Energy-efficiency isn't just about technology. If your organization hasn't adjusted its culture to help raise and sustain the energy consciousness of your human assets, now's the time to do it.

Frequently, even successful world-class organizations have difficulty conserving energy and cutting the cost of utilities. This is despite the availability of more cost-effective energy-management technologies than ever before. Some may be satisfied with implementing a few immediate, finite savings—*proverbial "low-hanging fruit."* Such a strategy often captures only part of the potential savings for existing facilities, without ensuring that future operations will be energy-efficient. For those that wish to achieve energy savings over the long haul, modest adjustments in the culture of an organization can motivate people toward continuous improvement.

The most successful—*sustained*—energy-management system is developed as a business process within the organization. Most employees really want to help cut costs and reduce energy-related emissions; they'll do just that if provided with the needed direction, training, resources, incentives, recognition and rewards. It may take a few years for energy-management to fully gain momentum in an organization, but it's worth the effort for both the bottom line and the environment.

In this first installment of a two-part series, the focus is on a framework of business principles for initiating and administering an organizational energy-management system. The second installment (coming in a special UTILITIES MANAGER follow-up in the December issue of MT) will discuss actual energy-saving implementation strategies.

Understanding the energy perspective of the site manager

To understand the challenge of achieving energy savings, consider the priorities of a site manager—*which often can be summed up as follows:*

- Get the product or service out the door.
- Have the work performed safely.
- Comply with laws and regulations.
- Keep facilities maintained for reliability and longevity.
- Minimize costs.

In the above list, energy-management would fall into the fifth priority. A further challenge is that energy costs are often a small percentage of the total expense budget. Yet most site managers and their bosses would welcome a reduction in energy costs and a reduction in environmental impact—*as long as these reductions are consistent with financial and other organizational objectives.*

Energy policy: Support from the top

The most successful approach to an energy-management culture is to begin from the top down—*in the form of a commitment from the top*. Thus, the first action to develop the needed organizational culture is development of an energy policy that is endorsed by senior management.

The energy policy needs to be only a short, simple statement of what is to be achieved from a broad perspective, and it can be drafted at almost any level of the organization. A few paragraphs can be written to express that the organization, with respect to energy-efficiency, will have a policy to:

- Reduce the life-cycle costs of energy and utilities.
- Reduce energy-related emissions, on-site and off-site.
- Be a good citizen in conserving resources.
- Enhance public image.

REMEMBER: The greatest chance of success will occur when the regular performance reviews of all levels of management include demonstrated progress toward the energy policy.

After internal reviews, endorsement and internal publication of the energy policy needs to come from as high in the organization as possible (preferably from the chief executive officer).

Senior management will also have a follow-up role in recognizing and praising energy-related achievements. Without the up-front commitment of senior management, progress in energy reduction and the associated cost savings is likely to be limited and slow.

Steering the effort
Once an energy policy is in place, the use of a steering team is the best way to develop a strategy for implementation of the policy. Ideally, the team should represent a cross-section of the organization in terms of: 1) function and/or division; 2) geography; 3) specialists in engineering, operations and maintenance; and 4) ad-hoc representatives of procurement, finance, environmental affairs and communications. The team can be led best by a person designated as the organization's "energy champion" or energy manager.

The steering team should make use of the ideas of others wherever possible, such as:

- The U.S. Environmental Protection Agency (EPA)/Dept. of Energy (DOE) Energy Star and state energy programs
- Trade organizations
- Your local utility suppliers' Websites
- "Sister" facilities within the same organization
- Competitors or comparable outside organizations
- Consultants

Even in businesses where competitors would never share production technology, research technology or other trade secrets, they often are very willing to share information on how to conserve energy and utilities.

Goal development
Measurable goals need to be developed by the steering team. The improvements can be expressed in terms of:

- Percentage reductions or absolute reductions—*These include units of energy usage,* *costs and related emissions.*

- Public-relations image and community relations—*These include favorable news coverage and public recognition by community leaders.*

- Local, regional or national awards

In the setting of goals, the steering team needs to address this question: What counts besides energy? Other potential measurable savings from energy-management include:

- Savings in utilities-system equipment procurement.
- Examples include:
- Potential capital-spending avoidance or postponement for an additional air compressor, pump, chiller, boiler, electric substation, air handler, piping or duct system
- Capital savings from bulk-purchasing of energy-efficient equipment

- Water- and sewer-use savings
- Energy-related maintenance and safety improvements
- Increased equipment production capacity and reliability
- Improved human productivity due to increased levels of comfort

Counting these additional related savings will substantially increase peoples' interest in managing energy.

Goal-related measurements

The two basic types of energy-saving-initiative measurements are: 1) metered; and 2) calculated. In a perfect world, all energy savings would be metered. In reality, the cost of metering the exact savings is most often not justified by the accuracy gained. Therefore, engineering calculations must often be accepted to determine savings in lieu of metering.

In calculating annual savings—*or attempting to meter savings*—there's often difficulty in making adjustments for effects of year-to-year production activity, weather-related energy usage and/or other variables. The simplest goal is, perhaps, expressed as an annual percentage reduction, whereby the numerator is the metered or calculated savings for all initiatives implemented in the present year, and the denominator is the total energy usage or cost from the previous year.

Reporting the results
Whatever measurement system is developed, it must reflect the organization's energy policy and goals. For operations with multiple sites or units, a uniform reporting system is necessary.

Results need to be kept in a spreadsheet format that is capable of statistical analysis. Assistance of specialists may be needed—for example, in calculating emission reductions related to energy conservation. If at all possible, the results should be available for viewing by anyone in the organization, such as on an Intranet Website.

Supply-side information that needs to be kept by time period includes:

- Purchased utility usage and cost (e.g., electricity, natural gas, water, sewage-treatment services)
- Total energy usage, all expressed in a single unit (e.g., BTUs, Joules, kilocalories). (Note that the energy represented by electricity can be expressed in two ways— *as delivered [3413 BTU/kWhr], or as produced [often about 10,000 BTU/kWhr]*. The off-site impact is expressed as the latter of the two.)
- On-site utilities production (e.g., steam, compressed air, chilled water)

Demand-side information to keep includes:

- Sub-meter data
- Energy usage per unit (e.g., BTU/square ft., BTU per unit of product, energy input per unit of output)
- Results of energy and cost-saving actions taken (metered or calculated), to identify progress toward the goals (including savings per unit of time [e.g., monthly and annually] expressed as energy units, cost and emission reductions [tons carbon dioxide])

Benchmarking performance
Where possible, comparison of a site's energy performance should be made against similar facilities. Seek indices that compare unit values, such as BTU/square foot, BTU per unit of production or input versus output. In addition, perform benchmarking of unit energy and utility costs if available. Weather-related adjustments may be made using local degree-day data. A site's performance can be compared with other facilities within the same organization—*or from outside the organization*

. The most confidence in the results of benchmarking comes when more than one benchmark measurement is used. Use the findings from benchmarking to prioritize future efforts.

Financial criteria
The financial specialist is a key ally in energy management: He/she must define the approved hurdle rate for capital investments in energy reductions. The hurdle rate may be expressed in terms of payback period or rate of return. Energy investments can typically use the organization's normal process for capital and expense appropriations, for which the financial specialist is an advisor.

REMEMBER: More energy-saving initiatives will be implemented where projects with returns not quite meeting the hurdle rate can be packaged together with projects that surpass the hurdle rate. This results in the largest possible package of savings, while still meeting the required hurdle rate.

Furthermore, an understanding is needed as to whether non-monetary factors can be used to help justify energy-improvement projects, such as associated improved reliability, safety or public image.

Energy-improvement projects tend to have lower risk than most other investments, and therefore may justify a less stringent hurdle rate than some other projects. For example, compare the risk of return on an energy-savings project with the risk of investing in the research and development of a new product, building facilities to manufacture it and then hoping that customers will buy it.

Too many times, systems that use large amounts of energy are specified and selected based on capital cost only. Design and selection decisions for such facilities need to be made based on life-cycle cost (LCC), rather than first cost. Consider the total cost of ownership (TCO) of a boiler, chiller, air compressor, pump or HVAC system—*or, perhaps, even an entire building or production process* . Frequently, less than 10 to 20% of the TCO is represented by the capital cost, while more than 80 to 90% of cost is for energy expenses. The lowest LCC alternative is not always the one with the lowest capital cost. The most common reason for making decisions based only on capital cost(s) is that it takes more effort and understanding to calculate LCC than it does to identify capital costs. The financial specialist can assist engineers and managers with LCC calculation methods. The extra effort is well worth it—

and can literally help pay dividends.

A framework for success

In summary, the framework described here in Part I of this series, is for initiating and administering energy management as a good business practice. This can usually be accomplished consistent with the long-standing objectives of the organization, beginning with an energy policy. Look for the concluding installment, Part II, in December, when we will discuss implementation and follow-up strategies for success. **MT**

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