energy efficiency

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Enlightening designs

Collaborative to ease simple daylighting into mainstream construction

By Jeremy Kohler

It's another beautiful day at the office. Golden morning sunshine streams in through enormous crystal-clear windows. You perform a strange hand-waving dance as you try to chase an obscuring yellowish haze from your computer screen. Beads of sweat form on your brow; only the plants on your desk thrive in the greenhouse-like conditions. Before too long the air conditioning kicks in, even though it's only 60 degrees outside. Regretfully, you drop the blinds, switch on the electric lights, and get to work—leaving the beautiful day for others to enjoy.

It's an all too common scenario that plagues indoor environments: daylighting gone bad. But the intentions are good. Research has shown that people who live and work in daylit environments are likely to be more productive, healthier, and happier. What's more, the sunlight is free, so you can cut costs by saving money on electric lighting. At least in theory.

In practice the result can be soaring costs, blocked windows, and frustrated humans groping in the dark for solutions.

"Most current daylighting has passive solar gain with no glare control," explains Energy Center program manager Abby Vogen. "It gets hot and the cooling bills go through the roof, taking away whatever savings you're getting from using natural light—so you're not saving money and not doing much good for people."

Vogen manages the Center's new initiative called the *Daylighting Collaborative*. Its mission is to make *successful* daylighting part of mainstream construction. Vogen says daylighting is successful when it is "cool."

"Simply having lots of windows isn't effective daylighting. *Cool* daylighting is designed to decrease solar gain over that of conventional construction."

Wherever sunlight enters a building, the interior heats up. And building designers are well aware of the consequences: they use the amount of planned window area to determine how big the cooling system needs to be. A typical commercial building spends the vast majority of its energy resources combating solar gain and, ironically, providing artificial light.

"Solutions to lighting and unwanted solar gain are the cornerstones of building efficiency," says Steve Ternoey, an architect who specializes in daylighting and is the technical director for the Collaborative. "These are far and away the most important places to save energy."

He says that cool daylighting, when properly designed, can cut 30 to 70 percent from typical lifetime energy and lighting costs. This is in addition to the construction savings you get from being able to install a smaller cooling system.

continued on page 3

RON JOHNSON (COURTESY OF THE DAVIS PARTNERSHIP, BOULDER, CO AND LIGHTFORMS, BOULDER, CO & SANTA BARBARA, CA)

In this issue

ENERGY CENTER OF WISCONSIN
We show you how

595 Science Drive
Madison, WI 53711
Phone (608) 238-4601
Fax (608) 238-8733
ecw@ecw.org
www.ecw.org

From the Associate Director

The focus of our work at the Energy Center has been evolving as the energy market changes. While we continue to invest in research and development, we are now also focusing on an increasingly important area: outreach services, which are designed to get our energy messages and research results to those who can most benefit. We do this through our website, one-on-one contacts, publications, workshops, and other events. The Center recently hired marketing communications director Mike Kawleski to help direct these efforts.

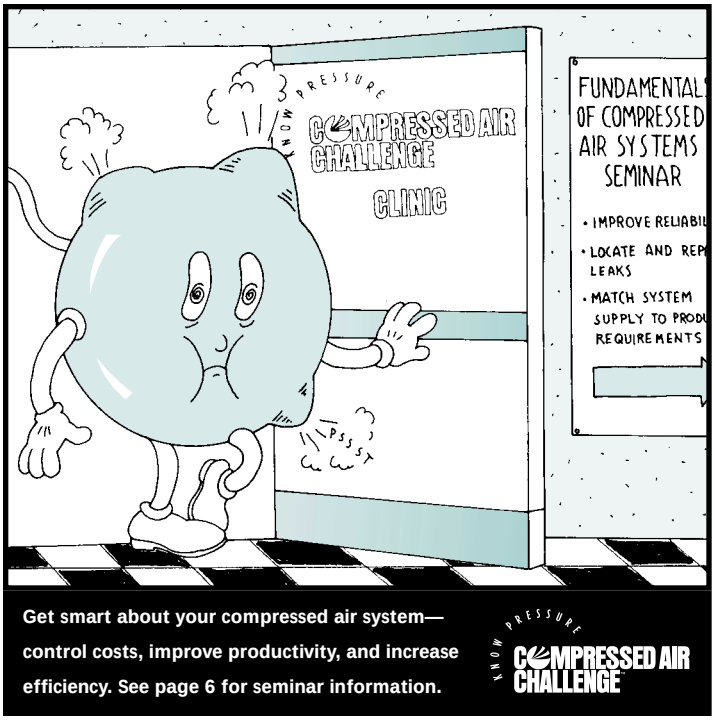
At a time of change, it's gratifying to get feedback. We recently got some in a letter from Eric T. Truelove, P.E., of Affiliated Engineers, a Wisconsin-based mechanical, electrical, and piping design firm. He wrote:

"The Energy Center of Wisconsin has helped us to be more competitive, has reduced our research time considerably, assisted us with specifying equipment and systems that reduce energy consumption without compromising quality, and provided insights into methods we can use to serve our clients while reducing negative environmental impacts. Your people have always been very professional and responsive."

More feedback came with our 1998 American Institute of Architects Award for Excellence in continuing education. These honors say more than I can about the effectiveness our efforts.

A well-deserved kudos to all of you who help make these efforts successful—our members, supporters, and customers. We are striving to ensure that our work will continue to serve you. So please take advantage of what we have to offer!

Karen Meadows



Get smart about your compressed air system—control costs, improve productivity, and increase efficiency. See page 6 for seminar information.

KNOW PRESSURE COMPRESSED AIR CHALLENGE

Award-winning professional education

The Energy Center's Education Department (from left to right): Lora Ring (Marketing Specialist), Becky Punzel (Education Program Assistant), Marge Anderson (Education Program Manager), Renee Abel (Education Program Assistant), Ann Millonig (Meeting Planner)

The Energy Center's education department has won the American Institute of Architect's 1998 Continuing Education System Award for Excellence in the category of Professional Organization. This award is given to organizations that demonstrate excellence in:

- Leadership and educational commitment
- Contribution to architects' professional education needs
- Educational design and management
- Performance evaluation and improvement

To maintain their membership, AIA members must take a certain amount of continuing education each year. The Center helps provide this education through workshops on topics like green building design, the commercial energy code, and daylighting.

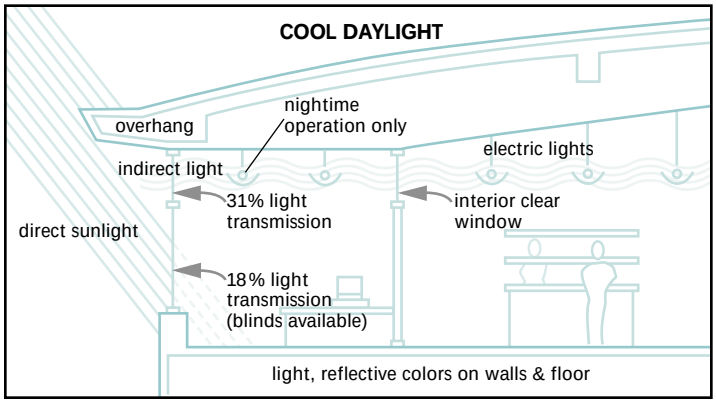
In Wisconsin some AIA architects sit on the Center's research and education committees. Education program manager Marge Anderson sees this involvement as a key to creating quality professional education.

"This award really affirms the collaborative nature of the Center," she says. "It also validates having a systematic comprehensive system for developing continuing education."

Getting good experts is only part of this process. "The most important part of any education program is to build the competence of the learner."

To help others benefit from their experience, the education department will share their insights on developing quality professional education at AIA's national convention.

—Eric Nelson



COURTESY OFLIGHTFORMS, SANTA BARBARA, CA

Cool daylighting uses low-transmittance glass, exterior shading, and partial window blinds to ensure that daylighting is cool, glare-free, and always available. Perimeter electric lights work like streetlights, operable only at night.

Enlightening designs *continued from page 1*

The choice isn't "clear"

Some daylighting designs use complex equipment like light-sensing dimmers and automatic electronic window coverings to manage glare and solar gain. But—and this is at the heart of the Collaborative's philosophy—there are much easier, much cheaper, and far more effective ways to do it. And anyone can do it successfully in any building.

"Right now the field is too specialized and high-tech, so it's expensive and overly complicated," Vogen says. "The simpler techniques usually work better anyway."

Perhaps the most important simple element in cool daylighting design is "low-transmittance" window glass, which transmits only a small portion of the sun's light and heat.

Ternoey says glass technology has come a long way from unpopular "tinted" windows; today's low-transmittance glass is color-neutral, so once people's eyes adjust to indoor light levels they hardly notice it.

"Clear glass is definitely wrong," Ternoey says.

But getting away from clear glass isn't enough. To eliminate the most intense solar gain, Ternoey also uses exterior overhangs specifically designed to block the high summer sun.

"You only have to shade glass on the hottest days of the year. Then your cooling energy use plummets and you've found a way to pay for your daylighting system."

"No-cost" daylighting

What does a daylighting system cost? In addition to glass and shading, successful daylighting requires an integrated design that considers window placement, interior design (such as reflective colors and interior windows to spread the daylight), levels of artificial lighting, and even the shape of the building. But cool daylighting design, although different, is no more complicated—and typically no more expensive—than traditional designs.

"You don't need high-priced design consultants or expensive high-tech equipment to take advantage of daylighting," Vogen says. And although low-transmittance glass does cost more than clear glass, using it cuts the size of the cooling system, making up for most, if not all of the extra construction cost. Anything left over is quickly covered by the long-term energy savings that cool daylighting promises.

Helping others see the light

To help more people understand the tremendous benefits of cool daylighting, on June 10 the Daylighting Collaborative will present its first Daylighting Goes Mainstream seminar on *How to Daylight Every Office Building* (see page 6). Architects, engineers, builders, lighting designers, and building owners and managers will learn why cool daylighting works and how to incorporate it into their projects. More importantly, they'll learn how to work together.

"The architect might need to discuss with the engineer the rationale for downsizing the cooling system," Vogen explains. "Cool daylighting depends on a team approach, and everyone has to be knowledgeable of the ideas for it to work."

Two more courses, one focusing on school buildings and the other on advanced techniques, will be offered this fall. To reach beyond the design and construction community, the Collaborative will hold a breakfast series for nontechnical decision-makers. This will not only teach people what cool daylighting is, but also how to ask for it.

"It's one thing to train designers how to do it," Vogen explains, "but unless you have customers asking for it and understanding the benefits, you're not going to get very far."

Copy this

The Collaborative is also building several concrete examples of cool daylighting in the form of "copy rooms." These are demonstration rooms within existing buildings that have been retrofitted with cool daylighting features. The idea is that building designers can visit these rooms and simply copy what they see.

"We want to make it very simple for people to start daylighting buildings," Ternoey explains. "With the copy rooms we'll be showing them some successful models that they can then modify for their own use. And we're keeping it simple so it can work on every building, not just special buildings with big budgets."

On a larger scale, if the Collaborative is able to raise sufficient funds it will finance cool daylighting design for three to four new office buildings in Wisconsin so they can be used as full-size case studies.

Armed with simple but successful examples like copy rooms and case studies, Vogen says, the Collaborative will help cool daylighting become a typical feature of both commercial and residential construction.

"We want this to become a mainstream practice, to ensure that everyone has the tools to do it."

FOR MORE INFORMATION about cool daylighting contact Abby Vogen at (608)238-8276 x22, avogen@ecw.org.

DAYLIGHTING collaborative

IMPROVING HUMAN, ENVIRONMENTAL, AND ECONOMIC PERFORMANCE

The Daylighting Collaborative is designed to be a joint effort among energy utilities, architects, engineers, manufacturers, environmental organizations, trade groups, and government to accelerate the acceptance and inclusion of successful daylighting design into mainstream practice for both new and retrofit construction.

The Collaborative is administered by the Energy Center of Wisconsin which welcomes your participation and support. Contact Abby Vogen at (608)238-8276 x22, avogen@ecw.org to get involved.

Solar-powered enzyme factories

What's cooking at UW?

Forum highlights university energy research

By Jeremy Kohler

Like a renewable resource, the University of Wisconsin keeps generating new ideas. At the Second Annual Energy Research Highlights Forum—showcasing projects sponsored by the Energy Center—researchers served up creative new recipes for efficiency. Here's a sampling of this year's menu.

Peas and carrots

There's enough refrigerated warehouse space in Wisconsin to cover 2600 football fields. Kyle Manske, a mechanical engineering graduate student, is turning a scientific eye toward one warehouse to find out what it takes to optimize an industrial refrigeration system.

Moving a half million pounds of fruits and vegetables through it every day, the facility spends $9000 per month to run its cooling system—that's no small potatoes if energy is being wasted.

Manske will model the refrigeration system with a computer to find the most efficient setup. His goal is to help other system designers do the same.

"We'll take manufacturer's data on components and see if that provides enough information to design an optimal refrigeration system," Manske explains. "If not, we'll see how to derive the needed information for future designers."

Doug Reindl, an assistant professor in engineering professional development, says efficient design practices have yet to be established for industrial systems. "There's a lot of art involved in these things, and we're trying to take the art out of it and put some science into it."

Cow grub

Transplanted genes are turning alfalfa into something more than just cattle feed.

Working with a team of researchers, Sandra Austin-Phillips of the UW-Madison Biotechnology Center is "teaching" alfalfa how to make enzymes called *cellulases*. These enzymes can be used to make bioethanol—a renewable fuel—from plant waste. Currently cellulases account for 40 percent of bioethanol's cost.

"We want to get an abundant, inexpensive supply of enzymes," explains Austin-Phillips, "not just to make bioethanol from relatively expensive feedstocks like corn and sugar cane, but to use low-value waste materials."

Alfalfa is a hardy perennial that grows well in poor soil, and it's easy to extract enzymes from it. "You don't need to put a ton of fertilizer or a lot of pesticides on this crop," Austin-Phillips notes, "so it's good for the environment."

Not to mention the economy. Wisconsin happens to be the largest producer of alfalfa, and if alfalfa were to become a "bioreactor" churning out valuable enzymes, it would be a boon to growers.

"There are so many environmental benefits from growing alfalfa," Austin-Phillips says, "that we would like to see it as *the* bioreactor crop, rather than corn or soybeans or tobacco."

Just add water

Drinking-water chlorination has dramatically reduced the incidence of water-borne diseases, but it also forms cancer-causing chemical byproducts in the water. And chlorine is no use against certain dangerous organisms like *Cryptosporidium*—the culprit that sickened 400,000 Milwaukee residents in 1993. These chlorine-resistant "emerging pathogens" may have been causing trouble for centuries, but scientists have only recently learned to detect them.

"The water industry could use a process that limits byproduct formation and at the same time inactivates a wide range of these emerging pathogens," explains Gregory Harrington, an assistant professor of environmental engineering. He's investigating disinfection with ultraviolet light, one of several possible alternatives to chlorination.

Cryptosporidium: **too tough for chlorine**

UV disinfection is relatively new to the water industry—it's not clear how effective it can be and what it will cost to use compared to other alternatives. Energy efficiency is likely to be a critical issue.

"There are significantly higher energy costs for these processes," Harrington explains. He says his research will focus both on water quality and on design and operation efficiency. The work will supplement a planned industry study of UV disinfection cosponsored by the Center.

FOR MORE INFORMATION about Center-sponsored UW projects, contact Ruth Urban at (608)238-8276 x17, rurban@ecw.org.

Pondering market transformation

Center project scrutinizes the new paradigm for doing energy efficiency programs

By Eric Nelson

Remember New Coke? How about Betamax? Despite the best efforts of manufacturers, these products just didn't catch on. Most new products don't.

Energy Center project manager Dan York sees a lesson in this for energy efficiency programs. "If you look at the private sector the rate of failure in promoting new products is relatively high. So should we expect universal success?"

Unrealistic expectations is just one of the problems facing energy efficiency programs today. When utilities operated demand-side management programs they were local and short-term. But now the focus has shifted to increasing the market share of energy efficiency products and services in entire markets, permanently—so called market transformation. It's a complex business.

"Market transformation is really a model for thinking about the market and figuring out where you're going to have the biggest effects," York says.

He compares it to a catalyst composed of ingredients like marketing, professional training, labeling, consumer education, rebates, and research and development. These "chemicals" combine to catalyze change. For instance, WashWise—a market transformation program in the Northwest that began in 1997—used marketing, education, and rebates to boost the market share of energy-efficient front-loading clothes washers from one to 13 percent in 12 months.

But will this two-year program have lasting success? It's hard to predict, in part because the very idea of transforming markets is poorly understood.

To help fill this void, the Center recently surveyed experts from the fields of energy efficiency, economics, marketing, and sociology to discuss and critique market transformation. They tackled questions such as, What is market transformation? What are its strengths and weaknesses? Are there parallels in other industries? What research is needed?

Some lessons are already emerging from this discussion:

- *With energy prices low, efficiency is a tough sell.* Successful programs are selling products on other benefits, such as comfort or environmental friendliness.
- *Long-term programs are needed.* In the business world, marketing is a constant effort. Those running market transformation programs should expect no less.
- *Programs need constant feedback.* Because consumers' tastes change, so must programs designed to influence them.

A Center report will present these and other lessons along with a record of the experts' discussion. York hopes the project will help market transformation become a successful part of public benefits.

"If we're going to do anything for energy efficiency, and this is the model we're going to use, then we have to make sure we understand what it is, what it can do, and how to make it work."

FOR MORE INFORMATION about market transformation activities at the Center, contact Dan York at (608)238-8276, x42, dyork@ecw.org.

Midwest gets organized

When it comes to regional market transformation organizations, we're bracketed by giants. On the east coast there's the Northeast Energy Efficiency Partnership. On the west coast there's the Northwest Alliance for Energy Efficiency. And in the middle? Well, we're working on that.

On November 9 and 10, 1998, representatives from utilities, government, research and development organizations, and advocacy groups met in Chicago to explore the formation of a midwest market transformation organization. The Energy Center—with the support of the U.S. Department of Energy—hosted the meeting and is developing guidelines and case studies for implementing successful programs.

Center project manager John Peloza says instituting a regional organization makes sense; markets often span state boundaries, so market transformation programs should too.

"This organization will also give the Midwest a more permanent basis for doing programs so we don't have to start from scratch every time."

—E.N.

Schools go geothermal

Energy efficient ground-source heat pumps can save schools money—money that can be used for other educational expenses. That was the message of *GeoExchange Heating & Cooling: An Educational Experience*, a meeting of 75 people and representatives of 15 schools on February 9, 1999 in Madison, Wisconsin. The Energy Center hosted the event.

Over 400 U.S. schools already have geothermal systems, according to Robert Dooley, a design consultant for the Geothermal Heat Pump Consortium (GHPC). He said that geothermal heat pumps cost about a third as much as conventional systems to maintain.

Although heat pumps cost more initially, they can save 25 to 50 percent on energy bills, according to GHPC case studies. They are also quiet and safe.

Geothermal systems use energy stored in the earth to heat and cool buildings. Loops buried in the ground collect warmth, which is brought inside for heating. In the summer, the process is reversed to provide cooling.

For schools interested in heat pumps, GHPC publishes *Energy-Smart Choices for Schools*—a free screening tool that compares geothermal against conventional choices (1-888-ALL-4-GEO for more information). The Wisconsin Energy Bureau offers a program called *Wisconsin Energy Initiative-2* to help schools improve their energy efficiency. The program offers audits and technical and financial help.

—Eric Nelson

FOR MORE INFORMATION on heat pumps in schools, contact Energy Center project manager Craig Schepp at (608)238-8276 x16, cschepp@ecw.org.

To learn more about WEI-2, contact Rob Everhart at (800)862-3725 x313, everhartr@cesa5.k12.wi.us.

(LEFT AND INSET) JIM SULLIVAN, QUILL GRAPHICS

keep learning

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PROFESSIONAL EDUCATION PROGRAMS & CONFERENCES

The Energy Center offers its own education programs and sponsors those given by other organizations

April–June

Fundamentals of Compressed Air Systems

Manitowoc (4/29), Eau Claire (5/11), Green Bay (5/18), Janesville (5/24), Madison (5/25), Waukesha (6/9)

This Compressed Air Challenge training shows how to optimize the performance of compressed air systems.

For more information call (800)338-5365 or visit www.knowpressure.org

May 21

Energy Consumers' Forum

Milwaukee, WI

This is a public discussion of energy-related issues.

Contact: Sherry Benzmiller, (608)238-8276 x59, sbenzmiller@ecw.org

June 10

Daylighting Goes Mainstream: How to Daylight Every Office Building

Madison, WI

Learn about low-cost daylighting and how it can cut energy bills and increase productivity.

Contact: Marge Anderson, (608)238-8276 x32, manderson@ecw.org

June 16–20

Solar Splash 99

Milwaukee, WI

This solar electric boat race takes place on Lake Michigan alongside Milwaukee's Summerfest grounds.

Contact: Robert Reid, (414)288-7259

June 18–20

Midwest Renewable Energy Fair

Amherst, WI

A fun-filled opportunity to learn about renewable energy and sustainability.

Contact: the Midwest Renewable Energy Association, (715)592-6595 or visit www.the-mrea.org

RECENT ENERGY CENTER PUBLICATIONS

To order a publication call (608)238-4601 or email orders@ecw.org

Net Energy Payback and CO_2 Emissions from Wind-Generated Electricity in the Midwest

Paper

This paper studies life-cycle carbon dioxide emissions from three wind power plants in the Midwest. It also calculates their life-cycle energy requirements and compares them to conventional generation sources. *180-1*

Eau Claire Couple Impresses Neighbors with Geothermal Heat Pump

Case Study

Learn how one homeowner is saving $600 per year in energy costs with a geothermal heat pump. The four-ton system used slinky coils. *311-1*

Home Builder Digs a Geothermal Heat Pump and Saves $500 a Year

Case Study

Learn what convinced this rural homeowner to install a geothermal heat pump. The four-ton system used a horizontal loop. *310-1*

Choosing the Right Exit Sign

Fact Sheet

This publication gives guidelines on choosing exit signs based on safety, price, and operating costs. *312-1*

New Technology Fact Sheets

These are one-page assessments of new commercial and industrial technologies. Four new fact sheets are now available for download at www.ecw.org: Fuel Cells, Compressed Air System Pressure Reduction, Circulating-Flow Steam Blanchers, and Pumping System Impeller Trimming.

Energy Service Companies

A Market Research Study

This review examines how energy service companies in the U.S. are evolving in the face of changing regulatory environments. The study focuses on the markets for energy efficiency services in New York and Wisconsin. *181-1*

Free On-Site Training Available

ENERGY EFFICIENCY SOFTWARE FOR INDUSTRY

The Energy Center of Wisconsin is offering free one-on-one training for *MotorMaster+ 3.0* and the *3E Plus Insulation Thickness Computer Program*. Available from the U.S. Department of Energy, these tools can help you maximize efficiency, economy, and productivity when making motor and insulation investments.

To register for training at your Wisconsin facility send email to industrial@ecw.org or call (608)238-8276 x47. Or visit www.ecw.org for more information.

Recent Library Acquisitions

The following publications are now available at the Energy Center Library. For more information call (608)238-8276 x26, library@ecw.org.

America Speaks Out on Energy: A Survey of Federal Energy Funding Priorities (1998). Sustainable Energy Coalition, Takoma Park, MD. Access # 6945

Approaching the Kyoto Targets: Five Key Strategies for the United States (1998). By H. Geller, et al. ACEEE, Washington, DC. Access # 6745

Assessing Potential Candidates for National Market Transformation Initiatives (1998). By M. Suozzo and S. Nadel. ACEEE, Washington, DC. Access # 6692

Community PV: How You Can Use Solar Power (1998). CD. By Utility PhotoVoltaic Group. Center for Renewable Energy and Sustainable Technology, Washington, DC. Access # 6757

Energy-Smart Choices for Schools: An HVAC Comparison Tool (1999). CD. By Dooley & Associates. Geothermal Heat Pump Consortium, Washington, DC. Access # 6947

Energy $mart Solutions for America's Schools: GeoExchange Heating and Cooling Teleconference (1999). Videotape of the downlink. Geothermal Heat Pump Consortium, Washington, DC. Access # 6956

Funding Public-Benefits Programs in a Restructured Electric Utility Industry (1998). Minnesota Dept. of Public Service & U.S. DOE, Washington, DC. Access # 6753

The Green Equation: Green Pricing and Marketing Strategies are Key to Building Renewable Energy Demand and Supply (1998). By K. Kozloff and S. Shah. Edison Electric Institute, Washington, DC. Access # 6729

Green Investment, Green Return: How Practical Conservation Projects Save Millions on America's Campuses (1998). By D.J. Eagan and J. Keniry. National Wildlife Federation Campus Ecology Program, Vienna, VA. Access # 6940

Allowing for the unexpected

A recent commercial refrigeration project started me thinking about how unpredictable research can be. I think that the closer a project is to basic research, the more likely the project is to take on a life of its own. Sometimes, of course, the twists and turns lead to a dead end, but other times we are led to interesting and important conclusions.

When the researchers submitted their proposal for this project, they planned to compare the field performance of a large refrigeration system with predictions from a computer model. They also planned to identify opportunities for reducing energy costs by optimizing the way the system operated.

We knew the chosen refrigeration system wasn't working as designed, but University of Wisconsin-Madison graduate student Kyle Brownell took a major detour from the planned research when he discovered he needed to extensively troubleshoot the system before he could do additional work. By comparing actual performance to the performance predicted by his computer model, he found that "bugs" (such as a plugged filter and low refrigerant charge) were costing the customer about $10,000 a year.

Debugging a system using a computer model isn't a practical approach for most nonresearch sites, so Kyle developed a generic plan for installing about $400 of monitoring equipment to detect these kinds of problems. This was a completely unanticipated, but very valuable, result.

Once the system was operating correctly, Kyle turned to considering ways to optimize it. In their proposal, the research team discussed many possible optimizations they could explore. Instead of trying to cover all of these, they followed the most interesting leads at each step in their research.

Following their curiosity led to several useful results. For example, they found that lowering the minimum condenser head pressure would pay for itself in two months and would decrease energy costs by 21 percent. Had the researchers limited themselves strictly to their proposal, they would have missed this.

If I evaluated this project solely on whether the researchers did what they said they were going to do, it wouldn't be a star project. If I look instead at the results and the favorable reviews this work is receiving, this project is a wonderful success.

As I review projects proposed for our next fiscal year, I have tried to consider the unpredictability of research. It may seem safest to fund only projects that have predictable, immediately applicable results. If we do this, though, we pass up the opportunity to discover the unexpected—and sometimes the unexpected moves us significantly ahead in knowing how to use energy wisely.

Ruth E. Urban

Ruth Urban
Project Manager

ECW Information and Services

Publications Orders
(608)238-4601
orders@ecw.org

Library and Information Services
Andrea Minniear
(608)238-8276 x26, library@ecw.org

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Member organizations provide the bulk of the Center's financial support. Representatives from both member and *participant* organizations serve on committees and on the Board of Directors.

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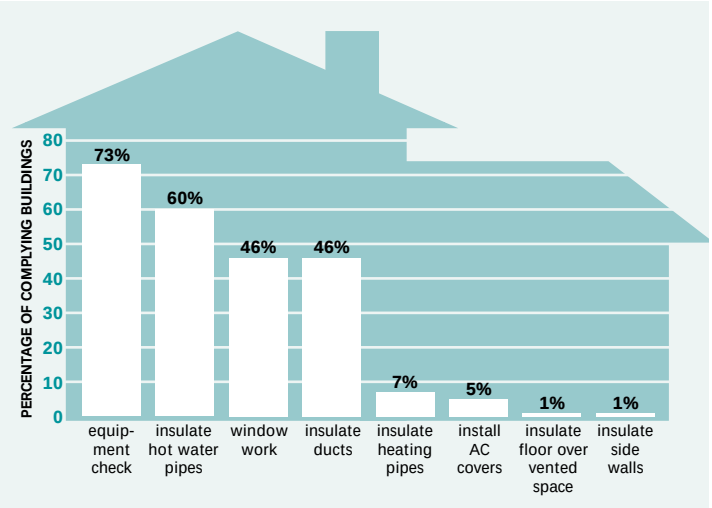
Weatherizing rental properties



Measures taken most often (left four bars) and least often (right four bars) to comply with the Wisconsin Rental Weatherization Code in 1997.

Making rental properties more energy efficient can be challenging because the owner often isn't the one paying the energy bill. But there is a method to motivate improvements—Wisconsin's rental weatherization code.

A recent Energy Center evaluation found that compliance with the code resulted in average annual energy savings of about $125 per building. The most common measures taken were checking heating equipment and insulating hot water pipes.

The rental weatherization code mandates that certain energy efficiency standards be met when rental properties change hands. The code—which was revised on March 1, 1999—requires measures such as insulation, double-glazed windows, and weatherstripping. The measures must pay for themselves in energy savings within five years. The revised code also allows buildings to comply by meeting a standard for heating energy use.

Center project manager Richard Hasselman says the code's five-year payback requirement makes it worthwhile. "These savings are going to last a lot longer than five years," he says. "The code also makes properties more comfortable for tenants and more affordable for those paying the heating bill."

In the future, computer tracking of building compliance could improve the code's effectiveness, recommends Center project manager Bobbi Tannenbaum. "Right now it's hard to figure out who is and isn't complying. This makes it hard to see what effect the code is having on rental energy efficiency."

—Eric Nelson

FOR MORE INFORMATION on the evaluation of the rental weatherization code, contact Bobbi Tannenbaum at (608)238-8276 x41, btan@ecw.org.

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Editor: Eric Nelson
Designers: Beth Kuglitsch
Cherie Williams