Energy Management Starts with the Art of Problem Solving

By **Bill Holmes, P.E.** May 4, 2012 03:30:39 pm

I was hired by SIECO, a consulting firm in Indiana, in June 1974, during the first oil embargo, to start an energy conservation department. Bob Kotnik was hired about the same time to start an industrial department. He was about 20 years my senior and had at one point been chief engineer for a division of Reliance Electric, a large electrical equipment manufacturer in Cleveland. Bob was a Cleveland native, a graduate of Case Institute of Technology and an Air Force veteran. When his plant was moved to Columbus, a small town in southern Indiana, he chose to move with it; a big decision for Bob. Except for his military service, he had lived his whole life in Cleveland. At some point after moving to Columbus, he decided he had enough of the corporate world and brought his expertise to the 100-person consulting firm to set up a new division to serve industrial clients.

Bob became my mentor. I learned so much from him about how to approach and solve problems in a calm, rational and organized manner. The tendency of many if not most people is to look at a problem and search their memory to see if it looks like something they have encountered before so they might have an idea of how to deal with it. If no solution or idea of how to approach the problem is obvious, they may either give up or immediately look for someone to help them. For an engineer, this often is not the best option because engineers are usually being paid to solve problems themselves.

When Bob approached a problem, he would sit at his desk looking very scholarly in his horned-rimmed glasses, natty tweed sport coat and knit tie and, continuously making a mess fooling with his pipe, would think out loud, “What is our goal? What do we want to accomplish? What do we know that might help us? What are our options? What else do we need to know? What additional information do we need and where are we are going to get it? Once we get it, what do we do with it? What is our plan?”

And guess what? As you started to address these questions one at a time, you would eventually start to see that the problem was becoming less daunting. He showed me how to break a problem that is too big to solve in one step into a series of small steps that can be dealt with one at a time. As you continued the process, two or three possible solutions would start to appear and then eventually, voila! You had figured it out.

To me, that is what sets apart a good engineer from the rest of them. It is easier and much more common to approach a problem with a preconceived solution whether appropriate or not. “I am the expert. I will just pull out the drawings and specifications for Widget #2 that we always use for these types of problems and, by God, we will make it work.” As one of my students who worked for a local automotive plant told me, “We have a standard approach to all problems – cut to shape, pound to fit and paint to match.” Unfortunately, that seems to the most common approach to energy conservation: “We already have the solution regardless of your problem.”

Bob’s approach to both problem solving and mentoring a young engineer were so valuable, when I began to teach for Purdue, my first class in every subject, every term was devoted to teaching the art of problem solving. I found my earlier observation about problem-solving skills often making the difference between a good solution and a poor one, a good engineer and a poor one, also applied to engineering students. Their tendency also was to look at a problem, particularly during a test, to see if it looked familiar and whether they had any idea how to solve it. If not, they would frequently panic, throw up their hands, say, “I have no idea,” and just sit there for the entire hour totally frustrated. Others who had mastered problem solving would just use the process, one step at a time, and more times than not, the solution would appear before the end of the period.

Sustainability Infographics

We here at Sustainable Plant love infographics. Aside from being easy to read and geniously designed, they are also incredible resources to have on hand, ready to share with others. With this in mind we've put together a collection some of our favorites from around the web. Check them out, pass them along and let us know if you have any other infographics you'd like us to share with the community. **View the gallery**

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

I love engineering problem solving. I know. By now you are screaming geek with a slide rule on his belt, a pocket protector in the pocket of his short-sleeved white shirt and carrying a briefcase. I do have to admit that when my son Jeff was in 4th or 5th grade, we used to solve story problems at night just for fun. I've told few people about that for fear of being arrested for child abuse, but it seemed to work for Jeff, who now has his PhD in biomedical engineering. For me, finding problems in existing building energy systems, opportunities to reduce waste and increase efficiency is like I am getting paid to play a game, work a puzzle, track down a double agent. Mystery, intrigue, hot cars and women, Double "O" 3.14159. I seem to have gotten a little off track.

For nearly all of the 40 years I have been involved with and watching developments and progress in the field that was originally called "energy conservation" and is now known as energy efficiency or sustainability, I must say that most of the solutions I have encountered seem to be along the lines of applying a preconceived solution whether appropriate or not; the "cut to shape, pound to fit and paint to match" approach. Of all of Bob's questions, the most important is probably the first, "What is our goal?" This is the key, the goal, the incentive. The incentive is the single most important factor; more than the technology, more than the "people" factor. Without the proper incentive, no project can be successful. And as difficult as it may be for many to believe, I have seldom encountered projects where the primary goal is to actually reduce energy consumption and costs.

This profession, at least in this country, is based on making a profit and staying in business, and there is nothing wrong with that. But because reducing energy costs primarily benefits the owner, others in the field have to make their money by selling equipment and services through energy studies, audits, designs and capital projects. So instead of "energy savings" being "the primary goal" for most in the field, the primary goal has become selling equipment and services.

I remember after giving a talk on one of my case studies at the Industrial Energy Technology Conference in Houston a few years ago, a young engineer came up to me and was excited. He said, "I've never met anyone before who actually saved any energy." That kind of sums up the field as I have experienced it. A lot of talk, a lot of money spent, a lot of publicity, but for all of that effort, disappointing lasting results.

For many years I worked under a "shared-savings" arrangement with owners that worked very well; our goals were the same. We used permanent instrumentation to document the actual savings every month from every utility meter and there was no fine print, no hidden penalties, no smoke and mirrors. There are companies that do offer shared-savings arrangements, however, there is normally no actual documentation of savings through valid, unbiased instrumentation; only a combination of temporary monitoring, estimates and models, and the contracts have become so complex that it is difficult for the average client to understand them. Their appeal to clients who may be in a funding situation that prevents them from borrowing or raising money for energy projects to be paid back from actual savings, is the opportunity to get new "free equipment" and in theory, use the resulting savings to pay for it plus the rather substantial management fees.

Is Our Goal to Save Energy, or to Get New Equipment?
"What is our goal?" Is it to save energy, or to get new equipment? Energy services companies are expanding and are quite profitable even though more than one of their executives has told me, "We make all of our money from selling equipment. That energy savings stuff is just a marketing tool." Even though buying new, more efficient equipment to replace older, less efficient equipment sounds like a no-brainer way to save energy, the one flaw is that it is not necessarily true. In all of the projects I have done for so many years in so many different types of buildings, I seldom ever had the luxury of new equipment. I learned how to create tremendous savings with existing equipment and found that the technology is only a tool; the key is good management, the people.

For many utilities and government agencies that have a mandate to provide incentives in the form of grants, the goal is giving away the money. In most cases, there are no requirements to actually measure the savings, and if there is, it's by using utility bills, the main meter, which is not an accurate way to measure savings in a complex facility. Projections, estimates or computer models of savings may be all that is required, even though that is not proven science. In my experience, the savings resulting from any capital project are primary dependent on the people who operate, maintain and manage the systems, not the technology or equipment.

The goal of saving energy has been all but forgotten in most projects. The goals are now energy audits, benchmarking, new equipment, new lights, solar, wind – whatever the company or person is selling, however they make their money. The idea of valid, objective problem solving is not a concept that is employed in most projects. With the stampede to take advantage of all of the new opportunities, many more companies and people are offering products and services and employing many entry-level employees who don't really have the combined theoretical and practical experience required, even if they do have the problem-solving skills. And so owners are becoming more and more confused with so many different people offering so many different solutions and many I have encountered, as a result of spending money in the past for projects that failed, have simply lost confidence and refuse to participate in any more.

Back to 1976 and my discussions with Bob about my career – by then, I had decided that what I really

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.

RSS Author Articles

The Most

Most Recent Most Read Most Commented

- Nation's Largest Brewery Goes Landfill-Free 10/18/2013 12:10pm
- Infographic: The Dangers of Industrial Dust 10/18/2013 11:44am
- Compressed Air Systems: Friends or Foes of Sustainability? 10/18/2013 10:29am

Green or Green Wash?

Manufacturer Designates Eco-Certification for Electrical Devices

The company's Acme electrical devices meet criteria established by the company for its Eco-Certified designation. Demonstrating its commitment for a better, cleaner environment, a company has developed an eco-certification designation for a variety of its industrial products, including the company's entire line of Acme electrical devices. The company's Acme electrical devices meet criteria established by the company for its Eco-Certified designation: The devices have a positive impact on…

Read More >>
Add Your Comment >>

Swisscleanwater Group
Just selecting and buying a water filter isn't enough, you also need to know the ways to maintain it so that you can enjoy great service from the Clean water...


Author
2/9/2013 @ 10:44pm Read More >>

Supporters Corner

1 of 7

Rockwell Automation

Rockwell Automation
A Sustainable Approach to

2 of 7

SAP

SAP
Sustainability Software for

wanted to be was an energy expert. I wanted to study and work and learn and know more about how buildings use energy and how to save energy than anyone else. When you first graduate from engineering school, you are pumped up; full of confidence and certain you can conquer the world. You made it! It was tough to get in and tough to make it through. You worked your ass off. Two-thirds of the people in my freshman class hadn't made it. Boy, was I going to be successful. According to the people in our college's recruiting and placement offices, once you made it through that school, all you had to do was coast through your career gathering accolades and money. Unfortunately, at that age, you are completely unaware that success in school often does not translate to success in the real world. The only thing it really means is that you are good at school. When you graduate you have to start at the bottom again and see if you have the ability to be a good engineer.

As a young engineer about 10 years out of school, I remember having one of those ah-ha moments when I suddenly realized just how little I knew, how much I had to learn to accomplish my goal. Crap. I had been designing mechanical systems for buildings completely unaware of some of the factors I should have considered. I guess I had lucked out because everything seemed to work. At some point, I imagine, most of us begin to realize how little you actually know and how unprepared you are. I hope those new to the energy efficiency profession understand that, and will continue to learn and gain experience and develop their problem-solving skills.

Hopefully they won't end up like the guys who never realized it, the ones who designed that tower in Pisa, the Tacoma Narrows Bridge or the Titanic.

Relevant Tags

audits, buildings, career, conservation, engineering, measurement, monitoring, outsourcing, suppliers,

Add a comment

You cannot post comments until you have logged in, and have an appropriate permission level.
Login here or register for a new account.

Related Stories

- The Occupant's Role in Conserving Energy
- How to Justify the Cost of an Energy Monitoring System
- America: Land of Opportunity, Land of the Consumer