Practical Strategies to Implement Manufacturing Energy Efficiency Projects

How to overcome common roadblocks encountered by industrial facilities on the road to improve energy efficiency.
For many years, industrial energy usage has been consistently greater than any other sector (residential, commercial, or transportation). In 2017, the industrial sector accounted for nearly one-third of U.S. energy consumption. Energy is a key resource required to produce the goods needed for our technologically advanced society, but most energy generation methods have a significant impact on the planet through reduction of natural resources and release of pollutants. More efficient use of energy at manufacturing facilities is a “win-win” proposition: a decrease in bottom-line utility costs coupled with a reduced environmental footprint.

The immediate cost savings from energy efficiency are typically sufficient to encourage implementation of projects. This is especially true for industries where energy cost is a significant percentage of operating expenses (e.g., cement manufacturing or refining). Rigorous energy management programs such as ISO-50001 are practiced at numerous energy-intensive industrial locations. However, there are many industrial facilities where energy cost may be less than a few percent of total expenses and the potential impact of energy efficiency projects does not get enough attention.

This article focuses on facilities in which recent efforts to improve energy efficiency have not been successful for any number of reasons (outlined in the “Common Implementation Roadblocks” sidebar below). Some strategies for overcoming those obstacles will be presented.

Identifying and Quantifying Projects
Energy efficiency projects are typically identified through a third-party audit (by an equipment vendor or an independent energy consultant) or through a self-assessment such as a lean energy treasure hunt. However the projects are identified, it is critical to calculate clear estimates of the savings as well as implementation costs. This allows you to fit these projects in the company investment plan.

Strategies to Make It Happen
The roadblocks discussed above can be pushed out of the way. The solutions discussed below all have been proven to accelerate the implementation of energy efficiency projects.

Identify a Management Champion
An ideal champion is someone who has budget decision-making authority, understands the benefit of efficiency, and will directly benefit from the project. You should present a polished project summary that you are confident you can implement and you should share the project success with that champion. Once you have management support, it will be easier to implement subsequent projects.

Be Creative with Finances
Perhaps the budget is too small this year. One thing you can do is buy equipment in small quantities as funds are available. For example, a facility leader bought about 20 light fixtures each year, eventually replacing all of the shop lighting over

Common Implementation Roadblocks
There are several reasons energy efficiency projects are not implemented, even when clearly identified with quantified cost savings:

1. Investment criteria not met. Small- to medium-size plant improvement projects typically have financial criteria of simple payback, and this can be less than one-year in older facilities where immediate cost savings are required. In this situation, it can be difficult to do more than the most basic energy projects (e.g., fixing copressed air leaks, turning equipment off, etc.).

2. Competition for capital funds. The annual budget is usually fixed, so situations will arise when you may be faced with the choice of purchasing new production equipment or investing in an infrastructure project such as a LED lighting retrofit.

3. Lack of resources. Many plants run with a lean staff of maintenance/facility engineers, who focus on keeping the production line operating. Those employees may not have the time to step back and consider energy efficiency or work on implementing capital projects focused on energy.

4. Too many small projects. Some energy improvements are very small projects, such as adding controls to a piece of equipment, and consequently are overlooked because of the small impact.

5. Culture. Have you ever asked someone at a manufacturing site, “Why do we do it this way?” The answer may often be “Because that is the way we do it. We have always done it that way.” The inability to embrace change—a key requirement of the continuous improvement philosophy—can inhibit progress in energy efficiency, especially when it comes to process change.
five years. Also, be sure to take advantage of utility rebates and other programs. Rebates from your first project could be used to fund the next one. Another option is to explore alternative funding schemes such as energy performance contracting.

**Attach to Major Projects**
Replacing a piece of equipment with a more efficient one may often have a very long payback. However, if you are already spending money on new equipment or a facility expansion, an incremental investment can yield very good savings. Work with your sourcing function to build-in energy efficiency requirements for new equipment, clearly outlining the lifetime cost of operating the equipment, and not just the initial outlay.

**Group Projects**
Small projects may be overlooked because individually the cost savings seem insignificant. However, when multiple projects are grouped together, the impact becomes more noticeable. Also, those projects with longer paybacks will benefit by being combined in a group with other more immediate paybacks. In addition, a group of projects could be assigned to a single vendor to implement, perhaps with some discount due to the scale (versus multiple contracts).

**Benchmark**
Rarely do competitors share information freely with one another, but in the case of energy efficiency, most companies are willing to discuss how they have improved their own facilities, especially when energy costs are not a key component of operating expenses. This is often accomplished through presentations at trade-group meetings and conferences focusing on energy efficiency. Benchmarking is not only useful with competitors, though. Perhaps one section of your plant or a sister plant in a different location has found an energy efficiency opportunity of which you can also take advantage. You can even learn by looking outside your specific industry segment. Recall that Henry Ford’s assembly line was partially inspired by the “disassembly” line of Chicago meat-packing operations.

**Measure and Track**
It may seem obvious that with measurement and tracking you can document savings and justify additional projects. But when motivation is important, such as projects involving operational changes and decisions, having measurements of energy usage also allows you to do a variety of other things to drive changes. One technique is to track separate areas of the facility to assign utility costs to specific production units or to encourage friendly competitions between sections of the plant. In some cases, improvements can happen by simply making energy use visible on control panels or other screens inside the facility. In addition, with better measurement of energy, you can track energy costs on a per-product basis, which gives you an energy intensity metric as a key performance indicator. Be sure to include sub metering in any proposed electrical infrastructure project such as new transformers, breakers, etc.

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**New Source Review (NSR) Workshop**

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Learn the Application of PSD Rules, New Sources, and Nonattainment Area NSR

Based on the best-selling A&WMA NSR Manual, this workshop will provide attendees with a working knowledge and understanding of New Source Review rules and how to apply them in different situations, as well as the recent memoranda issued by the EPA on applicability, project emissions accounting, common control and once in, always in.

Workshop sessions will cover the following topics:

- History and Program Implementation
- PSD Applicability (case studies, netting, calculating emissions increases)
- BACT (top-down process, modifications, examples)
- PSD Air Quality Analysis (increments, baseline dates, modeling)
- Nonattainment Area NSR (thresholds, LAER, alternative analysis)
- Emissions Offsets (applicability, offsets vs. netting, emission banks)
- Permit Appeals, Review and Enforcement
- Next Generation Reforms

The NSR Manual is recommended for the Workshop and can be added during the registration process. Member, government and multi-user pricing available.

Get the latest information from the experts! Workshop presenters include authors of the Manual:

- John Evans, Senior Environmental Consultant, RTP
- Eric Hiser, Partner, Jorden Hiser & Joy
- Gale Hoffnagle, Senior Vice President and Technical Director, TRC
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Highlight Additional Benefits

Finally, do not forget to emphasize the other advantages to proposed energy efficiency projects, such as:

- **Low risk.** Compared to other investments at your facility, the calculated return on investment for energy savings is quite certain. For example, you know exactly how much power a new lighting fixture will draw versus the current one.

- **Production improvement.** Some efficiency projects can increase throughput. For instance, upgrading a natural gas curing oven to an infrared system can reduce cycle time, as well as energy usage.

- **Improved worker comfort.** Heating, ventilation, and air conditioning (HVAC) improvements, such directing the ventilation specifically where needed, can provide a more comfortable workspace.

- **Light quality improvement.** Besides the reduction in energy usage, upgrading from lamps and fixtures with a low color temperature and low color rendering index (CRI) to certain light-emitting diode (LED) solutions will give a marked increase in the ability to see more detail in order to identify defects or complete complex operations.

Summary

All production environments are unique, but following the strategies highlighted here can accelerate the adoption of energy efficient practices, reducing expenses, as well as advancing an overall environmental benefit. For more information, the Advanced Manufacturing Office of the U.S. Department of Energy (https://www.energy.gov/eere/amo/advanced-manufacturing-office) has excellent resources on industrial energy efficiency.

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References