

## Century-old hospital hums with 21st-century efficiency

### Application Note



Testing Functions  
Case Study

A NASCAR driver would never build a racer on a Model T chassis. He'd never get off pit road.

And an HVAC professional probably wouldn't pick a century-old hospital building to compete for the nation's ENERGY STAR award for energy efficiency. But York Chan had no choice. His 551-bed hospital campus, Advocate Illinois Masonic Medical Center in Chicago, dates back to 1908.

Yet Chan and his team have turned the old building into a model for energy efficiency.

Based in Oak Brook, IL, Advocate Health Care is the largest fully integrated not-for-profit health care system in metropolitan Chicago, and is recognized as one of the top 10 systems in the country. Advocate has eleven hospitals with 3,500 beds and a home health care company among its more than 200 sites of care. More than 28,000 people, including more than 5,000 affiliated physicians, work at Advocate, making it one of the Chicago area's largest employers.

Illinois Masonic is one of the Advocate system's largest facilities, a major urban teaching hospital and a Level I trauma center that maintains operations around the clock. In 2006, U.S. News and World Report named it as one of the top 50 hospitals in the nation for heart care and heart surgery. "A lot of hospitals are now what's known as 'boutique' hospitals," Chan said. "They pick and choose what procedures are most profitable. But as an urban teaching hospital, we welcome whoever comes in the door needing our care."

York Chan is Director of Facilities for the hospital. He is also a faculty member for Joint Commission Resources, the consulting/

educational arm of the agency which accredits health care organizations around the country. He teaches classes on the Environment of Care. Chan is also a member of the Board of Directors of the American Society for Healthcare Engineering (ASHE) and is a Certified Healthcare Facilities Manager (CHFM).

### The challenge for hospitals

As places of illness and healing, the end of life and the joy of birth, hospitals provide the setting for many of our most important moments. In few other places is the quality of the indoor environment so clearly a matter of life and death. No wonder hospitals present facilities managers with special challenges in managing air quality and energy consumption.

Hospital air quality must be rigorously managed, often—as in operating rooms and facilities for infectious or immune-compromised patients—room by room. Temperature, air flow, pressure, airborne particles, filtration, humidity and outside air all must be precisely controlled and constantly monitored. Both

**Tools:** 179 DMM, 62 IR Thermometer and 1735 Three-Phase Power Logger

**Operator:** York Chan, Facilities Director, and the entire facilities team of Advocate Illinois Masonic Medical Center, Chicago

**Measurements:** Optimizing lighting, HVAC/air quality, steam, power, and other major systems



Rolf Zoeller, Electrician uses the Fluke 1735 Three-Phase Power Logger to do load studies on the hospital's electrical systems. Keeping close tabs on these systems helped the hospital achieve its ENERGY STAR rating.

patient-borne disease agents and environmental pathogens, like Aspergillus fungi and Legionella bacteria, must be controlled. Failure can be costly in both human and financial terms. In October 2008, the U.S. Centers for Medicare and Medicaid Services stopped compensating hospitals for treating infections patients acquire in the hospital. That made it even more crucial to provide an exemplary environment of care.

Hospitals use lots of energy—Chan figures 2.7 times more per square foot than an office building—yet cutting energy consumption is difficult. The buildings run around the clock, year-round, and energy-saving steps that might compromise patient health or comfort just won't fly. And operating rules imposed by regulators must be met. "The Centers for Disease Control, ASHRAE and other agencies have imposed quite a bit of burden on us by demanding higher levels of air exchanges," Chan said. "The more air you bring in, the more air you have to heat and cool. ASHRAE right now is asking for 20 air exchanges per hour in a surgery

room. I'm bringing in air from the outside—in the winter it could be zero degrees in Chicago; in the summer, over 100. So we fine tune it. We always meet the required volumes."

Such challenges can't be solved by just writing a check. For Advocate Illinois Masonic, for instance, there is no such thing as extra money. In fact, it was the imperative to control costs that got Chan and his team started in energy conservation more than 20 years ago.

"We were wrapped up with energy conservation way before it was fashionable," said Chan, Director of Facilities for the hospital. "Back in the 1980s I looked at it strictly as a way to help our bottom line. It's only in the last five to ten years that it's been fashionable to be energy-conscious, with talk about carbon footprints and greenhouse gas emissions. But my major focus is still the bottom line. Hospitals generally make four to five percent in margins at the end of the day. For every dollar that I save this hospital in energy, it precludes us from having to go out and look for \$20 in new business.

"I can go up to my administration and say 'I saved you \$100,000 last year in energy. That's the equivalent of you having to go out and look for \$2 million dollars worth of new business.' It gets their attention."

### **Teamwork and technology build a healthy system**

Illinois Masonic delivers those energy savings using state-of-the-art technology, operated by a team determined to watch every watt. "Energy conservation is not a single project, it's not a single piece of equipment that you buy to get you to efficiency," Chan said. "It's a culture that you've got to spread out amongst your whole organization, saying this is the right thing to do. You need buy-in from your president all the way down to the light bulb changer. That's the culture we've created."

A 29-year veteran with Illinois Masonic, Chan has seen the hospital through numerous benchmarking exercises and energy audits.

"We'll bring in consulting engineers and they'll go over the whole plant and make recommendations about where we can implement energy conservation measures," he said. "That's just a rough blueprint. A lot of this stuff actually comes from staff." Chan's "full disclosure" approach encourages that level of engagement.

"This is something I do differently than most facilities directors," Chan said. "I share my budget and bottom line with every member of my department. I actually go line item by line item. They look at the cost of energy, electricity and natural gas. I say, 'Hey, look at what we've done. We implemented this and we implemented that, and look at our energy costs. We're way below the curve.' They take pride in that. They all have a stake in it."

The result is a constant flow of ideas: Let's put lights in an outside corridor on a sensor, so when daylight allows, artificial light is turned off. We've got a circulating pump in this area—let's put it on a timer. Let's convert exit signs from incandescent bulbs to LEDs. And much more.

### **Building: 1908. Technology: 2009.**

Teddy Roosevelt was President when Illinois Masonic's first building was constructed. But inside, the systems and controls are strictly 21st Century. In the 1980s, the hospital spent millions retrofitting the building with some of the first variable air volume (VAV) systems. More than 100 variable speed drives are in use, many responding to pressure and temperature sensors and the building automation system.



Jim Murphy, Electrical Foreman uses the Fluke 179 DMM to look at low voltage signals in the newly installed VFD for the 40+ year old steam system.

“We fully utilize our building automation to constantly look at our air and water systems to make sure they’re fine-tuned,” Chan said. “We’ll reset the water temperature by one degree, and maybe that will delay the chillers coming on by one hour. We’re constantly fine tuning our building operation system to look at our operational parameters. Some people call this retro-commissioning. We call it constant commissioning.”

Sensors installed throughout the mechanical systems support Chan’s data-based management. For instance, filter loading is checked electronically. “When static pressure gets beyond 1.5 inches of water column, it gives us an alarm on our computer that says it’s time to go change the filter,” Chan said. “In the past, we’d schedule maintenance based on calendar time. Every three months we’d change that filter, regardless of whether it needed to be changed. Now we’re not going to change that filter every three months, we’re going to change it when it reaches 90 percent of useful life. We’re extending the life of the filters. It’s good for the environment and also good for my bottom line, because we’re not paying for labor and materials to go change it unnecessarily.”

“We collect a lot of data,” Chan said. “We know exactly how many gallons per minute (GPM) of chilled water goes into each air handler, and how many GPMs of hot water goes

into a machine room. We know the consumption, so we have a baseline.”

Chan estimates that 60 to 65 percent of performance data comes from wired-in flow meters, current transducers and other sensors. The rest is gathered with portable test instruments, such as data loggers used to evaluate the power consumption of individual variable-speed drives. “The handheld tools, a lot of it is used for spot-checking. You’re looking for temperature at a certain area, or temperature differentials across a coil—a one-time snapshot. The hard wired devices are more for long term data collection.”

### Icing on the cake

Though Chan says health care has largely escaped the recession, energy efficiency remains important. He sees energy savings delivering a “triple bottom line” with three key benefits: Economic Prosperity (profit); Environmental Stewardship (planet) and Social Responsibility (people).

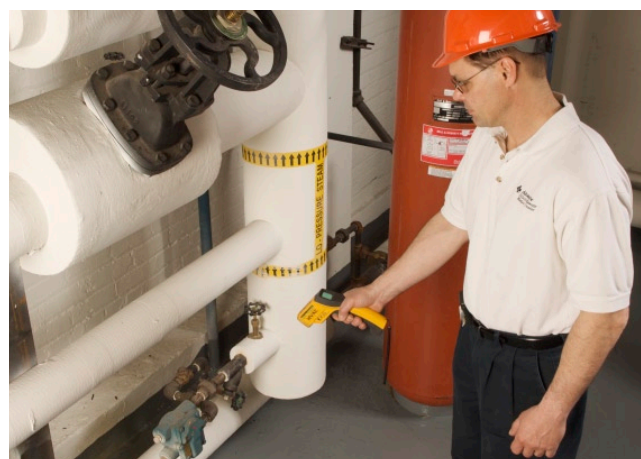
With those triple goals in mind, Illinois Masonic has saved energy at every turn, with measures that include variable air volume systems, occupancy sensors that turn off lights in empty rooms, retrofitting high-efficiency lighting and using permanent and portable technology to monitor and control HVAC systems. That long term effort has added up: The facility now uses 27 percent less energy than the average U.S. hospital, according to the U.S. Environmental Protection Agency’s ENERGY STAR database. In terms of greenhouse gas emissions, it’s like taking 1,433 cars off the road.

“It’s not me buying a million dollar chiller,” he said. “It’s the maintenance guy coming to me and saying, ‘Hey, I was looking on the internet and found this LED light that we can put into our exit lights, and we can go from 40 watts down to three watts.’ We calculated that it was worth \$100 savings a year, per

fixture, in energy and labor. We retrofitted probably 700 of these exit lights.

“Seventy-five percent of our success here is operational,” Chan said. “It’s procedures, it’s not equipment. Looking at discharge temperatures, looking at hot water temperatures, and constantly making sure your equipment is delivering as designed.”

And the ENERGY STAR recognition that put Illinois Masonic in the Winner’s Circle in 2008? With only one other hospital in Illinois and 72 others nationwide receiving the rating, it’s a rare honor. But for Chan, it’s the natural outcome of decades of effort and hundreds of small steps. “In the end,” Chan said, “getting the ENERGY STAR was just icing on the cake.”



Darryl Dylla, HVAC/Power Plant Manager, uses a Fluke 62 Infrared Thermometer to check steam traps throughout the HVAC system.

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**Fluke Corporation**  
PO Box 9090, Everett, WA 98206 U.S.A.

**Fluke Europe B.V.**  
PO Box 1186, 5602 BD  
Eindhoven, The Netherlands

**For more information call:**  
In the U.S.A. (800) 443-5853 or  
Fax (425) 446-5116  
In Europe/M-East/Africa +31 (0) 40 2675 200 or  
Fax +31 (0) 40 2675 222  
In Canada (800)-36-FLUKE or  
Fax (905) 890-6866  
From other countries +1 (425) 446-5500 or  
Fax +1 (425) 446-5116  
Web access: <http://www.fluke.com>

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