).

## Observations

During this HHE we observed the following work practices that could result in serious injuries and/or property damage:

- Three employees were performing repair/maintenance work on a mill but only one lock was used to “lockout” and prevent start-up of the mill during repair. Each employee working on the equipment is required to place a lock on the energy source.
- We noted that the containment doors on the zinc kettle were not always lowered to prevent molten zinc from splattering onto nearby unprotected workers.
- We observed fluids which had spilled onto the workplace floor, increasing the risk that employees may slip or fall.
- We saw some forklift operators not wearing their seat belts, and several drivers appeared to be traveling too fast and did not consistently use the forklift horn to signal when they were backing up.
- An employee using a 40-ton overhead crane to move a metal coil was observed standing too close to the load. In the event of failure or excessive swing of the load the operator would be at risk of injury.

## CONCLUSIONS

Our noise dosimetry results indicate that Republic Conduit workers are at risk of hearing loss from exposure to high noise levels in the production areas, and from our review of hearing test records, some employees have already experienced hearing loss. While employees used hearing protection, some wore it improperly. Metal impact was the main noise source near the mills, and impulse noise produced by the steam cannon was the main noise source near the hot dip area. Ear plugs alone cannot provide adequate protection from the high impulse noise levels in the hot dip area.

Employees working near the mills may be at risk of developing respiratory problems from exposure to metalworking fluid mist. Three employees were exposed to airborne MWF concentrations at or above the NIOSH recommended exposure limit. Only one or two of the five mills were operating on the days we sampled for MWFs, so the number of overexposed employees may increase when more mills operate and the production rate increases. Workers were not overexposed to airborne acid mist, metals,

or Cr(VI) during the NIOSH evaluation; however, overexposure to acids could occur when removing components or disconnecting lines from a system containing concentrated acid (line breaking).

We found that required or recommended procedures for several health and safety programs were not being followed, and employees were concerned about their health and safety. For example, the written confined space entry guidelines did not address hazards associated with each confined space, while the written respiratory protection program did not list the type of respiratory protection required for each hazardous operation. Regarding the LOTO program, we noted that not all employees had placed a lock to isolate the energy source when working on the same machine. Finally, during our interviews and survey, workers were concerned about receiving emergency response training so they would be prepared in the event of another acid tank spill, inadequate PPE, lack of timeliness in providing chemical suits and respirators, poor ventilation in acid rooms and zinc kettle areas, lack of training and identification of chemicals used in the plant, poor use of lock-out procedures, and lack of safety lines for the fall protection program.

## RECOMMENDATIONS

...Based on our findings and observations during this evaluation, we offer the following recommendations to improve employee safety and health:

1. Improve the existing hearing conservation program.
- Continue to require hearing protection in the production areas. Supervisors should be responsible and held accountable for ensuring the proper use of hearing protection in their work area. Hearing protection use should also be required for outside contractors.
  - Due to the high peak noise levels and TWA noise exposures that exceed 100 dBA for employees working at the steam cannon or as hot dip operators, require that they use dual hearing protection (i.e., the combination of insert-type earplugs and earmuffs) while the steam cannon is in operation.
  - Implement a hearing loss prevention program for all employees in job titles that have noise exposure levels greater than the NIOSH REL of 85 dBA. We recommend using the NIOSH REL for determining which employees to include in a hearing conservation program. Refer to the NIOSH document

“Preventing Occupational Hearing Loss: A Practical Guide” for more detailed information. This document (NIOSH publication number 96-110) is available at [www.cdc.gov/niosh/96-110.html](http://www.cdc.gov/niosh/96-110.html).

- Review and track hearing loss at all audiometric test frequencies. Specifically, NIOSH recommends using a confirmed 15-dB hearing threshold shift at any frequency to determine whether employees have experienced a STS.

2. Implement noise control measures to reduce impact noise. Consult with an experienced noise control engineer for help in investigating these and other noise control options.

- Reduce the distance that metal conduit rolls or drops before striking other conduit.
- Decrease the speed at which conduit rolls before striking other conduit.
- Add rubber or nylon damping on the pick-ups on the E-Galv loader arms.
- Construct a partial enclosure or barrier at the steam cannon to reduce operator noise exposure.
- Increase the thickness of the metal stop plates at the end finisher to dampen noise created when conduit strikes the plate.
- Replace metal pickups on the end finisher chain conveyor with nylon pick-ups.

3. Enclose the mills and install local exhaust ventilation to reduce exposures to MWFs. If the concentration of MWFs is not reduced below the NIOSH REL then workers must continue using respiratory protection.

4. Assess each confined space. Include in the written procedures an inventory of all confined spaces, their location, associated hazards (air contaminant and physical hazards), entry procedures, PPE required, LOTO/isolation requirements, atmospheric testing requirements, and mode of entry and egress, including emergency egress in accordance with OSHA Standard 29 CFR 1910.146 Permit-required Confined Spaces [Permit-required confined spaces - 1910.146]. ... We also recommend implementing incident response training for every employee in the plant, and coordinate training and communication with the local emergency service.

5. Update the written respiratory protection program so that it specifies what type of respiratory protection is required for each hazardous operation performed at the facility. The written program should include a change-out schedule for cartridges. OSHA’s Small Entity Compliance Guide provides guidelines for what is required in the written program. This guide is available online at [www.osha.gov/Publications/secgrev-current.pdf](http://www.osha.gov/Publications/secgrev-current.pdf).

6. Use supplied air respirators or a SCBA for protection against concentrations of nitric acid that exceed the NIOSH REL unless the respirator manufacturer specifies that the cartridges provide protection against nitric acid.

7. Provide workers a source of Grade D air or SCBAs for line breaking. The JSA we were provided required the use of supplied air respirators for line breaking but a source of Grade D breathing air was not available at the facility during our evaluation.

8. Use a supplied-air respirator or SCBA with a full-face mask, gloves and protective clothing for line breaking until it is determined through air sampling that a lower level of respiratory protection is adequate. Butyl rubber or neoprene gloves and Saranex, Barricade, or Responder suits are suitable for HCl (<37%) and nitric acid (<70%).

9. Investigate why dust accumulates in the threading area. A particle counter can be used to trace leaks in the ventilation system and to identify the point of dust generation. The cloth seals on waste drums in the baghouse were torn, allowing zinc oxide dust to escape. These seals must be maintained and replaced when necessary.

10. Rinse off chemical protective gloves and store them in a clean area when not in use.

11. Implement these recommendations to improve employee safety:

- Operate forklifts at a safe speed.
- Use safety belts when driving a forklift.
- Use forklift horns when approaching intersections and to signal that the forklift is backing up.
- Clean up fluids that have spilled onto the production floor.

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- Keep doors on the zinc kettle lowered to prevent splashing or splattering of molten zinc.
- Review the OSHA LOTO Standard 29 CFR 1910.147, The control of hazardous energy (lock-out/tagout). - 1910.147, to ensure that procedures specified by OSHA are followed.
- Instruct crews of workers who service or maintain equipment that each authorized employee must affix a personal LOTO device to the group lockout device, group lockbox, or comparable mechanism when work is started. The LOTO device can only be removed when the authorized employee stops working on the machine or equipment being serviced or maintained.
- Stand at least as far away from a load suspended by an overhead crane as the distance of its height in case the load drops from the crane and tips over. The load should also be kept at that same distance away from any other employees.
- Ensure that all tool rests and tongue guards on abrasive wheel grinders are maintained at the appropriate distance from the grinding wheel.

- Instruct workers to use a tool to move conduit and not place their hands between pipes.

12. Encourage workers who are experiencing respiratory problems, skin irritation, or other health problems to report exposures they feel may be work-related to the site health and safety manager. Because the work-relatedness of certain health concerns may be difficult to establish, each person with possible work-related health problems needs to be fully evaluated by a physician, preferably one familiar with occupational medicine. A complete evaluation including a full medical and occupational history, a medical exam, a review of exposures, diagnostic tests if warranted, and complete follow-up to note the progress of the affected worker should be conducted as determined by the attending physician.

13. Meetings with employees and management should be convened on a regular basis to address health and safety issues. We recommend that you establish a health and safety committee to address employee health and safety concerns.

**Manuel Rodriguez, Christine A. West, and Scott E. Brueck** are with The Hazard Evaluation and Technical Assistance Branch of the National Institute for Occupational Safety and Health. Editor's note: This information is from the NIOSH Health Hazard Evaluation Report "Evaluation of Worker Exposures to Noise, Metalworking Fluids, Welding Fumes, and Acids During Metal Conduit Manufacturing", April, 2008. To see the report in its entirety, including tables, references and related information, visit [www2a.cdc.gov/hhe/select.asp?PjtName=44585&bFlag=1&ID=1](http://www2a.cdc.gov/hhe/select.asp?PjtName=44585&bFlag=1&ID=1).

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# Expert Advice: Air Conditioners for Information Technology

This article explains the basic operating principles and major components of precision cooling systems from an IT perspective. It also provides basic concepts that are an essential foundation for the proper specification and design of data centers or network rooms.

By Tony Evans

Whenever electrical power is being consumed in an information technology room or data center, heat is being generated that needs to be removed from the space. Data center and IT room heat removal is one of the most essential yet least understood of all critical IT environment processes. Improper or inadequate cooling significantly detracts from the lifespan and availability of IT equipment. A general understanding of the fundamental principles of air conditioning and the basic arrangement of precision cooling systems facilitates more precise communication among IT and cooling professionals when specifying, operating or maintaining a cooling solution.

This article explains the basic operating principles and major components of precision cooling systems from an IT perspective. It also provides basic concepts that are an essential foundation for the proper specification and design of data centers or network rooms. This is an introductory paper from a suite of related papers on more advanced cooling topics from APC, and provides references for

readers interested in a more complete treatment of the subject.

## THE NATURE OF HEAT IN THE IT ENVIRONMENT

Heat is simply a form of energy. In the data center heat is produced as electricity is consumed by IT equipment. With few exceptions, over 99% of the electricity used to power IT equipment is converted into heat. Unless the excess heat energy is removed, room temperature will rise until IT equipment fails. Approximately 50% of the heat energy released by servers originates in the microprocessor itself. A fan moves a stream of cooling air across the chip assembly. The server or rack-mounted blade assembly containing the microprocessors usually draws cooling air into the front of the chassis and exhausts it out of the rear as shown in Figure 1. The amount of heat generated by servers is on a rising trend. A single blade server chassis can release 4 kilowatts (kW) of heat energy into the IT room or data center. Such a heat output is equivalent to the heat released by 40 100-watt light bulbs and is actually more heat energy than the capacity of the heating element in many residential cooking ovens.

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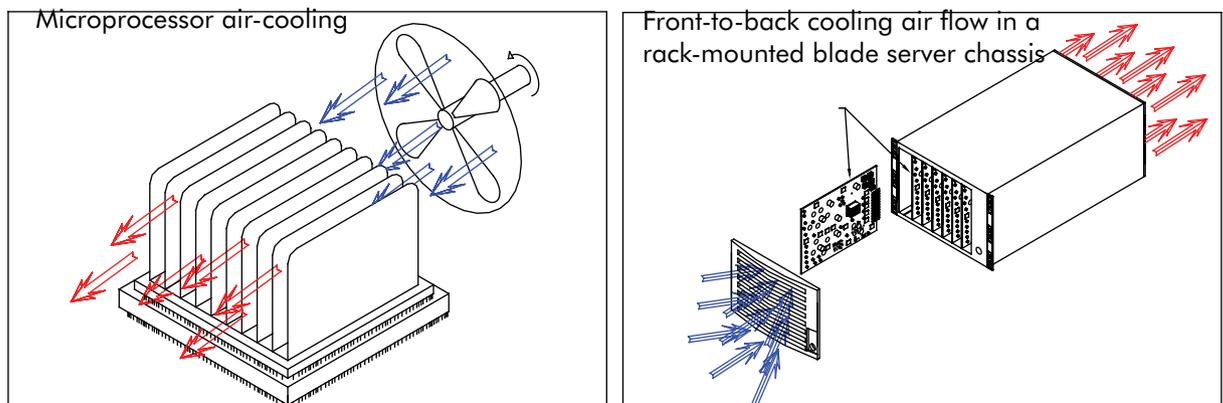
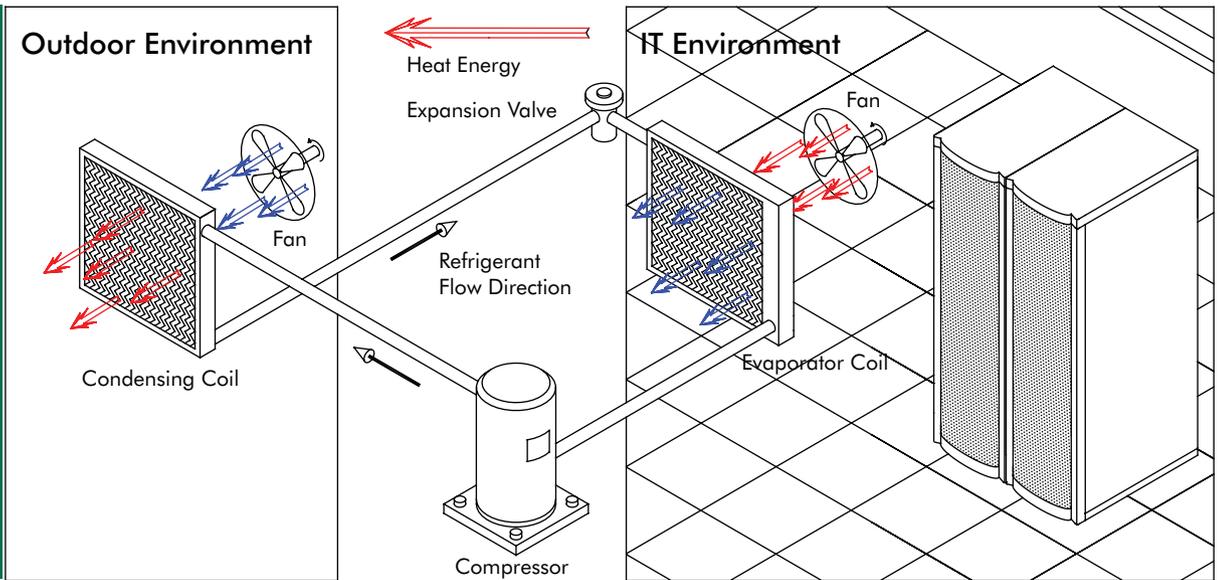


Figure 1 – Microprocessor and server cooling airflow

**Figure 2 – Heat energy removal via the refrigeration cycle**



A unique property of heat energy is that it can only flow in one direction, from hot to cold. For example, a cold object placed in a hot room cannot drop in temperature it can only gain heat energy and rise in temperature. It is for this reason that air conditioners and refrigerators exist. They use electrical or mechanical energy to pump heat energy from one place to another, and are even capable of pumping heat from a cooler space to a warmer place. The ability to pump heat to the outdoors, even when it is hotter outside than it is in the data center, is a critical function that allows high-power computing equipment to operated in an enclosed space. Understanding how this is possible is a foundation to understanding the design and operation of cooling systems for IT installations.

### THE REFRIGERATION CYCLE

The actual movement of heat energy from the IT room to the outside atmosphere is achieved by use of the refrigeration cycle. It's the same process today that has been used for over 100 years. The refrigeration cycle is a closed cycle of evaporation, pressure change, condensation, and flow regulation applied to a fluid called refrigerant. Figure 2 shows the refrigeration cycle and its key components as they are applied to a typical IT environment. The specific processes and components are described below.

#### Evaporation

Evaporation is the first step in removing heat energy from a computer room. The evaporator coil acts like an automobile radiator operating in reverse. Warm air from the computer room is blown across the evaporator coil by a fan, while the pipes comprising the coil are supplied with cold liquid refrigerant. (How the refrigerant comes to be cool is described later in the sequence). When the warm computer room air passes

through the cold evaporator coil it is cooled and this cool air is delivered back to the computer room. Even though the evaporator coil is cold, at approximately 46°F (7.8°C), the refrigerant inside is evaporating, or boiling, changing from liquid to a gaseous state.<sup>1</sup> It is the heat from the computer room that is boiling the refrigerant, passing heat energy to the refrigerant in the process. The refrigerant at this point is a cool gas in a small pipe that is carrying the heat energy away from the computer room.

#### Compression

The vaporized but cool refrigerant carrying the heat from the data center is drawn into a compressor, as shown in Figure 2. This compressor has two important functions:

- It pushes the refrigerant carrying the heat energy around the refrigeration loop.
- It compresses the gaseous refrigerant from the evaporator coil to over 200 psi or 1379 kPa. 2

It is a fundamental property of gases that the compression of a gas causes its measured temperature to rise. Therefore, the moving gaseous refrigerant exiting the compressor is hot, over 125°F (52°C), as well as compressed. This temperature rise due to compression is the key to the ability of the refrigeration loop to eject heat into the outdoor environment.

*NOTES: (1) Most people are familiar with water boiling at 212°F (100°C). How does refrigerant boil at 46°F? Every substance has a unique boiling temperature based on its composition and pressure. Air conditioning systems are engineered to boil refrigerant at approximately 46F by carefully regulating pressure.*

Refrigeration systems boil refrigerant at much lower temperatures in the same manner. (2) Psi = pounds per square inch, kPa = kilopascals

### Condensation

The hot compressed refrigerant carries the computer room heat energy from the compressor to the condenser coil. Like the evaporator coil, this coil transfers heat to another medium, like air. But unlike the evaporator coil which was LOWER in temperature than the air flowing across the coil, the condenser coil operates at a temperature HIGHER than the air. This means that the air flowing across the coil is heated by the coil, and that the hot gaseous refrigerant flowing through the coil is conversely cooled. Heat is flowing from the refrigerant to the air. The air is typically blown across the hot coil by a fan which exhausts the hot air to the outdoors. In this way heat energy from the computer room has been pumped outdoors.

### Expansion

The refrigerant exits the condenser coil as a hot, high-pressure liquid. The refrigerant is then piped to a device called an expansion valve positioned at the entrance to the evaporator coil. This valve has two key functions that are critical to the refrigeration cycle:

- It precisely regulates the flow of high-pressure refrigerant into the low-pressure evaporator coil at a rate that maintains an optimal difference in pressure to ensure all refrigerant is evaporated prior to leaving the coil.
- The refrigerant again becomes capable of being expanded (boiled) to a gas by the heat energy in the data center as it escapes the expansion valve and re-enters the evaporator coil.

In this way the refrigeration cycle is repeated, and the net result of the process is that heat is continuously flowing into the evaporator coil and continuously flowing out of the condenser coil. An air conditioner system operated in this way will continuously pump heat energy out of the computer room.

### Refrigerants

All air conditioners contain a volume of fluid known as refrigerant. Refrigerant is the substance used to actually transport heat from the IT environment to the outside environment. Many common substances have been used as refrigerants to include ammonia, carbon dioxide, air and water. Modern systems usually use fluorinated hydrocarbons that are nonflammable and nontoxic. These refrigerants are commonly referred to by their ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) numerical designation. Older systems use a refrigerant

designated R-12 that has been banned from future use due to environmental concerns of ozone depletion. Today the most commonly used refrigerant in the IT environment is R-22. Legislation exists that bans the production of equipment using R-22 in 2010. It is likely that cooling equipment manufacturers will produce equipment using alternate environmentally compliant refrigerants like R-134a in the near future. IT professionals and cooling professional should work together to ensure the choice of cooling equipment and refrigerant reflects environmental policy and the expected service life of the equipment.

### ENERGY USED BY THE REFRIGERATION CYCLE

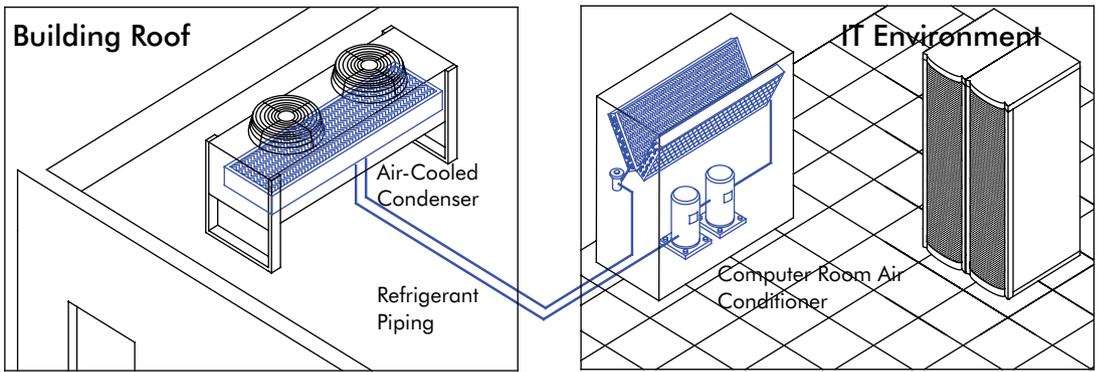
The pumping of heat energy from the computer room requires electrical energy. But to know how much electrical energy is required, you must first know how much heat energy is produced in the IT environment. This is the subject of APC White Paper #25, "Calculating Total Cooling Requirements for Data Centers". In a computer room, the amount of electrical energy consumed is roughly the same amount of heat energy produced which is roughly equal to the cooling capacity required. This fact has led to the rating of precision air conditioners in kW verses the traditional Btu/hr.

The amount of electrical energy required to cool a computer room can be readily estimated. The fans that circulate the air through the evaporator and condenser coils require electrical power approximately equivalent to 5%-10% of the rated cooling capacity in kW. The compressor requires electrical power approximately equivalent to 20%-30% of the rated cooling capacity in kW. This means that for every 1,000 watts of heat energy removed from the computer room, approximately 350 watts of electrical power is needed to run the air conditioner. Unfortunately, for reasons discussed in other APC white papers, typical computer room air conditioners operate much less efficiently than their design values. The actual electrical power needed to run typical, poorly designed, air conditioning systems is approximately equal to the cooling capacity being handled.

*NOTE: For a discussion on air conditioning efficiency in mission critical facilities see the following papers: APC White Paper #5, "Essential Cooling System Requirements for Next Generation Data Centers"; APC White Paper #49, "Avoidable Mistakes that Compromise Cooling Performance in Data Centers and Network Rooms"; APC White Paper #44, "Improving Rack Cooling Performance Using Blanking Panels" at [www.apc.com](http://www.apc.com).*

*Continued*

Figure 3 – Typical heat removal and heat rejection components



## APPLICATION OF THE REFRIGERATION CYCLE IN IT COOLING

IT rooms and data centers are usually cooled with specialized air conditioning equipment commonly called “precision cooling systems”. These systems differ from typical residential or commercial air conditioning systems in that they provide more precise, stable environments for IT equipment by closely regulating air temperature and moisture (See APC White Paper #56, “How and Why Mission Critical Cooling Systems Differ From Common Air Conditioners”, for information detailing the characteristics and capabilities of precision cooling systems).

### Equipment Located Inside the IT Environment

Common configurations for precision cooling systems in the IT room or data center include large floor-mounted computer room air conditioners (CRAC), computer room air handlers (CRAH), ceiling-mounted air conditioners, and portable air conditioners known as “spot coolers”. See APC White Paper #59, “The Different Types of Air Conditioning Equipment for IT Environments” for more information on these different heat removal devices. Any typical computer room air conditioner is expected to provide cold air; however there are several additional inputs, outputs and connections IT professionals should be aware of as the failure of any of them can lead to IT equipment failure. One floor-mounted computer room air conditioning system as shown in Figure 3 typically removes 35-150 kW of heat energy from the IT environment. Selected inputs, outputs and physical characteristics of a system designed to remove 50 kW of heat energy are described below:

- Over 8,000 cubic feet of air (226.5 cubic meters) at a specific temperature and moisture level enter the air conditioner from the data center every minute. That’s more than the volume inside two tractor-trailers.
- The same volume of air exits the air conditioner each minute at a new, user-set temperature and moisture level.

- The air conditioner consumes approximately 30 kW of three-phase electrical energy. (This heat energy is removed by the air conditioner itself and is not added to the IT environment).
- Two 1-inch (25 millimeters) diameter (approximate) pipelines supply and return refrigerant to the outdoor heat rejection device.
- A 7/8-inch (22.2 millimeter) diameter pipe transports water the air conditioner removes from the air to a building drain. This is known as a condensate line.
- A 1/4-inch (6.4 millimeter) diameter pipe from the building’s drinking water supply allows water vapor to be added to the air leaving the air conditioner to regulate humidity.
- The air conditioner itself is 70 inches long, 35 inches deep, 76 inches high (about the size of three IT equipment rack enclosures) and weighs 1350 pounds (612kg). (178cm x 89cm x 193cm)

### Equipment Located Outside the IT Environment

IT professionals are usually familiar with the presence of computer room air conditioners or air handlers in the IT room or data center. They are generally less familiar with the other half of the cooling system – the outdoor heat rejection device. With the exception of some ceiling-mounted and portable air conditioners, there are always one or more major components essential to the cooling system existing outside of the IT environment. The function of these devices is to transfer the heat pumped from the IT environment to the outside atmosphere. The computer room air conditioner detailed in the previous section requires a device called an air-cooled condenser to reject the heat from the IT environment to the outside atmosphere. Selected characteristics of an air-cooled condenser compatible with the computer room air conditioner shown in Figure 3 are described below:

- The device is 10 feet long, 4 feet high, 4 feet wide (304cm x 122cm x 122cm) and weighs 900 pounds (408kg).

- It receives the two refrigerant pipes run from the computer room air conditioning unit located in the IT environment.
- Over 20,000 cubic feet (566 cubic meters) of outdoor air pass through the air-cooled condenser each minute to receive the heat energy transferred from the IT environment.
- It must be secured outdoors to a roof or concrete pad.
- The air-cooled condenser consumes approximately 5 kW of three-phase electrical energy.

### VARIATIONS OF THE REFRIGERATION CYCLE IN IT COOLING

The previous section detailed the characteristics of an air-cooled computer room air conditioning (CRAC) system and its associated heat rejection components. There are several other cooling system configurations routinely installed in IT rooms and data centers that IT professionals should be aware of. All utilize the refrigeration cycle and ultimately reject heat to

the outside atmosphere. A guide to these various configurations of IT room and data center cooling is provided in APC White Paper #59, "The Different Types of Air Conditioning Equipment for IT Environments".

### CONCLUSIONS

Cooling systems for data centers and IT rooms utilize the refrigeration cycle to remove heat energy generated by IT equipment. Inadequate or unreliable cooling solutions jeopardize the availability of the space by increasing the risk of thermally induced downtime. IT professionals versed in precision cooling mechanisms, components and configurations can more effectively work with cooling professionals to ensure the specification and purchase of optimized cooling solutions.

*Tony Evans is an engineer with APC (www.apc.com) in West Kingston, Rhode Island. He has 14 years of experience in power and cooling system design and is a member of ASHRAE Technical Committee 9.9, Mission Critical Facilities, Technology Spaces & Electrical Equipment. (Editor's note: This article is APC White Paper #57, "Fundamental Principles of Air Conditioners for Information Technology")*



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## Lake Hydrothermal System is Key to 'Green' Pavilion Plan

**E**rin's Pavilion, the first of several buildings to be constructed on the 80-acre future home of the Edwin Watts Southwind Park in Springfield, Illinois, is on its way to becoming one of the most accessible and environmentally friendly welcome and visitor centers in the country. With the installation of the structural steel and insulated concrete form (ICF) walls completed, the facility is taking shape at the project site and on pace to open in June 2009.

The planned 15,000-square-foot pavilion, which is a collaboration between Springfield-based architecture firm, Walton and Associates Architects, a division of The Walton Group, and Vertegy, a St. Louis-based sustainability-consulting firm, is tracking for LEED Platinum Certification by the U.S. Green Building Council. It will serve as a welcome and community center as well as a special needs recreation and education center, accommodating the needs of individuals with all levels of disabilities and abilities in a setting that incorporates a host of environmentally friendly features. While the physical structure of the pavilion is the most visible sign of progress, the project team also has completed the installation of the loops for the nearby lake's hydrothermal system, which will serve as a heating and cooling source.

Sixteen 500-foot spiral coils made of one-inch HDPE that were dropped into the lake at its deepest point – 20 feet. The loop system feeds a total of 13 heat pump units to condition the facility. There is a water well that supplements the system if needed through an open loop system that also helps maintain the water level in the pond.

"The use of insulating concrete forms, the pond loops and other energy conserving features will save the Springfield Park District in utility costs year after year," said Todd Walton, president of Walton Management Consultants, the construction manager for the project.

Erin's Pavilion is being constructed with low-impact building materials, which use high amounts of recycled content. Upon completion, the building will



include an abundance of natural daylighting and water conserving fixtures, as well as a 5,500-square-foot banquet space which will be equipped to handle multimedia and all configurations of meetings and special events. The remaining 9,500 square feet of the building will house oversized and family bathroom facilities, program rooms, entry hall, administration offices, conference room, storage, and electric and mechanical rooms. The 15,000-square-foot building also will include 5,000 square feet of patio space that will have both covered and uncovered space and will be adjacent to the building, providing views of the lake.

“We are excited to be involved with such a landmark project,” said Thomas Taylor, general manager of Vertegy. “Erin’s Pavilion is already serving as a springboard from which a variety of other sustainable features are being extended to the rest of the park, and we believe the potential exists for this to truly be a one-of-a-kind public space when finished.”

The Springfield Park District is developing Erin’s Pavilion and the other buildings and spaces in The Edwin Watts Southwind Park with the goal of constructing one of the most accessible and sustainable parks ever built. Upon completion, the park will exhibit a multi-use design, providing year-round entertainment and recreation, education,

unique water features, open green space and natural habitats, with complete accessibility for all ages and disabilities. Some of the additional features being incorporated into park include fishing piers, a gazebo on the lake, a 2.5-mile urban trailway, a recreation center, Springfield Children’s Museum, outdoor amphitheatre, three playgrounds and a game play area for bocce ball, shuffle board and horseshoes.

*This information was provided by representatives of Vertegy ([www.vertegyconsultants.com](http://www.vertegyconsultants.com)) and The Walton Group ([www.thewaltongroup.com](http://www.thewaltongroup.com)). For more information on Erin’s Pavilion or the Edwin Watts Southwind Park, visit [www.springfieldparks.org](http://www.springfieldparks.org). (Note: AFE content is offered for the personal, individual non-commercial use of individuals. For reprints contact Gail Hallman at [ghallman@tsp.sheridan.com](mailto:ghallman@tsp.sheridan.com).)*



## University Has Five-Year Plan to Comply With ADA

The Justice Department recently announced a settlement agreement under Title III of the Americans with Disabilities Act ([www.ada.gov](http://www.ada.gov)) with Chatham University that will make its campus and services more accessible to individuals with disabilities.

The settlement resolves an investigation during which the department found violations of the ADA Standards for Accessible Design in newly constructed buildings, as well as barriers to existing facilities, including inaccessible entrances to buildings, steps in corridors leading to classrooms and other primary spaces, inaccessible counters, a lack of accessible seating in assembly areas, narrow doorways, the absence of directional signage, and inaccessible circulation paths throughout the campus. The university, located in Pittsburgh, Pennsylvania, has agreed to undertake a five-year plan to remedy these and other barriers to full accessibility on campus, according to a news release from the Justice Department.

The agreement addresses the major facilities on campus and related services, including administration buildings and faculty offices, assembly areas, classrooms, skill labs, cultural facilities, science facilities, dining areas, student housing and lounges, the library, the athletic center and playing fields, and parking.

"Our agreement with Chatham University, an older campus with a challenging terrain, is an important step in our continuing effort to ensure that the nation's educational facilities are accessible to students and visitors with disabilities," Grace Chung Becker, Acting Assistant Attorney General for the Justice Department's Civil Rights Division, said in the release.

Under the agreement the university will, among other things:

- Create new accessible entrances to a number of buildings including its major academic complex;
- Provide greater access to classrooms and other locations, including wheelchair seating in the theater, lecture halls and the chapel;
- Provide accessible parking spaces and access aisles leading to accessible walkways;
- Install new exterior ramps, including a ramp that will allow access from the theater parking lot to the upper quad;
- Maintain an accessible van for persons who use manual and power wheelchairs for use on campus on a daily basis;
- Provide new sidewalks and walkways and re-pave some existing sidewalks;
- Ensure that there are accessible restrooms throughout the campus;
- Provide accessible dormitory rooms and bathing facilities;
- Ensure adequate maneuvering space at various building entrances and interior entrances;
- Install interior ramps;
- Install accessible water fountains and telephones;
- Install visual alarms;
- Provide directional signage throughout the campus and raised and braille signage at room entrances; and
- Reasonably modify its policies, practices and procedures when necessary to afford access to services and facilities to individuals with disabilities.

Title III of the ADA requires that privately owned places of public accommodation, including colleges and universities, remove physical barriers to access to existing facilities where it is readily achievable to do so, comply with accessibility standards for new construction and alterations, ensure that transportation services are accessible, and modify policies and practices where necessary to ensure full and equal enjoyment of services and facilities.

# It's Up to Teams to Get it Done

The most effective managers metamorphose into coaches who motivate, support, teach, break down barriers and find resources for employees.

By Bob Niewenhous

Jack Welch, the renowned business manager and former CEO of General Electric, once said of leadership, "It's not about you; it's about the people who work for you." This is particularly true today given the rise of technology's importance in business in recent years.

The complexity of today's organizations, manufacturing processes, products, markets, economies and the technology required to operate and manage commerce in this global marketplace make it impossible for one person, no matter how talented, to accomplish much of anything on their own. It's up to teams to get it done.

## THE IMPORTANCE OF TEAMS

Understanding your team's abilities, creating a productive work environment with them, and obtaining the necessary resources and support they need are all skills in a strong manager; but it's the entire team who must work effectively together to deliver results.

High-performing teams are crucial to a successful business, but they need a manager with the right vision, skills and capabilities to lead the way. Managers with the ability to manage and orchestrate team to achieve results are critical to organizational success in today's challenging global environment.

So how does a manager build, motivate and even inspire a team to deliver breakthrough results in these times of economic contraction, shrinking orders, job cuts and nearly constant admonitions to "do more with less"?

## HARNESSING THE STRENGTH OF EMPLOYEES' IDEAS

Employers are increasingly looking to both their employees and their customers to identify ways to improve their business performance. This is clear



recognition that when driving innovation, improving customer service, and streamlining processes are needed, the frontline employees are rife with ideas.

Employees work in the company's functional, production and support areas every day. They interact with customers on a face-to-face basis regularly. They see the gaps and the faults in processes. And they have well-informed ideas on how to address problems and drive improvements.

But it's not enough to acknowledge your employees have good ideas. A robust process and even sophisticated electronic tools for large organizations are needed to mine, collect and manage employee ideas effectively.

For all but the smallest enterprises, the effectiveness of the Suggestion Box in the corner of the cafeteria is questionable. Studies show this method generates less than half of an idea per employee per year. Whereas sophisticated electronic tools can assist employees in not only communicating their ideas to the correct channels within the organization and developing them, but helping express the idea in an actionable format and receive timely acknowledgment.

Gathering ideas for improvement and acting on employees' suggestions is only part of the solution, however.

## ENGAGING EMPLOYEES TO ADVANCE FROM GOOD TO GREAT

Much is made of "employee engagement" in the human resources literature; and with good reason. Engaged employees deliver results in revenue growth, cost of goods sold, productivity, customer focus,

*Continued*

# Three Helpful Management Tools

There are dozens of tools and programs that can help increase employee engagement. Here are three programs that are particularly effective:

- **Coaching program for new hires.** Since research has shown that the first day at an organization is a key factor in determining the level of employee commitment and engagement in the years ahead, what happens as a new hire comes on board is critical. "Learning the Ropes" developed at the MITRE Institute provides a new hire with a coach for the first six weeks. The coach, who is someone in the work group of the new employee, spends time (usually lunch) with the new employee on his or her first day and then on a weekly basis over the next several weeks. They become a valued guide through the confusing maze of a new workplace.
- **Career conversations.** A formal career conversation program ensures that managers sit down with each of their direct reports on a yearly basis to discuss their career advancement and career plans. These discussions can focus and inspire employees and also managers can spot employees whose job fit is not right before they jump ship. Mentoring programs provide excellent structure for such conversations to happen outside the employee-supervisor relationship.
- **Large group meetings.** The level of engagement skyrockets when 60 to 600 employees representing all parts of an organization gather together to give input to the organization. These meetings can be used to review a vision, plan for the future, review progress to date, or introduce a new program such as an employee engagement initiative. This is a great way to reach all employees when there is an important message to deliver or a shift in strategic direction.

turnover, financial performance and even stock price. Employees are considered to be engaged when many different levels of employees are feeling fully involved and enthusiastic about their jobs and their organizations.

Engagement is defined as the willingness and ability to contribute to company success even by putting extra, discretionary effort into their work, which might take the form of extra time, brainpower and energy, according to a Towers Perrin study.

## THE BUSINESS CASE FOR EMPLOYEE ENGAGEMENT

An engaged workforce provides many intangible benefits for an enterprise; not the least of which is employee retention. In the past several years quantitative research studies have demonstrated a compelling business case for having an engaged workforce and the downside of having a workforce that is not engaged.

Highly engaged employees outperformed their disengaged colleagues by 20% to 28%, according to a Conference Board study released in 2006. And a 2005 study of 28 multinational companies by Serota Consulting found that the share prices of organizations with highly engaged employees rose by an average of 16% compared with an industry average of 6%.

There are costs associated with a disengaged workforce. Disengagement has been found to cost between \$243 to \$270 billion due to low productivity of disengaged workforces, according to a 2003 Gallup poll. In one 2003 study by ISR, companies with low levels of employee engagement found that their net profit fell by 1.38% and operating margin fell by 2.01% over a three-year period. Conversely, companies with high levels of engagement found that their operating margins rose by 3.74% over a three-year period.

## GUIDELINES AND TOOLS FOR ENGAGING EMPLOYEES

A myriad of options and ideas exist to help leaders better engage employees in their company's mission and vision. Here are a few of the best practices identified lately:

- **Create two-way communication opportunities.** Most organizations do well in communicating down from management to employees. But often missing are mechanisms for employees to communicate with management on a regular basis. Several ways to ensure two-way communication between employees and leaders include employee town halls, skip-level and diagonal slice meetings. In addition, brief quarterly online surveys that capture the changing concerns of employees can effectively supplement these two-way communications.

- Give clear, consistent direction to build leadership trust. Trust can be shattered instantly when executives appear to suddenly change directions or seem to break promises. Executives build trust by developing a clear vision of the organizations' future and consistently communicating the same message over time to all employees across the organization.
- Include employees in defining solutions, making decisions. When employees participate in crafting solutions and can contribute to the decision-making in an enterprise, they buy into the solutions and feel more engaged in the organization. They also are more likely to go the extra mile to ensure a positive outcome.
- Ensure employees understand their role in organizational success. Employees need to understand how their job fits into the big picture and what they must do more of and do differently to help the business succeed. HR can help by clarifying what competencies and capabilities are needed to help the organization grow, and by helping employees upgrade their skills to match the needs of the future.
- Provide career development and growth opportunities. Levels of employee engagement also rise when there is a formal, visible career development system that includes components such as formal career tracks, mobility systems to help employees move about in the organization, and annual career conversations.
- Foster employee creativity. Creativity, like all living things, requires space, air and nutrients to grow. And since creativity is the gateway to innovation – a critical element of companies that want to advance – the ability to nurture creativity in people is a hallmark of a truly outstanding manager. To enable a safe and open environment where people can develop creatively, managers should seek opportunities to reward initiative, encourage experimentation, articulate clear goals, promote collaboration and allow time for reflection. No idea is a bad idea because often they can serve as a springboard to other ideas and innovative trains of thought.

People who are given the latitude to work in the style that best suits them in an atmosphere that inspires creativity will devote their best effort and deliver their best work, and that is the essence of employee engagement.

## CONCLUSION

"The day you become a leader, it becomes about them," Jack Welch says. "Your job is to take people who are already great and make them unbelievable."

Starting out as professionals focused on individual performance, the most effective managers metamorphose into coaches who motivate, support, teach, break down barriers and find resources for employees, and in the process they become great managers themselves.

**Bob Niewenhous** oversees the human resource functions of Trane's commercial systems business in the Americas regions, including leadership development, performance management, compensation, staffing, executive coaching, sales compensation, acquisition support and leading a matrix organization of human resource professionals.

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# Use Praise and Recognition to Reward Your Staff

A genuine pat on the back, given at the right time, in the right way, for the right reasons – and in front of the right people – will boost staff morale and commitment in ways that money never will.

By Ron Kaufman

Some managers claim the best way to motivate staff is through the wallet: increase pay, expand allowances or give more cash incentives. While money is certainly useful, it is not the only key to human motivation. In the current economic climate, learning how to harness the power of praise also enables you to reward and retain staff without putting a big dent in your budget.

Sincere recognition can mean a lot more to your staff than just another dollar in the bank. A genuine pat on the back, given at the right time, in the right way, for the right reasons – and in front of the right people – will boost staff morale and commitment in ways that money never will.

Make a difference with these four steps to building the long-term morale of your team.

## LEARN FROM EVERYONE'S MISTAKES

Before rewarding people for a job well done, assure your staff they won't be crucified if things end up poorly.

In an environment of challenge and growth, people must try things they've never done before. And they will make mistakes. In a healthy and rewarding culture, people are encouraged to learn from their mistakes, and then quickly regroup and rebuild.

You should work with employees to understand what went wrong, rectify the situation and then improve the approach. Attack the problem, not the people involved. Ask your team aloud: 'What can be learned from this mistake? What can be improved? Who else should we inform so they can benefit from the learning, too?'

Many companies have rituals for celebrating success and achievements, and that's good. But it's the mistake no one hears about (and others blindly repeat) that can pull you to the bottom.

Start your next meeting by sharing the biggest mistake you've made in the past two weeks. Explain what you learned from the experience. Then ask others for their ideas, listen to feedback and thank those who offer their opinions. By taking the lead and sharing your mistakes, you will demonstrate a willingness to learn and encour-



age a culture of sharing and honest communication.

What about staff who make no mistakes? Either they are very good at hiding what is really going on or they are not being challenged enough. The person who only makes small, safe and bureaucratic moves does not innovate or grow. In today's turbulent markets, this is not what you need to succeed.

## MAKE APPRAISAL CRITERIA CLEAR

Make sure your staff understands how they will be appraised for raises, bonuses and promotions. Whether you evaluate yearly or monthly, openly or behind closed doors, in writing or in dialogue, one-way, two-way or 360 degrees, your staff must clearly understand the criteria for their evaluation.

Introduce your standards of appraisal during the initial hiring process, explain it again during new employee orientation, and clarify the process consistently in staff meetings, newsletters and executive forums.

After you have published these 'rules of the game', keep the playing field fair. Meritocracy demands unprejudiced assessment. Nothing dooms staff morale faster than watching an incompetent who 'takes care of the boss' move up the ladder while capable staff languish in mediocre positions.

Ask yourself: 'Are the criteria for staff evaluations made clear? Are they openly explained and discussed so that all parties can achieve and succeed? Is the process of evaluation fair-minded?'

If your answers are yes, keep moving forward. If your answers are no or maybe, tackle those issues now. If you are not sure of the answers, check with those whose opinions really count: your staff. Conduct a survey, take a poll, ask for immediate feedback. But be forewarned: If the staff says your system of appraisal is unclear or less than fair, you'd better be ready to change it. Even more discouraging than an unfair process of evaluation is an unfair process of evaluation that persists after the staff have given you their honest opinions about it.

*Continued*

# FACILITIES ENGINEERING *Journal*

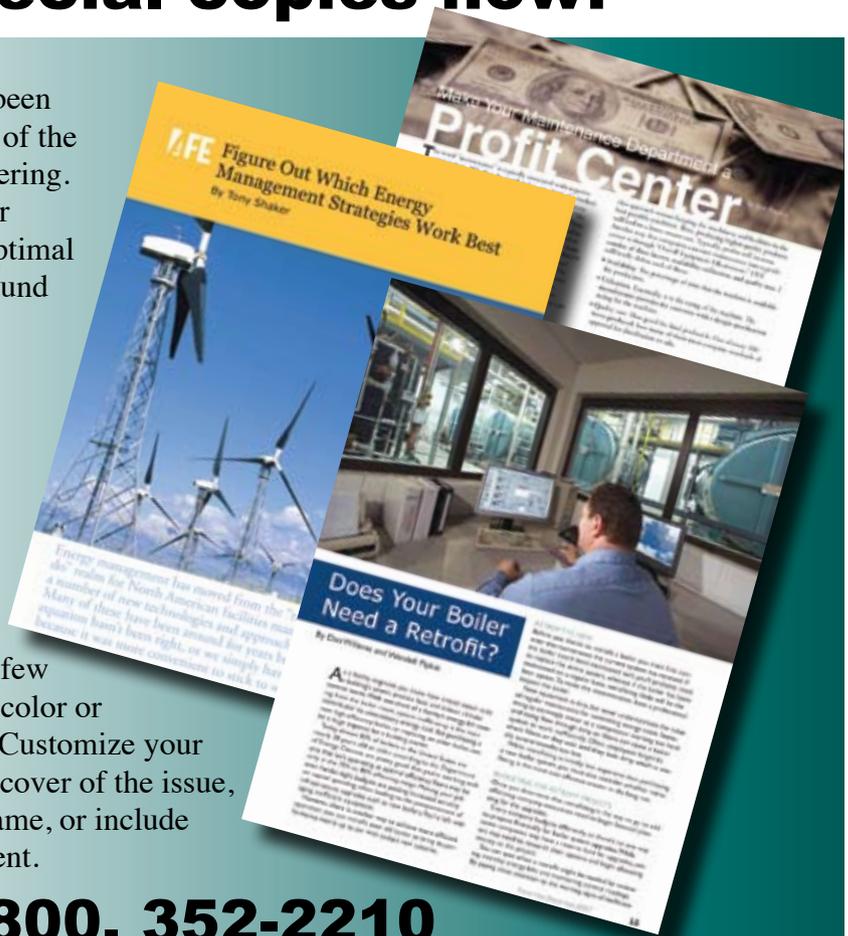
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## ENCOURAGE CAREER DEVELOPMENT

Make sure the conversation about career development is always open. Provide high performing staff members with a boss, mentor, counselor or human resource person who cares about their professional growth and personal well-being.

Show you care about your staff members' future possibilities and potential, not just their current results and past achievements. Help the staff understand the competencies required for a more successful future. Chart career progressions that are achievable and realistic.

Provide easy access to courses, seminars and conferences. Subscribe to useful publications and circulate them to your team. Share websites, e-zines and articles of interest. Build a library of books, catalogues, CDs, videos and other career-building resources.

Create opportunities for learning without spending money outside your organization by cross-training staff inside. Use team rosters and re-assignments to integrate neighboring departments. Create cross-departmental teams to work on cross-functional projects. Put these career development plans into action and watch your staff's confidence – and competence – grow.

## CREATE POWERFUL REWARDS AND MEANINGFUL RECOGNITION

Tailor your in-house reward and recognition programs to reinforce the company culture. Most rewards are handed down from the top: management praises staff, supervisor recognizes team member, boss applauds the workers. Why stop there?

Start a 'Bottom-Up' award for staff to recognize their leaders. You set the budget, but allow staff to select the winners, the reasons for winning and the appropriate awards.

Harness positive 'peer pressure' on a group and individual basis. Ask each department or team to select and publicly recognize another group for their effort, improvement or support. This encourages cross-functional appreciation, understanding and cooperation. Ask each staff member to nominate one or two role models from among their peers. Ask for specific reasons supporting each nomination. Then praise the role models and publicize the specific reasons to reinforce those values and behaviors.

Invite customers to participate in your staff recognition programs. Put easy-to-use nomination forms at key points of customer contact. Set up a hotline for customers to call with compliments or complaints.

And get your suppliers involved, too. Query them by phone, e-mail or in person. Thank them for their votes and send them a copy of the praise you will share with your staff.

## REMEMBER TO REWARD THE REWARDERS!

Provide recognition for managers who excel at recognizing the members of their team.

Use these four steps to conduct a 'recognition audit' inside your organization. List all the ways your people get appreciated, noticed and rewarded. Sort into categories: individual and group, financial and non-financial, daily, weekly, monthly and yearly, from managers and peers, from customers and suppliers, privately and in public, lavishly and simply, in writing and in person, long running awards and brand new awards.

If a category is empty or shallow, get creative with your team and fill them up!

It takes energy and commitment to deliver consistently uplifting service. Praise is the spark that lights the fire. Frequent recognition is the fuel that keeps the fire burning. Use plenty of both to keep the climate warm for staff – and the customers they serve.

*Ron Kaufman (www.upyourservice.com) is an international educator and motivator for uplifting customer service, partnerships and superior service culture. He is the author of the book series "UP Your Service!" and the 11-title inspirational book series "Lift Me Up!" As the founder of UP Your Service! College, his clients include government agencies and multinationals in every major industry sector. (Note: AFE content is offered for the personal, individual non-commercial use of individuals. For reprints contact Gail Hallman at ghallman@tsp.sheridan.com.)*

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## Web-Based Remote Monitoring Device Designed for Small, Medium Uses

The Maverick IP Sensor Appliance from MAMAC Systems Inc. “puts remote building sensing, alarming and control within reach of every building owner,” the company said in a news release. Monitoring and control can be done from any device utilizing a web browser.

MAMAC ([www.mamacsys.com](http://www.mamacsys.com)) manufactured sensors, transducers and control peripherals for HVAC automation and environmental controls.

“Until now, building control systems have been complex, expensive and difficult to understand and use. The Maverick product is aimed at owners of small and medium sized buildings that desire to remotely monitor and control building climate conditions, but cannot justify the expenditure for a complex automation system, or the staffing to learn to use and maintain such systems,” S. Asim Gul, founder, president and CEO of the company, said.

Applications for the appliance are libraries, hospitals, server rooms, hotels, fast food chains, convenience stores, service stations, strip malls, schools, vacation homes, temperature controlled warehouses, refrigerated coolers, greenhouses, and other building types, the news release states.

The Maverick appliance incorporates a web server, analog/digital inputs, and relay outputs and can be powered with any 24 VAC transformer. It can log the data of each input in a standard CSV file which can be reviewed with Word, Excel, or comparable software. The CSV file can be attached to the e-mail alerts to show log history. The appliance can also display the logged data as an adjustable graph.

Two configurations are available: one with four sensor inputs and four relay outputs, and one with eight sensor inputs. The relay outputs can be used for applications including fan or pump operation, starting standby heating or cooling equipment, or any other operation that can be initiated with a relay.

## Power Generation Professionals Get Their Own Online Community

Caterpillar Inc. has begun operating the Power Generation Online Community, an interactive forum where consulting specifying engineers and other power generation professionals can exchange ideas and best practices, at [www.catelectricpowerinfo.com/connect](http://www.catelectricpowerinfo.com/connect). Past experience purchasing or working with Cat Power Generation equipment is not required to participate and there are no registration fees.

“The goal of the online community is to provide a place where users can find answers to questions and interact with their peers,” Dave Lucas, an executive for the company’s Electric Power Division, said in a news release. “Caterpillar is hosting the forum, but the primary goal is to help people in our industry connect with each other around the clock and around the world.”

Caterpillar launched a test of the online community in October by inviting a select group of professionals involved in designing, specifying, purchasing, installing, and operating power generation equipment. By mid December, users from 119 countries had generated more than 110,000 page views.

The section spurring the most activity is power generation sustainability, featuring discussions on topics including

alternative fuels and emissions requirements. Other topics such as site design, standards and regulations and system components are also fueling conversation. Users who cannot find an existing topic of interest to them can easily initiate a new discussion by creating a new thread.

Also, users are leveraging several social networking features, such as the ability to give “Kudos” to other members whose input they value. Users can highlight the response that provided the best solution to their specific question and move the discussions they find most interesting to the top of their view of the community.

## Smart-Antenna Wireless Communication System Tracks Medical Equipment

Mary Washington Hospital, a 442-bed facility in Fredericksburg, Virginia, is using technology to keep track of its mobile medical equipment.

The hospital chose RadarFind Real Time Location System ([www.radarfind.com](http://www.radarfind.com)) for its flexible deployment, ability to provide precise room-level location, innovative status tags and scalability for asset and patient tracking, the company said in a news release. “Unlike other RTLS solutions, RadarFind is deployed enterprise-wide, rather than in one department such as an emergency room. In addition, RadarFind’s low installation costs and its ability to operate without interfering with wi-fi or other existing hospital networks were key factors in the decision.”

Most RTLS solutions available today only provide information about a device’s location and their accuracy can vary, the release states. The RadarFind RTLS technology features an asset tag that goes a step further by alerting staff to the device’s status: available, in-use or needs cleaning/sterilization. The status tag also provides accurate equipment utilization information to help hospitals budget for new equipment expenditures.

Based upon synchronous MIMO (multiple input/multiple output) smart-antenna wireless communication between RTLS components in the 900 MHz frequency band, there is no interference with existing wi-fi networks or other hospital equipment, and the system requires minimal involvement from a hospital’s busy information technology department. Plug-in readers complete the system’s seamless integration with existing hospital infrastructure and operations. Real-time location tracking information on mobile medical devices can be viewed via web-enabled software on any computer or PDA connected to the hospital’s intranet.

The status tag also augments a hospital’s active infection surveillance and prevention processes. As the system tracks devices, it reports time-stamped location history. This information can be used by a hospital as part of its infection control surveillance system. Equipment that has come into contact with specific patients, especially those who have contracted or are colonized with antibiotic-resistant organisms, can be identified. The data from the status portion of the tag can be also used to monitor whether a device passes through the appropriate decontamination process before it is assigned to another patient, according to the news release.

## Fire Alarm Control Panels Made Faster, Adaptable

Fire-Lite Alarms has enhanced two of its addressable fire alarm control panels, the MS-9200UDLS and MS-9600UDLS. Both panels offer faster polling speeds and support new lower-cost and legacy annunciation devices.

Other improvements are a factory-installed digital alarm communicator with upload/download capabilities coupled with a USB port and new Microsoft Windows-based programming tools, the company ([www.firelite.com](http://www.firelite.com)) said in a news release.

“A fully loaded MS-9200UDLS panel supporting 198 devices or MS-9600UDLS panel with a maximum of 636 devices can now activate notification circuits within 10 seconds using LiteSpeed technology. LiteSpeed is a patented Fire-Lite protocol utilized by both fire alarm panels to poll detection devices in groups of 10. This polling scheme allows all system devices to be wired using standard twisted, unshielded wire over an increased distance up to 10,000 feet per loop,” the release states.

## Companies' Agreement Boosts Resources for Real Estate Management

VFA, Inc., provider of software and services for facilities capital planning and asset management, and Bricsnet, provider of solutions for executive decision support and strategic planning in real estate, entered into a strategic alliance recently. The alliance is designed to help clients improve operating efficiencies and long-term planning for their real estate portfolios.

Together, the companies “offer organizations with large, complex real estate portfolios a comprehensive solution for facilities planning and management, with sophisticated decision support tools for enhanced financial intelligence,” according to a news release.

The capital budgeting capability within VFA facility enables organizations to define capital budget strategies and project priorities, which can then be managed through Bricsnet Enterprise’s work order and project management modules. In addition, the combined functionality of VFA facility and Bricsnet Enterprise will allow organizations to better understand the total cost of facility ownership. With a comprehensive understanding of daily maintenance and operations, asset condition and long-term capital planning information, clients can ensure that their capital plans and projects align with the strategic real estate goals of the organization, the release states.

“With access to critical information about asset cost, utilization and value across the portfolio, capital planners can more accurately evaluate new acquisitions and major repairs or renovations. Organizations can create a more efficient capital planning and budgeting process and reduce capital expenses.”

For more information about Bricsnet visit [www.bricsnet.com](http://www.bricsnet.com). For more information about VFA Inc. visit [www.vfa.com](http://www.vfa.com).



## Web Sites of Interest: New or Upgraded Resources

The following web sites have undergone changes recently:

- Belden, which specializes in development of signal transmission products for the industrial, enterprise, building management, broadcast, and security markets, has a new section of its site devoted to the industrial segment: [www.belden.com/industrial](http://www.belden.com/industrial).
- Ralph W. “Pete” Peters of The Maintenance Excellence Institute announced the new version of [www.pride-in-maintenance.com](http://www.pride-in-maintenance.com) recently. The company’s purpose is “improving reliability and maintenance to support total operations success.”
- Rolf Jensen & Associates Inc., a fire protection engineering and code consulting business, has revised [www.rjainc.com](http://www.rjainc.com).

## Survey Says Internet Use for Work Totals 12 Hours Weekly

Engineering, technical and industrial professionals apparently rely on the internet for work, according to results of the GlobalSpec Engineering Trends Survey.

This seventh annual study surveyed a registered user base of engineering, technical, industrial and manufacturing professionals to determine internet usage patterns. Results were released in late 2008.

Twenty-one percent of respondents reported spending over 12 hours per week online for work-related purposes. Thirty-three percent indicate that they spend at least nine hours online weekly. And the internet has become crucial to performing key work-related tasks: 83% of respondents have used the internet to find components and suppliers, and 81% go online to obtain product specifications. In addition, 79% use the internet to conduct research, 67% to request a price quote, and 66% to compare products across suppliers.

Results of the survey also indicate that an online presence encourages action. Eighty-eight percent of respondents stated that they have contacted a supplier after visiting a web site, and 51% ordered samples.

GlobalSpec Inc. ([www.globalspec.com](http://www.globalspec.com)) is a specialized vertical search, information services and e-publishing company serving the engineering, technical and industrial communities.

# New Product Showcase

## Water Conservation Firm Offers Lock for Outdoor Spigots

**F**ilm Improves Energy Efficiency for Structural Glazing  
Southwall Technologies ([www.southwall.com](http://www.southwall.com)), maker of high performance, energy-saving films and glass products, announced the availability of a new family of Heat Mirror film optimized to improve the energy efficiency of structural glazing used in the world's largest commercial projects.

Heat Mirror film creates multiple insulating cavities without increasing weight. It extends performance beyond that of generic low-e insulating glass.

The new family of suspended film, called Heat Mirror "S", uses an advanced coating that is compatible with Dow Corning 3362 two-part structural silicone sealant. Dow Corning 3362 is one of the leading silicone sealants used for large, glass-intensive projects utilizing structural and sloped glazing.

"By supporting the faster cure time and proven durability afforded by Dow Corning's two-part structural silicone sealant, these new films make high-performance Heat Mirror insulating glass a viable solution for large commercial projects that increasingly require higher energy-efficiency," Bruce Lang, Southwall's vice president of marketing and business development, said in a news release.



## Kit Enables Remote Monitoring of a Building's Air and Energy

**S**pinwave Systems has a field kit for monitoring a building's energy usage, carbon dioxide level, temperature and relative humidity, and equipment current consumption and transmitting the information wirelessly.

The field kit consists of one or more indoor environmental conditions monitors, one or more wireless pulse counters for measuring energy usage, and a receiver. The kit is simple to set up, with plug-and-play functionality. It enables building audits to be performed quickly and efficiently, the company ([www.spinwavesystems.com](http://www.spinwavesystems.com)) said in a news release.

The indoor monitor is mounted on a tripod, and includes wireless sensors for measuring temperature, relative humidity and CO2 levels. Simply place the monitor where it is needed to measure environmental conditions. A built-in repeater expands the range of the device, so that additional repeaters are generally not necessary. The data is transmitted wirelessly to a receiver, from which it can be collected using any standard PC or laptop computer. The Excel-compatible data can then be viewed on site, be sent via FTP to a remote server, or, using HTTP Post, to a web server.

Also, the kit has a wireless pulse counter that attaches to utility meters. The pulse counter wirelessly transmits gas or electricity meter values for remote monitoring. Using the wireless pulse counter, facilities managers can obtain accurate data for energy consumption around the clock, and combine this information with temperature, humidity, and CO2 readings to obtain a comprehensive idea of how efficient their building operations are. They can also use the data to identify areas where improvements can be made.

## Operating Modes for Industrial Ceiling Fans Move Air Better

**A**irMotion Sciences Inc. ([www.airmotionsciences.com](http://www.airmotionsciences.com)) added multimode control capability to its AltAir high volume-low speed (HVLS) industrial ceiling fans.

These fans are 9 to 15 feet in diameter, have small, highly energy efficient motors, and are used for cooling, heat de-stratification, ventilation, and as alternatives to air conditioning in large facilities. They already feature Variable Pitch Technology, which enables their Rotatair composite blades to be adjusted 0 to 20 degrees, up or down, while the fan is operating.

Now users can run these fans in multiple modes

- Manual allows the user control of speed, pitch, and direction.
- Eco can be programmed to select the most efficient blade pitch for a given fan RPM.
- DeStrat causes the fan to turn on automatically when there is a pre-set temperature difference between the fan and the fan's wall box control unit, shutting the fan off when the temperature difference is reduced to a set point.
- Auto cause the fan to run automatically at speeds and pitch that are a function of temperature differences.
- EXT enables the fan to be turned on and off using external devices such as timers and thermostats.

"Users can create what we refer to as 'adjustable air movement' in their facilities. When three or more AltAir HVLS fans are arranged in an array, it allows for what we call optimal 'CFM – complete facility movement' of air..." CEO Peter Caruso said in a news release.

## Colored Polymer Concrete Products are ADA Compliant

**ACO** Polymer Products produces detectable warning devices made from polymer concrete – a material that provides up to four times the compressive strength of cement concrete. Such devices are used at pedestrian walkways, sidewalk corners, curb ramps, railway platforms, and retail locations in connection with the Americans With Disabilities Act.

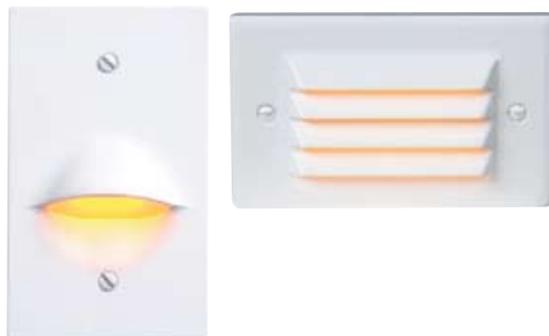
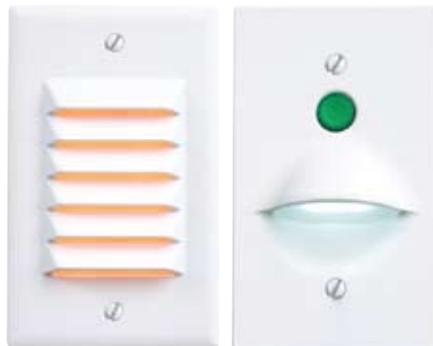
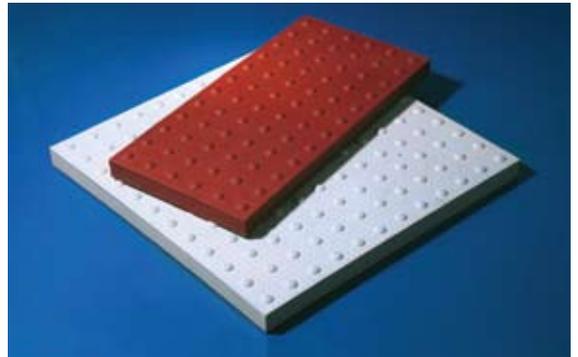
“The industry offers a number of styles and materials for detectable warning surfaces including cast-in-place or stamped concrete, small brick or concrete pavers, plastic or composite fiberglass, stainless steel, or polymer concrete. Several of these options have revealed performance problems over time including excessive and premature wear or chipping off of the domes, tearage and cracking of the base material, color fading or discoloration, and also loss of adhesion around the device’s edges and backing, causing delamination, lifting and settling, all leading to trip hazards,” the company ([www.acousa.com](http://www.acousa.com)) said in a news release. “Of these materials, polymer concrete has proven to be the best material...”

These brightly colored pavers are embedded into a surrounding paving material of a different color, providing a contrast of light-to-dark or dark-to-light, as a visual warning. In addition, devices use truncated domes (warning bumps) on the surface to deliver a tactile alert underfoot, and also a noticeable audible sound when tapped on or swept with a long cane, the news release states.

ACO detectable warning devices (which come in two sizes) use an anti-slip raised texture on the truncated domes and also in between each dome to increase pedestrian safety. The truncated dome warning bumps are 0.2 inches high and 0.9 inches wide, and are spaced out over the paver surface at 2-inch centers. This complies with both the ADA and proposed Architectural Barriers Act Accessibility Guidelines.

Multiple pavers can be combined to create larger detectable warning areas as needed. Color choices include brick red, gray, or yellow, depending on what differentiation is needed against the surrounding paving material.

These devices are easy to install, and can be cut when needed to fit specific sizes. During installation, air holes allow the wet concrete to flow into recesses on the underside of the paver while anchoring bolts hold pavers into the bed of concrete.



## LED Accent Lights Useful for Auditoriums and Health Care Settings

A new line of Arrow Hart Commercial Specification Grade LED Accent Lights is available from Cooper Wiring Devices, a division of Cooper Industries ([www.cooperwiringdevices.com](http://www.cooperwiringdevices.com)):

- The LNL1 and LNL4 Series feature a choice of vertical or horizontal louvered faceplate that distributes light evenly in hallways, stairways, auditoriums, outdoor walkways and other areas that need critical pathfinding lighting.
- The LNL2 and LNL3 Series are for task lighting or where a nightlight is needed. Both feature a vertical scoop faceplate; however, the LNL2 Series is equipped with an illuminated on/off push button switch for instant light activation. Patient rooms, exam rooms and nurses’ stations in health care settings are good locations for the LNL2 and LNL3 Series as they provide focused lighting without disturbing surrounding quiet activities. They’re ideal for reading charts or other materials in low light areas, and they make superior nightlights, according to the company.

These lights feature a polycarbonate lens, die-cast aluminum faceplate and operate on standard 120V power supply. They provide powerful illumination with a 20,000-hour rating.

The company’s LED lights are available in wet location configurations for use outdoors for deck and path lighting, also.

# New Product Showcase



## Ice Plugs Isolate Sections of Pipe for Repairs

The new RIDGID SF-2500 SuperFreeze pipe freezing unit quickly and easily isolates sections of copper or steel pipe with ice plugs, eliminating complete system shut-downs and draining.

This unit forms ice plugs in as little as five minutes in steel pipes up to 2 inches and copper tubing up to 2 ½ inches. One or two plugs can be formed with a single unit at the same time. The unit operates automatically once the freeze heads are attached to the pipes and the unit is turned on. The unit continues to run during repairs, ensuring the ice plugs do not melt. Flexible rubber hoses connecting the freeze heads to the unit make them easier to handle and allow for quicker coiling and storage in its rugged stainless steel carrying case.

No hazardous refrigerants, CO<sup>2</sup> or nitrogen are used, according to the company ([www.ridgid.com](http://www.ridgid.com)).

The unit is lightweight, easy to transport, efficient and reliable. It uses a specially designed compressor with quick restart capabilities and overload protection.

RIDGID offers more than 300 types of tools for the rental, plumbing, HVAC/R, utility, industrial, electrical, petroleum, institutional, commercial and hardware markets.



## Reformulated Firestop Sealant Goes Further, Needs No Collar

A new formula of TREMstop IA intumescent Acrylic firestop sealant provides more coverage and requires less material for fire-rated applications, according to its maker, Tremco Commercial Sealants & Waterproofing.

This the only UL classified intumescent acrylic firestop sealant on the market that can be installed around a four-inch plastic pipe without requiring a collar, sleeve or backer rod, the company ([www.tremcosealants.com](http://www.tremcosealants.com)) said in a news release. No priming is necessary, it's easy to apply and contains antifungal properties. In addition, it can be painted over once fully cured.

Further, the release states, TREMstop IA+ is a high-performance, single-component, water-based, firestop sealant that will expand to fill the voids left when combustible materials burn and deteriorate in a fire. It has undergone third-party testing from Underwriters Laboratory Inc. and Intertek Group, PLC to challenge its ability to perform under extreme conditions of water pressure and flames.

Tremco Commercial Sealants & Waterproofing's full product lines include high performance silicone and urethane joint sealants, waterproofing membranes, drainage protection, air barrier systems, deck coatings, expansion joints, and glazing.

**Compressed air systems.** Kaeser Compressors Inc. offers “Energy Savings in Compressed Air Systems.” This free, eight-page guide explains factors that greatly impact compressed air system performance, and outlines easy steps to dramatically increase the efficiency of existing systems. It includes details on understanding and measuring the complete cost of generating compressed air. For more information visit [www.kaeser.com](http://www.kaeser.com).

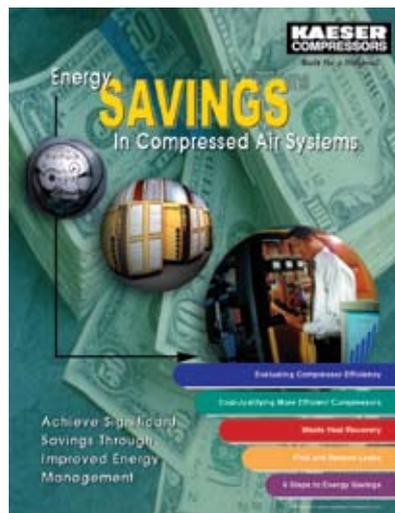
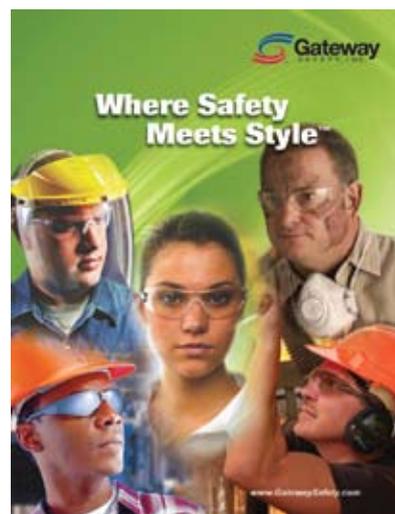
**Health care facility construction.** “Infection Control in the Healthcare Environment During Construction” by Dennis Tremblay, CFPS, is a free white paper from EH&E, an environmental health, safety and engineering consulting firm. It details the process required to establish hospital compliance with The Joint Commission while maintaining a high level of patient care services and critical institution functions. Included are recommendations on how to create a construction oversight panel, incorporate Infection Control Risk Assessment (ICRA) elements into construction documents and establish clear-cut project phases. Download a copy at [www.eheinc.com/infectioncontrol.htm](http://www.eheinc.com/infectioncontrol.htm).

**Health care facility safety.** Joint Commission Resources released a CD-ROM called “Environment of Care Crosswalk: A Comparison of The Joint Commission 2009 Environment of Care, Emergency Management, and Life Safety Standards with OSHA, NFPA, EPA and Other Regulations.” The information helps hospitals to simplify their compliance activities and recognize when there is a duplication of requirements. The CD enables easy electronic access to the standards and requirements, and facilitates use as a compliance tracking tool. It includes the full-text of the Environment of Care, Emergency Management and Life Safety standards and the associated elements of performance. To buy a copy visit [www.jcrinc.com](http://www.jcrinc.com).

**School energy use.** “Grid Neutral: Electrical Independence for California Schools and Community Colleges” is a step-by-step guide from the State & Consumer Services Agency to help California schools and community colleges cut energy costs. It walks school officials through the steps to creating a school that will balance its use of electricity with energy that is produced on the school campus. Schools are advised on the use of solar panels that convert sunlight to electricity, solar-thermal, where sunlight becomes heat for heating water; geo thermal installations that pump ground heat for heating water and air, and wind power. Download a copy at [www.dsa.dgs.ca.gov/OtherProg/gridneutral.htm](http://www.dsa.dgs.ca.gov/OtherProg/gridneutral.htm).

**Safety products.** The 2009 edition of Gateway Safety’s product catalog has more than 60 styles of safety eyewear; and hearing, respiratory, head, and face protection products. Specially designed icons provide easy, “at-a-glance” confirmation of the appropriate safety certifications for each safety product, such as ANSI, CSA, UV-A and UV-B, and Underwriters Laboratories. For more information visit [www.gatewayssafety.com](http://www.gatewayssafety.com).

The following is an assortment of companies’ informational resources submitted for readers of *Facilities Engineering Journal*.



# Industry News

## Community College Using a Cool Roof

Custom-Bilt Metals announced its Titan Cool Roof metal roofing is helping Southwest College, part of the Los Angeles Community College District, reduce its energy costs and contribute to green building energy certification. The LACCD Board of Trustees mandates the use of sustainable building practices for all of its nine campuses.

A Cool Roof — or “cool roofing” — is a roofing material’s ability to reduce heat build-up inside a building and thereby reduce energy consumption and costs by reducing air conditioning loads. By minimizing heat gain through the roof as a result of the solar reflectance and thermal emitting properties of the roof’s surface material, a Cool Roof minimizes energy consumption and lowers a building’s carbon footprint.

Custom-Bilt Metals partnered with PPG to offer their panels with the Kynar 500 Paint System with ULTRA-Cool coatings. Covered with these heat-reflective coatings, the Titan Cool Roof Panel colors meet the ENERGY STAR criteria for cool roofs. Also, these roofing products will contribute to points in LEED credits where recycled content, recyclability, energy optimization, and water collection properties are included in a whole-building, weighted-average approach, according to a news release from the company ([www.custombiltmetals.com](http://www.custombiltmetals.com)).

## Facility Management Software Firm Grows

MicroMain Corp., a provider of asset and facility management software and services, has completed the acquisition of Aleier intellectual property, including all software and associated documentation. Aleier was a subsidiary of wireless communications leader RF Monolithics Inc. and formerly known as Caver-Morehead.

Aleier provided Enterprise Asset Management / Computerized Maintenance Management Software applications to municipal, state, and federal government agencies and businesses. The software applications include maintenance management; fixed asset tracking; inventory; and scheduling with “machine-to-machine” connectivity for building automation, equipment monitoring, and energy management.

The flagship applications — Aleier FM1j interprise and Aleier FM1i INNOVUS —handle the complex structures of large enterprises, geographically dispersed operations, and multi-layered organizational structures. Users can access those applications’ capabilities from any personal computer with a web browser.

MicroMain ([www.micromain.com](http://www.micromain.com)) acquired Aleier’s software, EZ Workorder, for managing work orders using portable computing devices, also.

## Dry Ice Blast Cleaner Assists TPM Program at University

Cold Jet will provide technical expertise for a new Total Productive Maintenance program being conducted by the Natural Resources Research Institute at the University of Minnesota Duluth. NRRI’s wood products team will also use Cold Jet’s dry ice blast cleaning systems to conduct hands-on training for wood product manufacturers that will emphasize a deep cleaning strategy for equipment as the first step in implementing and maintaining a successful TPM program.

Dry ice blasting will replace the manufacturers’ conventional cleaning methods, which include grinders, wire wheels, vacuums, spray cleaners, degreasers and hand scraping, according to a news release from the company ([www.coldjet.com](http://www.coldjet.com)).

The U.S. Forest Service Wood Education and Resource Center provided funding to develop training materials and conduct TPM events under the program. Other project cooperators include the Sloan Foundation Forest Industries Center at Virginia Tech and the Center for Industrial Research and Service at Iowa State.

“Primary and secondary hardwood manufacturers are facing tremendous economic pressures, and by implementing lean manufacturing and TPM into their environments, we are able to help them strengthen their equipment reliability, minimize downtime and improve productivity...” Brian Brashaw, program director at NRRI, University of Minnesota Duluth, said in the release.

## San Francisco Site to Get Energy-Saving Elevators

KONE Inc. will supply and install seven new EcoSystem MR elevators and four gearless modernizations using its Polaris Pro Destination Control system at the historic Market Square building in San Francisco. Work will begin in June, the company ([www.kone.com](http://www.kone.com)) said in a news release.

This elevator system consumes 50% less energy than compared to a traditional traction elevator, and the state-of-the-art destination control system reduced the number of new elevators by one, resulting not only in energy savings but also in creating a more efficient building core and layout, the news release states.

KONE was awarded a five-year service contract, also.

Built in 1937 and currently being redeveloped, Market Square contains 200,000 square feet of retail space and more than 890,000 square feet of Class A office space.



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## Groups Partner to Bolster Disaster-Resistant Building Codes

The International Code Council and Federal Emergency Management Agency launched a new partnership recently. The groups agree to support the maintenance, adoption, outreach, training and enforcement of disaster-resistant building safety codes to reduce human and economic losses resulting from natural hazards including hurricanes, earthquakes, tornados and flooding.

Code Council representative Steve Shapiro said the agreement emphasizes “first preventers” – code and fire officials who prevent harm by ensuring compliance with building safety codes before a disaster occurs. FEMA Administrator David Paulison said it will go a long way toward making America safer. “Mitigation – reducing disaster losses before events strike – is more important than ever in today’s economy. Small investments now will provide big returns when disasters do strike,” Paulison said in a news release.

Under the agreement, the Code Council will provide direct assistance to FEMA on a range of programs designed to reduce losses during natural disasters. FEMA will participate in the council’s code development process, using its data to help develop future codes that increase public safety. The organizations also will jointly develop a strategy to promote code adoption to enhance disaster resistance in the built environment.

FEMA and the Code Council have a history of cooperating successfully to enhance public safety. FEMA was one of the first federal agencies to recognize the benefits of model building codes and to participate in the code development process. The two organizations worked together to incorporate the National Flood Insurance Program floodplain management regulations and the National Earthquake Hazards Reduction Program Recommended Provisions in safety codes developed by the Council, according to the news release.

## Medical Journal in Italy Reports Study of Antimicrobial HVAC Ducts

The Journal of Preventative Medicine and Hygiene in Italy recently published results of a five-month study of indoor air quality when HVAC tubing ducts are treated by a U.S. company that specializes in natural silver-based antimicrobial solutions.

Researchers from the Italian Ministry of Health and the University of Genova used tubing ducts from ALP ([www.alp.it](http://www.alp.it)) of Bergamo, Italy; some of the ducts were treated by Agion Technologies ([www.agion-tech.com](http://www.agion-tech.com)) and some were not. The researchers tested samples of particulate in air for different microorganisms including *L. pneumophila*, *E. coli*, and *Staphylococcus aureus* molds and yeasts.

“In all micro-organisms tested, the percentage reduction on the treated ducts ranged from 99%-100%. In addition, the values of bacterial load found in the air emerging from the treated ducts were five times lower than the load found in the air from the untreated ducts,” the news release from Agion states.

The ALPActive system – as the treated duct products are known commercially – has been installed in many food processing facilities, hospitals and public buildings in Europe and the Middle East already, according to the release.

## Schools in Illinois Using Special Heat Procurement Strategy

ARAMARK and Amerex Energy Services introduced an electric procurement product to the State of Illinois designed to assist educational institutions in managing their utility costs.

Loyola University, Saint Xavier University, Rockford College and Indian Prairie School District are the state’s first consumers to contract for deregulated electric power using a heat rate pricing model. This model is designed to help customers secure lower electric rates and maintain flexibility in a volatile market.

This procurement strategy, called “Managed Heat Rate,” capitalizes on deregulation, placing more control with the consumer by unbundling and separately managing the primary components that comprise the price of electricity. Amerex Energy Services has successfully unbundled the electric price components in Illinois, allowing ARAMARK to introduce this innovative approach to educational institution as a means to manage escalating utility budgets, the companies said in a news release.

Heat rate contracts can offer long-term cost savings over traditional fixed-priced contracts. They provide price stability and budget certainty, which are features particularly desired by educational institutions.

“The managed approach is an excellent alternative to fixed rate pricing,” Paul Matthews, assistant vice president for facilities at Saint Xavier University, said in the release. “Our multi-year contract protects the integrity of our budget this year. It also provides greater price predictability in future years than we could obtain with a fixed rate agreement....”

Amerex Energy Services ([www.amerexenergy.com](http://www.amerexenergy.com)) is a national energy consultant that provides industrial, commercial and institutional clients with a wide array of sophisticated energy and energy-related financial tools designed to provide a stable platform to manage risk. ARAMARK ([www.aramark.com](http://www.aramark.com)) is a provider of food services, facilities management, and uniform and career apparel to health care institutions, universities and school districts, stadiums and arenas, and businesses around the world. The companies began offering innovative power procurement contracts to the higher education industry in 2006. They partnered with Baylor University in Texas to secure a 10-year discounted heat rate contract that resulted in a unit price reduction of 35% and savings in excess of \$20 million.

## Lease Program Available for Portable Gas Detectors

Honeywell offers a new leasing program for its portable gas detection business customers. The program, available through Honeywell Analytics distributors and funded by Honeywell Global Finance LLC, offers customers the opportunity to upgrade their life safety equipment to achieve more functionality and less maintenance and service expenses over the life of the equipment.

Qualified customers can get lease financing for up to 100% of the cost of portable or fixed gas detection instrumentation systems, at fixed rates and variable terms. Financing may include soft costs such as installation and other related expenses.

A variety of flexible payment options, including fixed and deferred payments, are available.

Honeywell Analytics ([www.honeywellanalytics.com](http://www.honeywellanalytics.com)) is part of Honeywell’s Automation and Control Solutions group.

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CAC is an independent company that shows clients how to significantly improve compressed air system performance and quality through quality engineering while creating a project that pays for itself. We're not in the equipment business and are not aligned with any manufacturer. That means we have a vested interest in maximizing your return, which in turn drives us to rely less on equipment and more on engineering. Average operating cost reductions are in the 25%-60% range with paybacks in the 12-30 months range. We can also help you get more out of your existing system, possibly eliminating the need to expand the air system or at the least, minimizing it. "It's about money, not air."

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## Deal Pushes Development of ADA-Compliant Recreation, Fitness Areas

**G**reenMan Technologies and The Great Plains ADA Center of Columbia, Missouri recently entered into a 60-month agreement for the advancement and development of solutions, particularly those related to recreational and playground areas, to promote compliance with the Americans with Disabilities Act.

The partnership will be facilitated by National Safe Surfacing Initiative, a wholly owned subsidiary of Greenman's Welch Products subsidiary, according to a news release GreenMan (<http://greenman.biz>) issued in late 2008.

"NSSI is committed to providing resources and solutions that enable our customers to meet ADA standards for their facilities, with special focus on their outdoor play and fitness areas," Tim Mahoney, president of the initiative, said. "We recognize the importance of providing accessibility to all individuals and our goal for this partnership is to work with the Great Plains ADA Center to create a 'Best Practices' model that integrates innovative education, training and technology solutions."

GreenMan CEO and President Lyle Jensen said he is confident the agreement with the Great Plains ADA Center "will provide a springboard for future opportunities in the Midwest and across the country."

According to the news release, Jensen's company "pursues technological processes and unique marketing programs to transform recycled materials into renewable fuel, alternative energy, recycled feedstock, and innovative recycled products." More than 12 million tires are collected and recycled annually into tire-derived fuel, tire-derived aggregate, and crumb rubber feedstock for playground, athletic track and field, and road surfacing. Through its subsidiary, Welch Products, "the company develops and markets branded products and services that provide schools and other groups viable solutions for safety, compliance, and accessibility."

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# Events

FEBRUARY, 2009

**2** AFE Certified Plant Maintenance Manager course. This live, interactive online course will be taught 12-4 p.m. ET on February 2, 5, 9, 12, 16, 19, 23 and 26. Description: Course participants will become proficient in preventive maintenance, predictive maintenance, work flow-planning and scheduling, computerized maintenance, investment returns and Total Productive Management. Upon successful completion of a 200-question exam, they will earn the prestigious CPMM credential. Eligibility requirements are current employment as a maintenance professional and two years of experience. To apply online visit [https://www.afe.org/certification/cpmm\\_applic.cfm](https://www.afe.org/certification/cpmm_applic.cfm). Information: Katrina McEwan at (703) 234-4123 or [KMcEwan@AFE.org](mailto:KMcEwan@AFE.org).

**12** Webcast on the Benefits of Energy Assessments to Large Facilities. Description: This webcast provides an overview of Save Energy Now assessments at large facilities; the types of systems assessed, how to apply, and the value they provide companies. Conducted by the U.S. Dept. of Energy. Registration: <https://www1.gotomeeting.com/register/490557670>.

**18** AFE webinar: "The Top 10 Parasites of Your Compressed Air System." Location: virtual. Description: Learn how you can identify the parasites that are robbing you of compressed air and driving up your energy costs. With an estimated \$4.5 billion spent on compressed air in manufacturing annually in the U.S., eliminating these parasites can mean savings that go straight to the bottom line. Speaker: Jason Hall of Peterson Power. Information: Advance registration is required. Go to [www.AFE.org](http://www.AFE.org). Click on Education and Training, and then on Webinars. Any Certified Plant Engineer, Certified Plant Maintenance Manager or Certified Plant Supervisor who participates in this session can earn 0.1 credit toward recertification. All current members can attend for free. Non-members are welcome; the cost to them is \$99 per person, per session.

**19** Webcast on the Benefits of Energy Assessments to Small- and Medium-Sized Facilities. Description: Conducted by the U.S. Dept. of Energy. DOE's university-based Industrial Assessment Centers conduct one-day assessments at smaller plants. Teams of highly-trained IAC faculty and engineering students apply the same DOE software tools and technical resources to identify key savings opportunities throughout the plant. This webcast will cover

potential energy cost savings, improvements to energy use efficiency, and a brief overview of available tools and resources. Registration: <https://www1.gotomeeting.com/register/939636424>.

**25-27** China International Heating, Ventilation & Air Conditioning Expo. Location: Beijing. Theme: "Reducing Building Energy Consumption, Promoting Energy Saving and Pollution Reduction." Information: <http://www.cihe-hvac.com>.

## MARCH

**3-5** Achieving Total Process Reliability through TPM seminar. Location: Myrtle Beach, South Carolina. Conducted by The Marshall Institute. Description: You will learn how to implement TPM in existing facilities, large and small, union or non-union; how TPM/TPR complements and supports your lean and Six Sigma efforts; why autonomous maintenance is not enough; the importance of assessing the current systems to determine where to start with TPM/TPR and related information. Information: [www.marshallinstitute.com](http://www.marshallinstitute.com).

**9-12** Power Test 2009 Electrical Safety and Maintenance Conference. Location: San Antonio, Texas. Description: conference tracks (safety, reliability and equipment), interactive panel sessions (70E, safety, cables and transformers). interactive symposium, keynote speaker and trade show. Conducted by the InterNational Electrical Testing Association (NETA). Information: <http://www.powertest.org>.

**10** Motor Systems Management workshop. Location: San Diego, California. Description: This workshop covers motor systems management including applications, inventory tracking, maintenance, replacement decisions, repair, and the impact and maintenance of power quality. A rigorous overview shows how the MotorMaster+ software can form the structure and reduce the work of motor systems management and motor systems decisions. Sponsored by San Diego Gas & Electric, the California Energy Commission and U.S. Dept. of Energy. Information: Yvonne Moreno at (858) 654-3589 or [ymoreno@semprautilities.com](mailto:ymoreno@semprautilities.com).

**10-12** National Facilities Management & Technology Expo. Location: Baltimore, Maryland. Description: 100 free sessions in 12 tracks, exhibit hall, other activities. Information: [www.nfmt.com](http://www.nfmt.com).

**11** Motor Systems Management workshop. Location: Downey, California. Description: This workshop covers motor systems management including applications, inventory tracking, maintenance, replacement decisions, repair, and the impact and maintenance of power quality. A rigorous overview shows how the MotorMaster+ software can form the structure and reduce the work of motor systems management and motor systems decisions. Sponsored by Southern California Gas, the California Energy Commission and U.S. Dept. of Energy. Information: Larry Bennett at (562) 803-7570 or [lbennett@semprautilities.com](mailto:lbennett@semprautilities.com).

**16-20** AFE Certified Plant Maintenance Manager course. Location: Indianapolis, Indiana. Description: Course participants will become proficient in preventive maintenance, predictive maintenance, work flow-planning and scheduling, computerized maintenance, investment returns and Total Productive Management. Upon successful completion of a 200-question exam, they will earn the prestigious CPMM credential. Eligibility requirements are current employment as a maintenance professional and two years of experience. To apply online visit [https://www.afe.org/certification/cpmm\\_applic.cfm](https://www.afe.org/certification/cpmm_applic.cfm). Information: Katrina McEwan at (703) 234-4123 or [KMcEwan@AFE.org](mailto:KMcEwan@AFE.org).

**23-26** The Reliability Centered Maintenance Managers' Forum. Location: Daytona Beach, Florida. Description: RCM-focused learning sessions and networking opportunities. Conducted by [reliabilityweb.com](http://reliabilityweb.com) and Uptime magazine. Information: [www.maintenanceconference.com](http://www.maintenanceconference.com).

**17-20** Reliability Training workshop. Location: Dallas, Texas. Description: The Timken Co. is hosting reliability training workshops to educate engineers, distributors and maintenance managers on how to gain higher levels of uptime and performance. The workshops will include courses on reliability-centered maintenance, vibration analysis, bearing maintenance fundamentals and predictive maintenance. Information: <http://www.timken.com/workshops>.

**24** Fundamentals of Compressed Air (Level 1) workshop. Location: Omaha, Nebraska. Description: Find out how a compressed air system works and the benefits of optimal compressed air system performance. This initial class demonstrates how

# Events

to compute the current cost of your plant's compressed air systems, how to measure and create a baseline of system performance, and how to determine the impact of different compressor control types.

Learn basic approaches for cutting costs; identify steps for proper system operation, maintenance, and point-of-use accountability; and tailor a compressed air system management action plan for your plant. Sponsored by Hughes Machinery Co., Omaha Public Power District, Atlas Copco Compressor, Draw Professional Services, the Compressed Air Challenge and the U.S. Dept. of Energy. Information: Dennis Tribbie at (402) 571-5004 or tribbie@hughesmachinery.com.

**25** Motor Systems Assessment workshop. Location: Lewisburg, Pennsylvania. Description: This workshop covers motor systems management including applications, inventory tracking, maintenance, replacement decisions, repair, and the impact and maintenance of power quality. A rigorous overview shows how the MotorMaster+ software can form the structure and reduce the work of motor systems management and motor systems decisions. Sponsored by SEDA-COG Energy Resource Center, Pennsylvania Department of Environmental Protection - Office of Energy and Technology Development and U.S. Dept. of Energy. Information: Jessica Scott at (570) 524-4491 or jscott@seda-cog.org.

**25-26** Advanced Management of Compressed Air (Level 2) workshop. Location: Omaha, Nebraska. Description: This advanced course in compressed air system management teaches you to develop a system profile and address point-of-use issues. In addition, you will learn how to implement a compressed air system maintenance program, determine different compressor control strategies, align the supply-side to demand-side operation, and gain an understanding of the value of heat recovery. Participants will also gain knowledge on how to successfully present project proposals to management. Sponsored by Hughes Machinery Co., Omaha Public Power District, Atlas Copco Compressors, Draw Professional Services, the Compressed Air Challenge and the U.S. Dept. of Energy. Information: Dennis Tribbie at (402) 571-5004 or tribbie@hughesmachinery.com.

## APRIL

**1-2** Sustainable Building Expo/West. Location: Anaheim, California. Who should attend: Anyone involved in management or operations of buildings/

facilities in the commercial, industrial, hospitality, municipal, manufacturing or institutional sectors. Information: [www.sustainableexpos.com](http://www.sustainableexpos.com).

**3** Introduction to the Pumping System Assessment Tool. This webcast provides an overview of the U.S. Dept. of Energy's PSAT and how it can be used to target opportunities for energy savings. Registration: <https://www1.gotomeeting.com/register/316322142>.

**5-9** National School Plant Management Association annual conference and trade show. Location: Atlantic City, New Jersey. AFE Certified Plant Maintenance Manager and Certified Plant Supervisor one-day review programs and exams to be offered as part of the event. NSPMA breakout workshop topics include guns in schools, gangs, carpet; activities include tours of historic sites in Philadelphia, fishing and golf. Information: <http://www.nspma.org>

**7** Fundamentals of Compressed Air (Level 1) workshop. Location: Sacramento, California. Description: Find out how a compressed air system works and the benefits of optimal compressed air system performance. This initial class demonstrates how to compute the current cost of your plant's compressed air systems, how to measure and create a baseline of system performance, and how to determine the impact of different compressor control types. Learn basic approaches for cutting costs; identify steps for proper system operation, maintenance, and point-of-use accountability; and tailor a compressed air system management action plan for your plant. Sponsored by the Sacramento Municipal Utility District, California Energy Commission, Compressed Air Challenge and U.S. Dept. of Energy. Information: Paul Gillaspay at (916) 732-5375 or pgillas@smud.org.

**10** Introduction to the Process Heating Assessment and Survey Tool webcast. Description: This webcast provides an overview of the U.S. Dept. of Energy's PHAST and how it can be used to target opportunities for energy savings. Registration: <https://www1.gotomeeting.com/register/628011855>.

**13** Introduction to Compressed Air Systems webcast. Description: U.S. Dept. of Energy webcast provides an overview of the Compressed Air Challenge Toolkit and the AIRMaster+ software tool and how these tools can be used to target opportunities for energy savings. Registration: <https://www1.gotomeeting.com/register/189078840>.

**15** Fundamentals of Compressed Air (Level 1) workshop. Location: Joplin, Missouri. Description: Find out how a compressed air system works and the benefits of optimal compressed air system performance. This initial class demonstrates how to compute the current cost of your plant's compressed air systems, how to measure and create a baseline of system performance, and how to determine the impact of different compressor control types. Learn basic approaches for cutting costs; identify steps for proper system operation, maintenance, and point-of-use accountability; and tailor a compressed air system management action plan for your plant. Sponsored by Hughes Machinery Co., the Alliance for Business Education, Atlas Copco Compressor, Missouri Southern State University, the Compressed Air Challenge and the U.S. Dept. of Energy. Information: Nancy Kenney at (417) 455-5402 or kenny-n@mssu.edu.

## MAY

**6-7** Colorado Sustainable Building Expo & Conference. Location: Denver, Colorado. Description: Seminars designed to help you stay current in your industry. Who should attend: Anyone interested in the sustainability of your building or helping to make your building green; including: facility managers, facility engineers, building owners, property managers, corporate real estate executives, architects, interior designers, landscape architects, space planners, construction project managers, developers and commercial real estate brokers. Information: [www.sustainableexpos.com](http://www.sustainableexpos.com).

**14** Motor Systems Management workshop. Location: Albuquerque, New Mexico. Description: This workshop covers motor systems management including applications, inventory tracking, maintenance, replacement decisions, repair, and the impact and maintenance of power quality. A rigorous overview shows how the MotorMaster+ software can form the structure and reduce the work of motor systems management and motor systems decisions. Sponsored by PNM and the U.S. Dept. of Energy. Information: Carmen Chico at (505) 241-4404 or carmen.chico@pnm.com.

**18-22** Reliability Training workshop. Location: Greenville, South Carolina. Description: The Timken Co. is hosting reliability training workshops to educate engineers, distributors and maintenance managers on how to gain higher levels of uptime and performance. The workshops will include courses on reliability-centered maintenance, vibration analysis,

## Upcoming seminars, workshops, and conferences in facilities engineering.

bearing maintenance fundamentals and predictive maintenance. Information: <http://www.timken.com/workshops>.

**27-28** Advanced Management of Compressed Air (Level 2) workshop. Location: Sacramento, California. Description: Learn what data and tools are necessary to measure and assess the efficiency and cost-effectiveness of a compressed air system. This advanced course in compressed air system management teaches you to develop a system profile and address point-of-use issues, including determining actual air quality requirements, investigating and reducing highest point-of-use pressure requirements, and addressing high-volume intermittent applications. In addition, you will learn how to implement a compressed air system maintenance program, determine different compressor control strategies, align the supply-side to demand-side operation, and gain an understanding of the value of heat recovery. Participants will also gain knowledge on how to successfully present project proposals to management. Sponsored by the Sacramento Municipal Utility District, California Energy Commission, Compressed Air Challenge and U.S. Dept. of Energy. Information: Paul Gillaspay at (916) 732-5375 or [pgillas@smud.org](mailto:pgillas@smud.org).

### JUNE

**3-4** Bay Area Sustainable Building Expo & Conference. Location: Santa Clara, California. Description: Seminars designed to help you stay current in your industry. Who should attend: Anyone interested in the sustainability of your building or helping to make your building green; including: facility managers, facility engineers, building owners, property managers, corporate real estate executives, architects, interior designers, landscape architects, space planners, construction project managers, developers and commercial real estate brokers. Information: [www.sustainableexpos.com](http://www.sustainableexpos.com).

**16-19** The TFM Show. Location: Indianapolis, Indiana. Description: Conference program, networking opportunities and an exhibit hall. Co-located with CONSTRUCT2009. Information: [www.thetfmshow.com](http://www.thetfmshow.com).

### JULY

**23** Pumping Systems Assessment workshop. Location: Albuquerque, New Mexico. Description: This workshop discusses performance problems encountered in everyday applications. The work-

shop covers practical issues involved in field measurements of fluid and electrical data and presents the U.S. Dept. of Energy's Pump System Assessment Tool used to assess the performance of pump systems. Sponsored by PNM and the U.S. Dept. of Energy. Information: Carmen Chico at (505) 241-4404 or [carmen.chico@pnm.com](mailto:carmen.chico@pnm.com).

### AUGUST

**24-28** The Original Environmental Bootcamp. Location: Williamsburg, Virginia. Description: Topics covered include: environmental law; the Clean Water Act; Clean Air Act; Resource Conservation and Recovery Act; Comprehensive Environmental Response, Compensation and Liability Act; Emergency Planning and Community Right-to-Know; transportation of hazardous materials; Toxic Substances Control Act; storage tank management; an introduction to the Environmental Management System; and environmental training requirements. Conducted by The Archer Institute of Environmental Training LLC. Information: <http://www.aarcherinstitute.com>.

### SEPTEMBER

**1** Motor Systems Management workshop. Location: Sacramento, California. Description: This workshop covers motor systems management including applications, inventory tracking, maintenance, replacement decisions, repair, and the impact and maintenance of power quality. A rigorous overview shows how the MotorMaster+ software can form the structure and reduce the work of motor systems management and motor systems decisions. Sponsored by the Sacramento Municipal Utility District, California Energy Commission and U.S. Dept. of Energy. Information: Paul Gillaspay at (916) 732-5375 or [pgillas@smud.org](mailto:pgillas@smud.org).

**2** Fan Systems Assessment workshop. Location: Sacramento, California. Description: This workshop introduces the Fan System Assessment Tool, which helps users to quantify potential benefits of configuring fan systems for optimal performance, calculate how much energy a fan system is using, and determine how efficiently the system is operating. The workshop also examines fan system performance characteristics and the practical issues involved in field measurement of fluid and electrical data. Sponsored by the Sacramento Municipal Utility District, California Energy Commission and U.S. Dept. of Energy. Information: Paul Gillaspay at (916) 732-5375 or [pgillas@smud.org](mailto:pgillas@smud.org).

**10** Fundamentals of Compressed Air (Level 1) workshop. Location: Albuquerque, New Mexico. Description: Find out

how a compressed air system works and the benefits of optimal compressed air system performance. This initial class demonstrates how to compute the current cost of your plant's compressed air systems, how to measure and create a baseline of system performance, and how to determine the impact of different compressor control types. Learn basic approaches for cutting costs; identify steps for proper system operation, maintenance, and point-of-use accountability; and tailor a compressed air system management action plan for your plant. Sponsored by PNM, the Compressed Air Challenge and the U.S. Dept. of Energy. Information: Carmen Chico at (505) 241-4404 or [carmen.chico@pnm.com](mailto:carmen.chico@pnm.com).

**22-23** Facility Decisions Conference & Show. Location: Las Vegas, Nevada. Conducted by Trade Press Publishing Corp. Information: [www.facilitydecisions.com](http://www.facilitydecisions.com).

### OCTOBER

**7-9** World Workplace. Location: Orlando, Florida. Conducted by the International Facility Management Association. Information: [www.worldworkplace.org/2009](http://www.worldworkplace.org/2009).

**29-Nov. 2** AFE National Meeting, plus Facilities America Conference & Show. Location: Greenville, South Carolina. Details to be released as they become available.

### NOVEMBER

**4-5** World Energy Engineering Congress. Location: Washington, D.C. Description: Includes multi-track conference agenda, seminars on a variety of current topics and a comprehensive exposition of new technologies. Conducted by the Association of Energy Engineers. Information: <http://www.energy-congress.com>.

**Your Opinion Matters.** If you have a question, comment or suggestion about the content of Facilities Engineering Journal, contact Editor, Gabriella Jacobs, at 703.234.4066, or [gjacob@AFE.org](mailto:gjacobs@AFE.org). If you'd like to advertise, contact Sales Manager Norman Wisler at 856-768-9360.

## Greenville, South Carolina

The Upstate of South  
Carolina is home to  
1.1 million people  
and more than 800  
manufacturing facilities



including:

- ❖ BMW of North America, LLC
- ❖ Michelin North America, Inc.
- ❖ Milliken & Company
- ❖ GE Energy – Gas Turbine Plant
- ❖ Cytec Carbon Fiber
- ❖ 3M

Greenville and the six-county area in Upstate South Carolina is the perfect location for the Association of Facility Engineering 2009 Technical Conference, Facilities America.

This world-class Industrial Conference, Trade Show, and Training Event is designed for:

- ❖ Facility or Plant Engineers, Managers, or Supervisors responsible for planning /administration of multiple facilities
- ❖ Maintenance Technicians responsible for keeping industrial, logistical, commercial, or educational buildings operating efficiently
- ❖ Managers or Supervisors concerned with Green Building practices
- ❖ Product or service vendors who work with MRO professionals

Save the Date

## October 29–November 1, 2009 Association for Facilities Engineering Facilities America Trade Show, Conference, Training Event and AFE Business Meeting

### Preliminary Agenda:

- Oct 29-30 Trade Show and  
Conference Tracks:  
**Going Green for Existing Buildings**  
**Latest Technologies in the Plant**  
The best new products, services, and techniques  
to improve operations
- Oct 29-31 **AFE Career Development Certifications:**
- Certified Plant Supervisor
  - Certified Plant Maintenance Manager
  - Certified Plant Engineer
- Oct 31-Nov. 1 AFE Business Meeting and  
National Board of Directors Meeting

### Show Location Oct 29-30:

Carolina First Center, Greenville, SC

### AFE Meeting Location Oct 31-Nov 1:

Fluor Engineering Campus, Greenville, SC