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CONSERVE YOUR ENERGY

How quality practitioners can help reduce energy costs **by John R. Dew and Somayeh Rokhgireh**

JUST THE FACTS

While many organizations suffer from the unexamined and wasteful costs of energy consumption as part of their hidden factory, many don't have trained staff to help assess and reduce these costs.

Fortunately, *ISO 50001:2018—Energy management* can help your organization create an approach to assessing its energy practices.

rmand Feigenbaum was well known for emphasizing quality practitioners' role in identifying and eliminating wasteful activities in work processes as part of a hidden factory in organizations—a concept often included in Six Sigma training courses. The concept of the hidden factory, with its impact on overhead and support costs, has become an important concept in organizational accounting.

Manufacturing, service, healthcare and educational organizations all must address wasteful practices that contribute to overhead and support costs that make up the hidden factory. Increasingly, organizations are recognizing unnecessary energy consumption as a significant part of their hidden factory costs. While many organizations suffer from the unexamined costs of energy consumption as part of their hidden factory, many do not have trained staff to help assess and reduce these costs.

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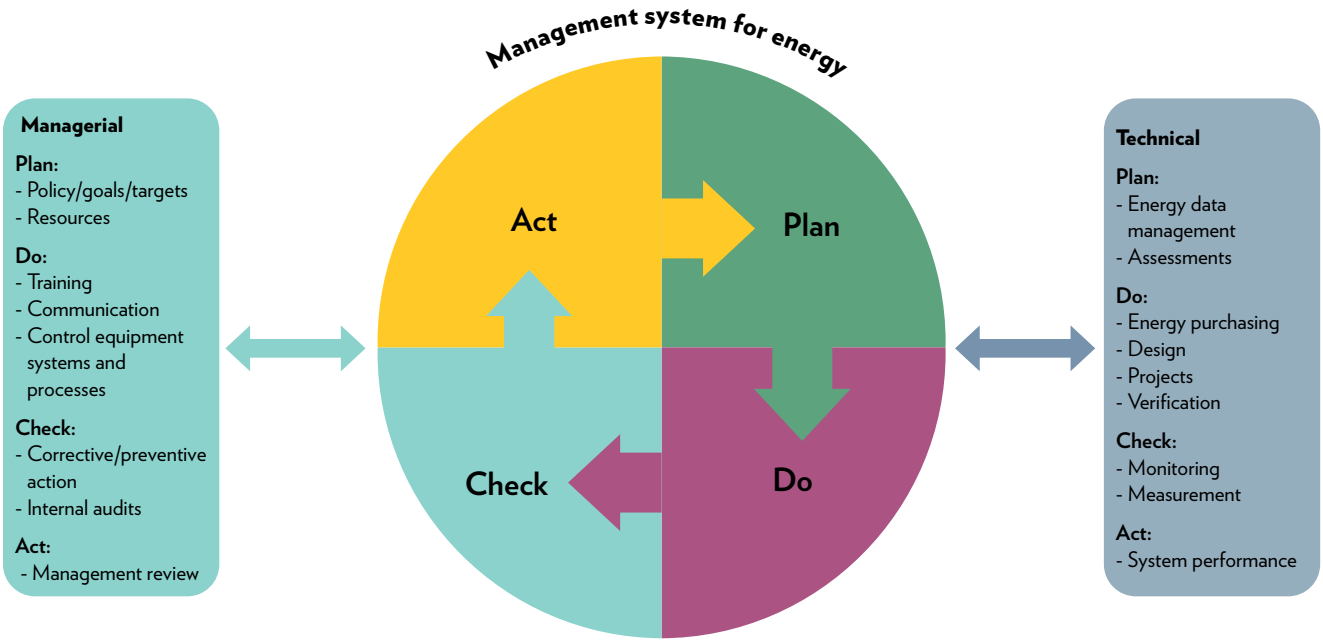
Quality practitioners have knowledge and skill sets that can contribute to this effort in four ways:

1. They have expertise in conducting assessments and audits in their organization and often are used to working with International Organization for Standardization (ISO) standards or other performance measurement systems.
2. They are skilled in organizing and facilitating project teams that could apply quality improvement methods—including value stream mapping, lean and Six Sigma—to projects designed to reduce energy resource wastes.
3. Often, they are familiar with approaches to innovation, such as TRIZ, that can be useful in achieving breakthroughs in reducing energy costs as part of the hidden factory.
4. They embrace the notion of systems thinking and can look at how all parts of an organization are interconnected. They appreciate the need to create

FIGURE 1

Management system for energy



an organizational culture that embraces continuous improvement and eliminates all hidden factory costs.

If your organization does not already have someone focused on assessing and reducing wasteful energy consumption, where do you start, as a quality practitioner, in helping your organization get up to speed? Fortunately, there is *ISO 50001:2018—Energy management*, which you can use to help your organization create an approach to assessing its energy practices.

An overview of energy management systems

ISO 50001 is an internationally recognized voluntary standard that provides a framework for organizations to establish, implement, improve and maintain an energy management system. The standard provides guidelines for systematically managing energy efficiency, helping organizations optimize their consumption, reduce energy costs, enhance competitiveness and minimize their greenhouse gas emissions as well as other related environmental impacts.

This standard applies to organizations of all sizes and sectors, and shares common elements with other ISO management system standards, such as ISO 9001 (quality management) and ISO 14001 (environmental management). This means that organizations implementing ISO 50001 can integrate it smoothly into the quality improvement and environmental management systems they may have in place, allowing for a cohesive and coordinated approach to managing energy, quality and environmental performance within the organization.

ISO 50001 is based on the plan-do-check-act (PDCA) cycle, which serves as a continuous improvement model for energy management. The standard provides a framework for defining energy objectives and targets, developing action plans and implementing energy-saving initiatives. It encourages organizations to monitor and assess their energy consumption, measure and analyze data, and evaluate the effectiveness of energy management efforts. The standard entails two aspects of "managerial" and "technical" components (see Figure 1). These two aspects in each step of the PDCA cycle are identified as follows:

Managerial

Plan

- Establish energy policies, goals and targets.
- Define the roles, responsibilities and authorities related to energy management.
- Allocate resources and create action plans for achieving energy efficiency goals.

Do

- Implement the action plans and ensure the allocation of necessary resources.
- Provide training, communicate with stakeholders and raise awareness among employees about energy management practices.
- Control equipment systems and processes.

Check

- Monitor and measure energy performance against defined objectives and targets.
- Conduct internal audits and review the progress toward achieving energy efficiency goals.
- Implement corrective and preventive action.

Act

- Perform management reviews, take corrective actions based on the findings from the check phase, and update energy policies, objectives and targets as needed.
- Continually improve the energy management system and its performance.

Technical

Plan

- Conduct energy assessments, value stream mapping and process mapping to identify energy-intensive processes and areas of improvement.
- Identify root causes of energy waste and implement measures to prevent recurrence.
- Establish energy baselines and develop metrics and key performance indicators.
- Develop energy management strategies and select appropriate energy-saving measures.

Do

- Implement energy-saving measures and technologies.
- Develop improvement solutions and design processes and equipment to enhance energy performance, and verify results.
- Establish procedures for managing and controlling energy.

Check

- Collect and analyze energy data to identify trends, patterns and areas of improvement.
- Monitor and record energy-consumption data.
- Conduct energy audits and inspections to assess compliance with energy management requirements.
- Perform internal and external audits to evaluate the effectiveness of energy management practices.

Act

- Establish dashboards and mechanisms to continually review and improve energy management practices, update action plans and enhance energy performance.
- Implement corrective and preventive actions to address energy inefficiencies.
- Review and revise energy management strategies and action plans based on lessons learned and best practices.

QMS tools and LSS methods can enhance an organization's ability to optimize energy management processes, drive continuous improvement and achieve tangible results.

Many organizations incur a range of hidden energy costs that silently affect their financial performance and sustainability efforts. ISO 50001 offers a structured approach to analyzing and improving energy use systematically, resulting in cost savings in areas such as:

- **Heating and cooling systems:** According to the U.S. Department of Energy (DOE), a heating, ventilation and air-conditioning (HVAC) system consumes about 35% of the total energy used in a building. ISO 50001 helps organizations assess and improve HVAC systems that are not operating at their optimal efficiency, thereby lowering direct and indirect costs of energy and emissions.
- **Lighting inefficiencies:** According to the DOE, a lighting protection system—which directs the energy from a lightning strike safely to the earth—accounts for 11% of total energy consumption in a building. By using the ISO 50001 framework, organizations can identify lighting system inefficiencies and implement energy-efficient alternatives.

- **Energy consumption during nonoperational hours:** This refers to energy use in buildings and facilities when they are not in active use, such as evenings and weekends. ISO 50001 provides a framework for identifying, quantifying and addressing energy waste during nonoperational hours, thereby reducing costs by minimizing unnecessary energy consumption.

According to the Energy Management Working Group of the Clean Energy Ministerial (a multinational forum for developing clean energy solutions),[1] energy management systems have the potential to achieve significant energy savings. In the industrial sector, for example, these systems can save up to 30% of total energy use, while the savings potential can reach up to 40% in commercial buildings. This highlights the effectiveness of implementing energy management systems in optimizing energy performance.[2]

Implementing ISO 50001 globally could result in substantial energy savings. By 2030, it is estimated that ISO 50001 implementation could cumulatively cut energy use by 62 exajoules. This reduction in energy consumption translates to more than $600 billion in energy cost savings. Furthermore, implementing ISO 50001 also could lead to the avoidance of about 6,500 megatons of CO_2 emissions.[3] To put it in perspective, this is equivalent to removing 215 million passenger vehicles from the road in terms of carbon emissions.

QMS and LSS for improved efficiency

Quality management system (QMS) tools and lean Six Sigma (LSS) methods can effectively enhance an organization's ability to optimize energy management processes, drive continuous improvement initiatives and achieve tangible results. On the path to energy efficiency, quality practitioners play a pivotal role in achieving an organization's goals aligned with ISO 50001 and other energy management frameworks.

By integrating QMS tools into the organization's energy management system, quality practitioners can lead the team to systematically identify the root causes of inefficiencies, pinpoint areas for improvement and develop data-driven solutions to energy-saving measures. Additionally, quality practitioners can establish control dashboards to track progress and monitor system performance.

Some of the QMS tools and LSS methods that can be harnessed to enhance the organization's energy efficiency include but are not limited to:

- Define, measure, analyze, improve and control; and define, measure, analyze, design and verify methods.
- Root cause analysis tools.
- Theory of constraints.
- Statistical process control and data analysis.
- Value stream and process mapping.
- TRIZ.
- Stakeholder and employee engagement tools and techniques.

Example: 3M

3M, a renowned multinational conglomerate, adopted LSS methods to propel energy efficiency improvements throughout its operations. Its comprehensive approach encompassed implementing energy management systems, optimizing processes to eliminate inefficiencies and reducing waste.

By aligning its initiatives with ISO 50001, 3M demonstrated a commitment to best practices in energy management and sustainability. This concerted effort enabled the organization to achieve significant advancements in energy efficiency, resulting in reduced energy consumption, cost savings and a strengthened commitment to environmental stewardship.

Driving initiatives

By leveraging QMS tools and LSS methods, organizations can establish a structured approach to drive energy efficiency initiatives and harness the power of continuous improvement methods, data-driven decision making and employee engagement initiatives to optimize their organizations' operations, reduce energy consumption and related hidden factory costs, and enhance overall profitability and sustainability.

In this context, the quality practitioner's role becomes paramount in driving these initiatives and aligning with ISO 50001 and other energy management frameworks. **QP**

EDITOR'S NOTE

Visit this article's webpage at qualityprogress.com for a list of references noted in this article.

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