

ENERGY MANAGERS' QUARTERLY

Third Quarter ■ 2006



FEATURE

Quality Systems for Energy Management

Gwen Farnsworth

C&A Floorcoverings saved \$55,000 on annual energy costs just by lowering the temperature settings for thermal oxidizers on a curing range.¹ That and similar measures will also lengthen equipment life and reduce maintenance costs. In hindsight, these operational changes may seem obvious, but they weren't until C&A implemented a continuous improvement program based on Georgia Institute of Technology's Management System for Energy (MSE 2000). MSE 2000 is just one of several tools that are available to help energy managers adopt the concepts of continuous improvement management (CIM).

Total Quality Management™ and Lean Six Sigma™ are widely recognized examples of CIM systems. The ideas embedded in these systems have revolutionized business by improving productivity, encouraging teamwork and cross-functional interaction, and reducing waste (see sidebar, page 2). Incorporating CIM into a corporate energy

management strategy helps to ensure that savings from capital retrofits are sustained year after year. Plus, management systems based on CIM can help you to achieve another 5 to 20 percent savings from low- and no-cost operational and behavioral changes.

E SOURCE investigated four assessment tools and guidelines developed specifically for energy managers that incorporate CIM theory:

- EnVINTA One-2-Five Energy
- Georgia Tech's MSE 2000
- Energy Star Matrix
- Building Research Establishment's Energy Management Matrix

Any of these tools will lead you to establish your own guiding principles and objectives, integrate energy issues into a variety of corporate decision-making processes, document results, and share best practices internally. If you decide to incorporate any of these guidelines into your energy management program, you

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Corporate Energy Managers' Consortium

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can be confident that you are in good company. Companies widely recognized as having top-notch energy management programs are using many of the same best practices recommended in these guidelines (**Table 1**, page 3).²

Take Your Pick

Are you confident that your energy management program is built on established best practices? Energy managers are turning to assessment tools and guidelines to avoid reinventing the process. Rather than taking the time to theorize and re-create the best practices already defined by reputable experts, you can jump right in with an existing process and put your time and effort into getting the job done.

All of the systems described here share various CIM concepts. Each also features a methodology for assessing what is strong with your energy management program and which elements are missing. In fact, just taking the step to conduct an assessment can give a big boost to your program. "More than anything, the process was most valuable for bringing key decision-makers to the table," said Jeff Hyslop, asset management analyst for Legacy Hotels REIT, remarking upon his experience with EnVINTA One-2-Five Energy. Hyslop credited the One-2-Five assessment process with helping Legacy to prioritize critical actions. "We couldn't make everything a critical priority; this forced us to assign priorities."

The Fundamentals

Continuous improvement management (CIM) theory is a good fit for energy management precisely because energy management is not a one-person job. Success requires regular attention and action by staff up and down the chain of command and across functional boundaries. CIM is designed to address these challenges.

Some basic concepts of CIM relevant for energy managers are:

- Get top-level commitment
- Define goals and strategies
- Maintain ongoing leadership and communicate goals
- Identify your starting point (set baselines)
- Create systems for monitoring and tracking progress
- Manage and implement action with cross-functional teams
- Decentralize responsibility: Staff at all levels contribute to reaching the goals
- Document and recognize results

Table 1: Common features of best-in-class energy management

The Alliance to Save Energy (ASE) investigated 10 industrial companies that it determined are leaders in energy management. This table shows features shared by at least five of the companies. These common features overlap with best-practice recommendations found in continuous improvement management theory. (Note that ASE’s results were published in 2005, so it is possible that the energy management strategies of these companies have evolved beyond what is identified here.)

	3M	Continental Tire	C&A Floorcoverings	DuPont	Frito-Lay	Kimberly- Clark Corp.	Merck & Co.	Mercury Marine	Shaw Industries	Unilever
Organization and communications										
Corporate energy coordinator or “champion”	X	X	X	X	X	X	X	X	X	X
In-company energy team offers technical evaluation and assistance	X	X	X	X	X	X	X	X	X	X
Energy performance results released in investor publications	X			X	X	X				X
Plant-level teams and/or supervisors support energy improvements	X	X	X		X		X	X		
Participate in government-business energy-efficiency collaborations	X			X	X		X	X		
Tactics and approaches										
Performance goals and metrics	X	X	X	X	X	X	X	X		X
Project-based approach	X			X	X	X		X	X	X
Behavioral/procedural approach		X	X	X	X	X	X	X		
Multiyear planning horizons	X			X	X	X	X			
Tools and functions										
Energy performance reflected in budget-to-actual comparisons	X				X	X	X			X
Database to archive energy performance metrics and/or projects	X	X	X	X		X	X			
Routine auditing or self-assessment of energy consumption	X	X	X		X	X	X		X	

Courtesy: Alliance to Save Energy [2]

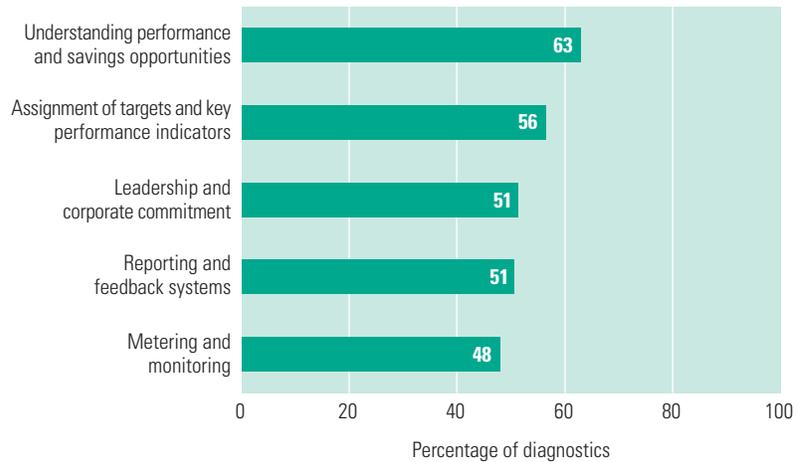
Using these assessment tools and adopting the related guidelines is also a way to demonstrate that your company is implementing best-practice management techniques. Many companies get public recognition through awards programs organized by governmental agencies, utilities, and nonprofits that promote energy efficiency. But hoping to receive an award is a fairly haphazard strategy, and whether you receive due recognition is not entirely within your control. Neither is it a good strategy if you want to regularly check whether your program is functioning well. What about something more concrete, such as the ability to benchmark specific energy management practices against those of your peers? Or even getting recognition for good energy management in your company’s stock value and ratings? One way to get recognition is to certify your program as implementing best practices, which can be done with two of the systems explained here—One-2-Five Energy and MSE 2000.

EnVINTA One-2-Five Energy

One-2-Five Energy is a diagnostic tool designed by the environmental consulting firm EnVINTA to evaluate corporate energy management strategies (www.envinta.com). It primarily consists of a two-hour session in which top-management staff respond to a number of questions from a trained facilitator. The diagnostic session includes questions like, “Does your company use energy-efficiency guidelines for equipment procurement?” The result is a report identifying five recommended action steps (see **Figure 1**, page 4).³ EnVINTA advises repeating the process regularly to generate new action items. Another output of the One-2-Five process is a score on a scale of 1 to 5 rating the company’s energy management practices overall, with a score of 5 representing best practices. Companies can use this score to benchmark their energy management systems against others.

Figure 1: Typical action items from a One-2-Five Energy assessment

EnVINTA compiled results for 631 North American manufacturing companies and facilities that had completed a One-2-Five diagnostic session by January 2006. The result of each diagnostic is a report identifying five critical action items. This figure shows the top-five items that are recommended most frequently, indicating areas in which most companies need to improve.



Source: E source; data from EnVINTA [3]

Payment of a license fee covers the cost of a facilitated diagnostic session and also provides access to online software to view and benchmark results. Several energy providers and state organizations subsidize One-2-Five diagnostics.

Advantages. A skilled facilitator conducts the diagnostic using software that quickly computes results. Many companies report significant benefits just from the process of gathering key staff from a variety of functional areas to participate in the diagnostic session. It is possible to get third-party certification of your One-2-Five score, which would enable you to publicize your rating.

Limitations. The One-2-Five critical action recommendations do not provide detailed instructions on implementing best practices. The company undergoing the diagnostic, a consultant, or a sponsor must have tools and strategies ready to take action on the One-2-Five results.

Georgia Tech's MSE 2000

Engineers at the Georgia Tech Enterprise Innovation Institute developed the Management Standard for Energy (MSE 2000, revised in 2005). The MSE is officially recognized as a standard by the American National Standards Institute (ANSI).⁴ It is modeled after the International Standards Organization (ISO) 14001 standard for environmental impact management. However, MSE 2000 is specifically geared to energy issues and emphasizes cost savings rather than environmental impacts. It includes management areas that are not directly addressed in ISO 14001, such as procurement and reliability (see next section for more on ISO 14001).

The MSE follows a "Plan-Do-Check-Act" cycle and incorporates a team approach. It covers a variety of activities, from high-level policy planning to documentation of equipment operating procedures. However, the text of the standard itself is brief—only eight pages. It addresses these topics in a

general outline; the details are up to the user to define. Appendices provide additional guidance on tracking utility data and key performance indicators.

MSE 2000 can be adopted as an organization's first formal management system, or it can be added on to an existing ISO or similar system.

Advantages. Purchasing the MSE 2000 standard is easy and cheap. It's just \$35 and can be downloaded from the ANSI web site. You can hire independent auditors to certify that you are meeting the MSE standard. Currently, only the consulting and certification firm Det Norske Veritas (DNV) (Sweden, www.dnv.us) is an official registrar for MSE 2000 certification worldwide. Georgia Tech offers training to get through the entire planning, implementing, and documentation process, which can take nine months to a year.

Limitations. The MSE 2000 standard won't tell you precisely what to do; it merely lays out key steps. To get the most out of MSE 2000, it is recommended that you work with a consultant during the initial implementation period.

Energy Star Matrix

The U.S. Environmental Protection Agency's Energy Star program created this simple one-page spreadsheet that can be used to assess whether your company is implementing best practices. It is available at no charge from the Energy Star web site (www.energystar.gov/index.cfm?c=guidelines.assess_energy_management).

The Matrix lists 23 actions in 7 categories, such as "Make a Commitment to Continuous Improvement" and "Set Performance Goals." The user checks off each action item as fully implemented, partially implemented, or not addressed.

Advantages. The spreadsheet is easy to download and use. Also, you can download Energy Star's Guidelines for Energy Management to help you revamp your program after completing the self-assessment (www.energystar.gov/index.cfm?c=guidelines.guidelines_index).

Limitations. Unless you hire a consultant to assist with this process, it is easy to avoid the hard part: pulling together a group of key staff from across company departments to participate in the assessment. It is also up to the user to properly frame the questions and honestly fill in the blanks of the Matrix. The Matrix focuses only on energy efficiency, so issues such as reliability and savings from procurement strategies are not addressed. It would be easy for the user to adjust the spreadsheet to include additional relevant items.

BRE Energy Management Matrix

The UK's Building Research Establishment (BRE) created its own Energy Management Matrix starting in the late 1990s. It is a pencil-and-paper self-assessment tool designed to help organizations assess the current status of their energy management procedures and identify areas for improvement. It is actually a set of matrices covering energy management processes, financial management, awareness and information, and technical activities, plus one summary matrix.

Advantages. The self-assessment and related guidebook, "Energy Management Priorities: A Self-Assessment Tool," are available at no charge to take the user through the process.⁵ They cover management and technology-specific issues.

Limitations. As with any self-assessment, the user must be as diligent and honest as possible to get accurate results. The 13 BRE matrices are grids, each with five levels

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of achievement for up to six task areas. This can make the assessment process complex. The matrices are not available in an interactive electronic format. No certification version is available.

What About ISO Standards and Lean Six Sigma?

Three widely used CIM systems for quality management, environmental compliance, and defect control are the ISO 9001 and 14001 standards and Lean Six Sigma.

Are ISO Standards Enough?

Companies that have implemented the ISO 14001 and ISO 9001 standards have a head start on working with any of the energy management guidelines. ISO 9001 is a standard for ensuring quality in manufacturing and business operations. ISO 14001 is more relevant to energy insofar as it guides companies to establish procedures to control and track environmental impacts. Both systems incorporate CIM concepts and thus have something to offer energy managers in terms of improving performance tracking and extending responsibility for good business decisions and practices throughout the organization. Yet these standards aren't enough to fully inform an energy management strategy.

Each company that adopts ISO 14001 standards can choose whether to create detailed procedures and documentation relating to energy. Typically, however, only government-regulated environmental impacts are covered in an ISO 14001 implementation, so energy is often overlooked. Staff at Georgia Tech noticed energy management needs weren't being met by the ISO standards. "When we first started developing MSE 2000, there were people who said it was not needed because it was covered under 14001. But what we found was that a lot of organiza-

tions didn't even identify energy as an environmental aspect," said Ginny Key, senior research associate at Georgia Tech. They also found that when companies did include energy in their ISO 14001 procedures, they were not reaping as much savings as they could potentially get. Georgia Tech designed MSE 2000 to complement ISO 14001 and boost the energy savings.

In countries that regulate greenhouse gas emissions, companies are incorporating energy-related emissions in their 14001 documentation. At the same time, they are recognizing the limitations of 14001 for many aspects of actually managing energy use as opposed to simply documenting consumption.

"One thing that 14001 misses is purchasing," noted Michael Brown, senior engineer at Georgia Tech. The ISO standard does not address best practices in energy procurement, which is obviously a key element of energy management. Nor does it provide guidance on selecting, calculating, and tracking key performance indicators that specifically relate to energy. So while 14001 offers a useful conceptual framework for establishing accountability and a management process, it lacks detail on how to actually go about managing energy.

What About Lean Six Sigma?

Lean Six Sigma, a process designed to improve productivity and reduce defects in manufacturing, can also be applied to energy management. Dow has successfully used Six Sigma in this way, saving approximately \$4 billion through energy-efficiency efforts from 1994 to 2005.⁶ DuPont also applied Six Sigma to energy, helping the company to complete improvement projects that produced energy savings of nearly \$20 million per year.⁷

An element of Six Sigma that is particularly useful for energy managers is statistical

analysis, which can greatly improve interpretation of energy performance metrics. But this advantage also highlights a key challenge to implementing Six Sigma—namely, that it relies on statistical expertise. This is one reason that Six Sigma is not cheap. Companies that invest in Six Sigma spend millions to get the process going, often hiring specially skilled consultants for the start-up period. Considering the start-up costs, integrating energy management into a larger Six Sigma project should be decided from the outset. Even if your company already uses Six Sigma, any of the methodologies described above can help you adapt a Six Sigma implementation to energy-specific concerns.

Projects or People

For most companies, energy management is oriented around efficiency projects. It's easy to make the mistake of assuming that a capital retrofit project is going to save energy all on its own. Of course, it will initially if the project is designed and installed correctly. But over time, savings are eroded if equipment is insufficiently maintained and settings are altered. "One of the things that led us to write the [MSE 2000] standard in the first place was we'd go back into a plant after five years, and you could

practically pull the old assessment report off the shelf and give it to them again," explained Ginny Key. "Even when they had implemented things, in five years the savings had all disappeared because [the plan] was never incorporated into day-to-day activities."

Each of the guidelines described in this article is designed to address this problem and open the way for lasting improvements by establishing a people-based strategy in addition to a project-based strategy.

Jeff Hyslop at Legacy emphasized the importance of getting the people side of the equation right. The first step is to assess where you are now. "A report is a report at the end of the day. The key is bringing everyone together to discuss the critical elements and figure out where your successes and weaknesses are," said Hyslop. "Otherwise everyone is too busy to really think about these things."

Whether an organization adopts one of these management systems, or develops its own, a people-centered strategy is necessary to sustain savings. Without this approach, any number of retrofit projects will deliver less than the desired results over time.

Notes

- 1 Alliance to Save Energy, “We Did It ... So Can You! Corporate Energy Management at C&A Floorcoverings,” www.ase.org/uploaded_files/industrial/CollinsAikman%20v04.pdf (accessed October 2, 2006).
- 2 Christopher Russell, “Energy Management Pathfinding: Understanding Manufacturers’ Ability and Desire to Implement Energy Efficiency,” Alliance to Save Energy (March 2005), www.ase.org/uploaded_files/industrial/5_Pathfinding%20Mar05.pdf (accessed October 2, 2006). Reprinted with permission of the Alliance to Save Energy.
- 3 Doug Burgess (January 10, 2006), Vice President of Sales, EnVINTA, Austin, TX, 512-343-7210, dburgess@envinta.com.
- 4 Background on MSE 2000 and information on related training programs can be found on the Georgia Institute of Technology web site (<http://develop.edi.gatech.edu/Default.aspx?alias=develop.edi.gatech.edu/energy>). The MSE standard is available for purchase from the American National Standards Institute (http://webstore.ansi.org/ansidocstore/dept.asp?dept_id=3108).
- 5 Building Research Establishment, “Energy Management Priorities—A Self-Assessment Tool,” *Good Practice Guide*, no. 306 (May 2001), www.thecarbontrust.co.uk (accessed March 8, 2006).
- 6 U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, “Applying Six Sigma Methodology to Energy-Saving Projects,” case study, http://texasiof.ces.utexas.edu/texasshowcase/pdfs/casestudies/cs_dow_sixsigma.pdf (accessed October 2, 2006).
- 7 Christopher Russell [2].