Written by Ken Bannister Contributing Editor
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When it comes to energy efficiency around your operations, pay attention to these steps and begin counting your energy savings.

As a wartime resistance fighter, Ted Monkiewicz used his incredible ingenuity to assist the Allied forces in thwarting the Germans at every turn. Post war, he moved from his native Poland to England and used his considerable engineering talent to amass countless patents and awards for ingenious designs. While working in my early career as a junior mechanical design engineer, I was fortunate to have Monkiewicz as a mentor to teach me the hallmarks of good design practice. He advocated that to be considered a good design, there are four elements the designer must strive to incorporate:

- Design for maintainability… to allow a maintainer or operator rapid and easy access to calibrate, repair or replace parts with minimum impact to production operations.
- Design for ergonomics… allowing the operator to successfully operate the equipment with minimum fatigue and supervision.
- Design proportionally… what looks right to the eye is always trusted
- Design for simplicity… simplicity translates into reliability.

Adhering to these four principal design elements has allowed me to produce my own award-winning designs, and over the years I have added a fifth element: Design for Conservation. This addresses the reduction of an asset's environmental and energy impact over its life cycle.

Most of today's maintenance or facility management departments are caretakers of older equipment that was not designed with energy conservation in mind. Fortunately, design element #5 can be applied to any equipment—in any state—through the application of good asset management practices. The following three steps are mandatory:

- Step One is about acquiring rights to view the plant energy bill, and gaining understanding how the costs are tabulated. Establishing a working relationship with your plant utility manager—if you have one—or your local utilities representative(s) can provide knowledge of your own energy pattern use, as well as any rebate/assistance programs you could take advantage of.
- Step Two is about taking responsibility and ensuring that any energy losses relating to asset ineffectiveness and energy waste are under the direct control of the maintenance department, and that heating, cooling and generated power systems (including compressed air

and steam generation) are operating at an efficiency level no less than the original minimum design level. Understanding the direct relationship between asset management practices and energy use will deliver more control over the operating costs—for the life of the asset—thereby increasing profits and competitiveness.

- Step Three is about adopting an asset management approach toward your equipment. Previously, the business of maintenance was dedicated to the preservation of an asset through the application of assessment, evaluation, adjustment, calibration, prevention, prediction, repair and overhaul techniques, designed explicitly to assure that an asset was capable of delivering on its original design specification. The business of asset management differs in that it elevates maintenance to a more proactive and creative process that reviews not only the asset's current health, but also the consequences of its state of health and—more importantly—the consequences of its current usage pattern and design inefficiencies. To achieve this, maintenance must partner closely with production, recognizing the integral impact each has on the other and the resulting asset efficiency.

Asset efficiency translates to higher levels of reliability, uptime and throughput, while reducing energy spikes caused by induced friction and peak and cyclical loading that surpass the asset's design load limit. Introducing a value-added maintenance approach, alongside an optimized equipment usage program, will make your assets as energy-efficient as their current design will allow.

Value-added maintenance

Implementing a simple operator cleaning program not only provides the ability to troubleshoot equipment problems faster, but also eliminates the energy absorbing thermal blanket caused by machine dirt that converts energy to heat and not work. Implementing an engineered lubrication management program ensures delivery of the right lubricant, in the right place, in the right amount, at the right time, reducing bearing wear and friction to tolerable levels. Introduction of correct torquing and laser alignment eliminates energy-robbing vibration caused by mechanical looseness and misalignment.

Optimized equipment use

This type of optimization is best achieved through the collaboration of both maintenance and production planners who work to address idle time reduction through improved planning, or use of automated control systems.

In a Lean Manufacturing environment, the equipment throughout can be slowed down to produce at a slower, but more consistent rate, eliminating energy surges caused when an asset is consistently being asked to perform above its design specification in an erratic manner. This

strategy also serves to eliminate idle time—something that's very important to an operation.

In studies by the Research Institute for Energy Economics, it was concluded that during a single eight-hour shift, machine tools consumed a disproportionate 30% of total energy consumption when they were left idling during operation, breaks and non-productive time periods. If capacity is abundant and idle time still exists, then Maintenance may wish to explore turning idle time into a maintenance opportunity, utilizing the time to perform planned maintenance tasks.

Ken Bannister is managing partner and principal consultant for Engtech Industries Inc, based in Innerkip, ON. Engtech provides a wide range of production & maintenance management consulting and training services for national and international clients. He has written several books, including Energy Reduction through Improved Maintenance Practices and the upcoming Industrial Energy Efficiency Handbook. Internet: www.engtechindustries.com ; telephone: (519) 469-9173; e-mail: kbannister@engtechindustries.com