On prime movers, macro and micro

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Industry and Mother Nature have both developed highly efficient motors.

Survivor USA Plant of the Year (http://ad.doubleclick.net/click%3Bh=v8/34cd/3/0/%2a/g%3B64847277%3B0-0%3B0%3B13822371%3B384-468/90%3B19480339/19498233/1%3B%3B%7Esscs%3D%3fhttp://www.plantservices.com/articles/2005/253.html)
How maintenance and asset management helped it beat the odds.

Whether you have dozens or hundreds of motors driving your operations, if you selected them based on price rather than energy consumption, they're doing your company a great disservice. Efficient motors consume less energy and, in general, run quieter and cooler, are more reliable and last longer than conventional motors. High-efficiency motors might cost a little more upfront, but the energy cost savings over the motor's life can be tremendous.

If persistent motor failures or excessive energy consumption have you considering a replacement, some of the newer motors on the market have impressive energy credentials. If your existing motors serve their purpose, some great online resources could help you increase their efficiency. If you're interested in what the future might hold for motor efficiency, read on to learn about some amazing research currently underway.

New high-efficiency motors: Highly efficient motors benefit not only your bottom line, but our environment. The cream of the crop are National Electrical Manufacturers Association (NEMA) Premium labeled. According to U.S. Department of Energy data, the NEMA Premium efficiency motor program is estimated to save 5,800 gigawatts of electricity and prevent nearly 80 million metric tons of carbon dioxide from being released into the atmosphere during the next 10 years.

The effect is similar to that derived from keeping 16 million cars off the road.

NEMA's Motor and Generator Section established the program on the basis of a consensus definition of "premium efficiency." The premium label can be found only on products that meet or exceed the specifications, and were made by a partnering manufacturer.

Siemens Energy and Automation introduced three new lines of energy-efficient AC motors this year. Designed to meet or exceed NEMA standards, they're available in high-efficiency or NEMA Premium efficiency designs. Siemens also carries a new line of IEEE 841 motors that exceed IEEE 841 standards and provide maximum durability and operating efficiency in severe operating environments.

Remember that misapplied motors might actually diminish performance and reduce motor life, so make sure the motor you select is engineered for its intended purpose.

Increase existing efficiency: Seven tip sheets from the U.S. DOE's Industrial Technologies Program provide suggestions on how to save energy in your motor systems. Topics include avoiding nuisance trips, eliminating voltage unbalance, estimating motor efficiency in the field, extending motor operating life, aligning motor shafts, replacing V-belts with cogged or synchronous belt drives, and determining when to purchase NEMA Premium efficiency motors.

Drive energy efficiency can deteriorate over time in the absence of proper maintenance and belt tensioning. For guidance, consider using the free Gates *Belt Drive Preventive Maintenance and Safety Program*. Choose from a hands-on *Belt Drive Preventive Maintenance and Safety seminar*, a 68-page *Belt Preventive Maintenance* manual, and a weekly *Belt Tips* e-mail. Proper maintenance can minimize energy loss, reduce belt failures and increase production uptime.

Biology's role: Science could transform the way machine motors and lubricants are designed. For example, single-celled algae called diatoms provide hints about how nature handles complex engineering problems.

"The diatom motor is 99.9% efficient," says self-described armchair diatomist Dr. Richard Gordon. The University of Manitoba professor is fascinated by the properties of the microscopic biological organism. "A diatom has no moving parts, but it can push up to 1,000 times its own weight. Its motor can reverse rapidly and its motion can be controlled to some extent with light."

Diatoms also have remarkable lubricant properties. They never show signs of wear, and they move with great ease. The study of diatoms in relation to lubrication is referred to as diatom bionanotribology. Researchers in this field, like pioneer Ille Gebeshuber at the University of Technology Vienna and the Austrian Center of Competence for Tribology in Wr. Neustadt, hope to inspire innovation in lubricant in lubricant technology by understanding how the microalgae's structure and surface chemistry affect friction, stress, adhesion and wear.

The multifunctional properties of biological systems often surpass those of similar synthesized materials. If the diatom's natural nanostructure could be harvested, manipulated and evolved, it could provide a bottom-up approach to nanotechnology that overshadows today's top-down fabrication techniques. Although it's not yet known whether diatoms will have a significant effect on industry, the possibilities are certainly intriguing.

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