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Energy Monitoring Instrumentation Can Be Simple and Inexpensive

By **Bill Holmes, P.E.** April 11, 2011 04:48:41 pm[Email](#)[Print](#)[Like](#)

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I first worked with instrumenting and monitoring energy systems on fighters during my seven years in the Air Force in the late '60s and early '70s. It was the beginning of a new era in the instrumentation field. After returning to civilian life and a stint with a consulting firm, I started my own Energy Services business and began contracting to serve as Building Energy Manager for a variety of facilities. The contracts were written so that all fees were a percentage of actual documented savings for each meter, each month; actual energy savings, no upfront fees, no smoke and mirrors, no fine print, no penalties. No savings; no income. I took 100% of the risk. With a young family to support, I had to produce. What was I thinking?

For my first project in 1979, I designed, built and installed, at my own expense, an energy monitoring system in a mental health hospital. The resulting data was used to reduce the annual energy costs by 59% with no capital improvements, and the project was written up in the Journal of the Association of Energy Engineers. Other projects resulted in reducing energy costs 20%, 30% and in some cases, more than 50% with no capital required.

I spent my days working in buildings, operating, controlling and maintaining actual energy systems, interacting with the owners, occupants and maintenance people and was responsible for not only saving energy but maintaining or improving comfort. I learned a lot that others who have not spent much time actually working in buildings have missed.

At night I was teaching Thermal Systems, Power Systems, HVAC and other classes for Purdue and what I was teaching often bore little similarity to what I was finding in the buildings. The theory is certainly essential, but without the actual field experience it can lead to overconfidence and the assumption that technology can provide most of the solutions. I learned just the opposite; technology is only a tool, people are the key.

I have been promoting this approach since that first project. One of the first questions I am always asked is, "How can I justify the cost of the instrumentation?" If you just call in your friendly instrumentation or temperature controls salesperson and let them select the points at \$1,500 or \$2,000 apiece, my guess is you can't justify it. That's not the way to do it. I essentially taught myself how to instrument buildings to get the most useful information at the least first cost in order to produce, document and maintain the highest energy savings, so my perspective is quite different from most. I wasn't selling instrumentation; I was paying for it. I was selling results – energy savings, proper operation and control and many other benefits. Providing instrumentation was the only way I knew how to do it; and after more than 30 years, I still haven't found a better approach.

Instrumentation versus the Navy

One year when I was teaching a continuing education class in energy management at the University of Wisconsin, I had a number of students who worked for the U.S. Navy. After using several case studies from past projects to demonstrate my approach and the benefits, several of them got pretty enthused. Unfortunately, they told me, they were not allowed to spend money on instrumentation. Even though they understood how it could produce savings, and wanted to try it, the Navy wouldn't let them buy it. They had to identify a capital project, estimate the initial cost and savings, and calculate the ROI. If the ROI was within an acceptable range, the chances of approval were good.

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Author Bio

**Bill Holmes, P.E.**

Bill Holmes, P.E. founded Holmes Energy LLC www.holmesenergy.com and developed the AutoPilot Monitoring-Based Commissioning (MBCx) System in 1979. He has a B.S. and M.S. in mechanical engineering and has done additional coursework and research for his PhD. He is a former Purdue professor and taught for several years in the Continuing Education in Energy Management Program at the University of Wisconsin.

Bill has produced savings from 20% to, in a few projects, more than 50% from low-cost, no-cost changes in management, operation, maintenance and control alone in all types of facilities including Industrial Plants owned by Fortune 500 Companies.

He is the recipient of a DOE Award for Energy Innovation and was the Indiana Energy

They couldn't attach a savings estimate to instrumentation so they couldn't buy it. How interesting. They could however, get money for capital projects with an ROI based on estimated savings in an era where the largest factor in those savings was the future cost of fuel; an unknown that could change 20% or 50% in a year. Plus with no instrumentation, the actual savings were never measured, only estimated. There was no way to verify the actual ROI. In my experience and in the words of Mary Walton in "The Deming Management Method," published in 1986, "Views not backed by data are more likely to include personal opinions, exaggerations and mistaken impressions."

If I made a list of the organizations most likely to understand the value of information, the U.S. Navy would be right at the top. I wonder how well their planes would fly and ships would float if they had no permanent instrumentation; if they used the approach taken by most in the energy management field: Put in some temporary sensors for a couple of flights and if everything is working right, take them back out. Permanent monitoring would be too expensive; besides, once you know everything is working right, you can be sure that it will continue that way forever – right?

Sixty Megawatts with 14 Current Transducers

Along with my management course, there was another session in the week-long continuing education course on instrumentation, so I sat in. I listened for several hours as the expert from one of the labs at the university explained in great detail the intricacies of using the highest accuracy sensors and how to calibrate them. Trying to be open minded and learn something, in the back of my mind I was thinking that while he was an expert, he had no clue of what is actually required in the field to accomplish the objective of reducing energy costs; the topic he was teaching.

That wasn't the only time I have sat through a presentation by an instrumentation expert telling how you need to buy the highest accuracy sensors and calibrate them so you can read all of the temperatures within a billionth of a degree. Everytime I hear that, the words of Henry Stokes float back to me. My boss at one point in the service, an old Georgia farm boy who's dad supported seven children on 60 acres in south Georgia, Henry said, "You damn engineers, you measure it with a micrometer, mark it with a piece of chalk and cut it with an axe." Boy, was he right in the case of instrumentation for energy conservation. Why in the world would I want to buy an expensive piece of instrumentation when I can get the exact same results with something else at 10% of the cost?

What is the whole purpose of energy monitoring instrumentation? Is it to produce billing quality information, to know down to the penny how much Chiller #3 cost to operate yesterday or last month? No, that's not the objective. The objective is not to measure power; it is to measure energy and reduce energy consumption and costs. Power measurement is expensive, energy measurement is not. The objective is to find waste, inefficiency and opportunities to cut costs, save money and verify the results. You're not billed separately for how much energy the chiller uses.

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Manager of the Year in 1990. He has published numerous papers and been making presentations on his projects and methods for more than 25 years. Bill is a sculptor, a writer and a regular contributor to Sustainable Plant.

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