The Power of Myth

Technology equals energy performance, right?

By Clark A. Reed, U.S. Environmental Protection Agency

Money Isn't All You're Saving

Imagine two buildings, one with all the latest efficient technologies and the other with older systems. Yet as impossible as it may seem, the older building delivers better energy performance than the other. A fluke? Hardly. It's something we see often at EPA since launching the national energy performance rating system for buildings under the ENERGY STAR® program*.

EPA's miles-per-gallon equivalent rating for buildings uses a 1–100 scale to give relative meaning to energy use; buildings rating high on the scale are considered to be better energy performers than those with lower ratings. And a fifty (50) is considered industry average. New building owners expect to receive high ratings. When they don't, our phones begin to ring. What's going on?

The problem most likely is not the technology itself. After all, today's building products are at least 30% more efficient than 20 years ago. But despite improved efficiency of components, the energy intensity of buildings over the past several decades varies by 200 - 400 percent, regardless of the year of construction. In short, a building built today may not automatically perform better than one built thirty years ago.

If technology alone can't explain why one building delivers better energy performance than another, what can? Tom Hicks, a mechanical engineer at EPA, believes there are many reasons why buildings—new or old—might not meet performance expectations. "Improper sizing of equipment, incorrect application of technology, limited labor, and insufficient training can all play a role in degrading expected energy performance", he says. "Sometimes facility management lacks technical expertise or staff to perform diagnostic tests and repair problems." Whatever the ultimate cause, failing to maximize energy performance of existing systems could be costing facility managers big bucks, according to a recent EPA study.

The Clues Come In

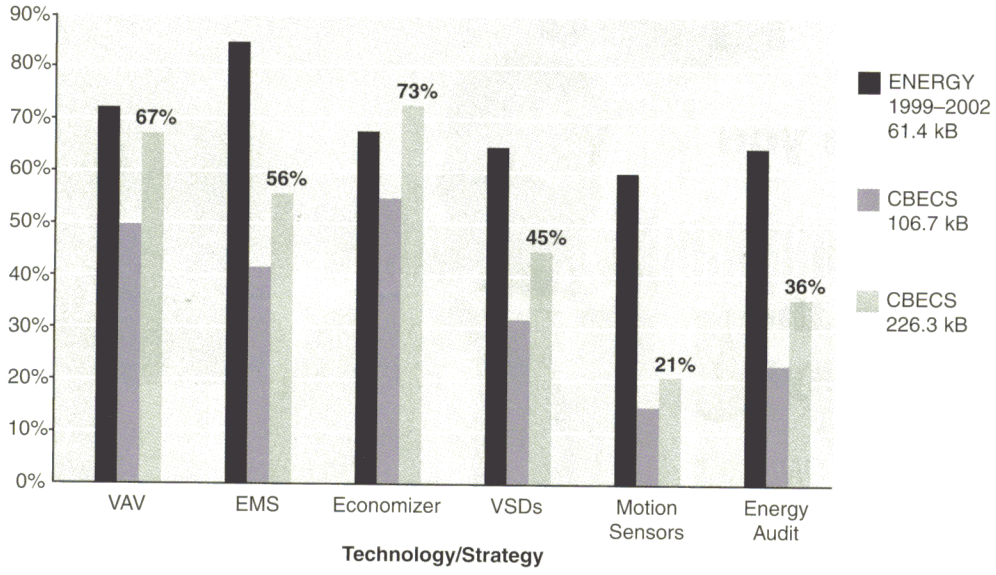
Every year, EPA conducts studies to verify that the buildings receiving the ENERGY STAR label for top energy performance actually are the most energy efficient in the country. To do that, we compare the buildings that earn the ENERGY STAR to a representative sample of U.S. building stock found in the Commercial Buildings Energy Consumption Survey (CBECS) of the U.S. Department of Energy.

While EPA expects to run our first analysis on ENERGY STAR-qualified hospitals in 2003, we have completed studies for the past three years on administrative office buildings. Our conclusion: ENERGY STAR-labeled office buildings were 42% more efficient than the average U.S. office building. On an energy cost basis, ENERGY STAR-labeled office buildings cost 42% less to operate ($1.23 per square foot) than the average CBECS office building ($2.09 per square foot), in 2000 constant dollars.

This analysis, including a similar comparison with average office buildings in BOMA's Experience Exchange Report, confirms that the ENERGY STAR label does in fact distinguish the top energy performing buildings in the country. But things got really interesting when we began comparing the energy-related technologies of U.S. buildings with those qualifying for ENERGY STAR. One might expect that the worst performers would have few of the technologies employed by the top performers. But in fact, the opposite was true: the worst performing

* To determine the energy performance of your acute care or children's hospital, set up your own free, private account at www.energystar.gov/benchmark

Technology Does Not Equal Performance



U.S. buildings (found in CBECS 4th Quartile) most closely resembled the ENERGY STAR buildings. With few exceptions, each group used efficient technologies such as variable air volume systems, energy management systems, economizers, and occupancy sensors with nearly the same frequency. (See Figure 1)

Apparently, for reasons that are not fully understood at this time, many energy efficiency investments were not delivering on their promise. "One hypothesis is that these technologies were installed incorrectly, maintained improperly, or both", says Hicks. Studies will soon be underway at EPA to find out if this hypothesis holds up under scrutiny. If so, then the energy costs incurred from improper installation and maintenance in commercial office buildings could be as high as $2.23 per square foot. With hospital energy intensity three times as high as office buildings, healthcare engineers could have a lot more to lose.

Bill Von Neida, an ENERGY STAR analyst and co-author of the EPA study, is not surprised that energy efficiency efforts could go awry. "The technologies available in the marketplace can increase performance", he says. "But they don't run themselves. You can't just plug them in and forget about it."

Recommissioning May Help

If you suspect your facility is not operating as intended, and standard maintenance and energy management procedures have failed to fix chronic building problems, EPA recommends you consider recommissioning. Recommissioning is essentially the same process as commissioning, but applied to existing HVAC, controls, and electrical systems. Making low-cost adjustments to your building systems will not only minimize your current operating costs, it will also lower future maintenance costs. Furthermore, performing a recommissioning will help you understand your buildings' current operational needs and how it is intended to operate.

What kind of payback might you expect from recommissioning? According to a study published by E SOURCE on more than 40 tune-up projects, energy savings range from 5 to 15 percent. A follow-up study conducted by Texas A&M University showed that about 80 percent of all savings from recommissioning comes from optimizing building controls while improved operations and maintenance accounts for the remaining 20 percent.

Recommissioning will require spending funds up front, but the payoff it provides in terms of energy performance can be enormous. Operational staff will acquire a deeper understanding of their building, how its systems interact with occupants, and the knowledge to maximize peak performance. Generally speaking, newer buildings should outperform older buildings. But it can only happen when new technologies are properly sized, installed, and specified and facility managers place a greater focus on building operations and management. Technology can never do it alone. ASHE

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