



125 HP and a 200 HP, 1800 rpm, 3 phase, 60 hertz, 460 volts, IEEE 841, Reliance driving process water pumps.



1250 HP, 1200 rpm, 3 phase, 60 hertz, 2300 volts, WP-II enclosed, driving stock pumps.

Motor Decisions Matter

How Motor Management Can Help Reduce Plant Operating Costs

— BY TED JONES, AND ILENE MASON

With the current economic climate putting a squeeze on capital budgets, now is the time to improve the efficiency and productivity of existing motor systems, such as pumps, fans and air compressors. According to a Department of Energy study, focusing on the efficiency of motor-driven equipment could add an additional 5 percent to the operating margins of many pulp and paper mills. Improving the efficiency of pump systems, for instance, can easily translate into lifetime energy cost savings in the range of \$200,000 to \$250,000. To quantify and justify motor system improvements, mill personnel are encouraged to analyze potential energy savings as well as maintenance savings and other system costs (environmental costs, disposal costs, etc.) over the expected lifetime of the system. A motor management system can help identify and prioritize these projects within your plant.

What exactly is motor management?

Motor management is a variety of practices that capitalize on the benefits of premium-efficiency motors (lower operating costs and improved reliability) and best

motor repair practices (maintain efficiency, optimal availability). It includes:

- A decision-making protocol based on life cycle costing for making purchase and repair/replace decisions.
- Guidelines to ensure quality repair services.
- Practical advice on making sure that the optimal motor for your critical applications will be available when you need it.

Motor Decisions Matter, a national educational campaign, is working to spread the word about the benefits of motor management and premium-efficiency motors and to empower companies to adopt these practices. Campaign sponsors include motor manufacturers, utilities, energy efficiency organizations, trade associations and government agencies. For more information, see www.motorsmatter.org.

Identifying appropriate applications for premium-efficiency motors is an important component of every motor management plan. As a result of working closely with the National Electrical Manufacturers Association (NEMA), also a campaign sponsor, a premium-efficiency specification and brand, called NEMA Premium™, was established that motor manufacturers, distributors, repair shops, energy efficiency organizations, and motor incentive program administrators now embrace. For more information, see www.nema.org/premiummotors.

Why is motor management important?

Over a motor's lifetime, its electric bill accounts for over 97 percent of its total cost. Less than 3 percent of the lifetime cost goes toward its purchase, installation, and repair. For example, consider a typical 75 horsepower motor running at full load for 6,000 hours per year. A typical purchase price would be about \$4,000. Over its 10-year life, however, that same motor will cost \$220,000 to run (based on 7.5¢ per kilowatt-hour). Obviously, small increases in efficiency translate into big savings. In this example, a one percent increase in motor efficiency translates into \$2,800 in energy savings over that time—nearly the cost of the motor.

Implementing a motor management plan often improves productivity. The first step to implementing a plan step is to understand and catalogue your motor fleet. One of the benefits of this review process is that it quickly identifies equipment with older, inefficient motors and improperly sized motors that should be replaced based on their economic performance. The economic analysis will also indicate whether these motors should be replaced immediately or upon failure. Plants that have large motors and motors running critical processes have the most to gain from the review in terms of economic return and reduced downtime.

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Motor management may also bring about reduced downtime for machine repairs. Premium-efficiency motors are typically constructed with superior materials and have more copper, tighter tolerances and longer warranties.

Motor management is about quality motor repair. Motor repair quality is an important consideration when analyzing the costs associated with motor repair/replacement decisions. Proper evaluation requires comparing motor energy use after repair versus a new NEMA Premium replacement in order to determine which option will achieve the greatest economic return. In general, the benefits of repairing an existing motor can usually be realized only if the repair achieves little or no deviation from its original specifications. For more information, see the Electrical Apparatus Service Association (EASA) guidelines on best practice repair (www.easa.com) under Industry Resources.

Finally, motor management is about planning. Too often, repair/replace decisions are based on motor availability or short-term economics, not long-range planning. Motor management provides the financial analysis tools on which to make good motor decisions and offers direction for developing cost-effective purchasing and repair/replace policies. The Motor Decisions Matter website (www.motorsmatter.org) offers a motor planning toolkit to help you get started in the development of a plan for your mill.

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Where are the savings?

Leading pulp and paper companies around the world are realizing that motor-related savings are not a one-time opportunity, but a continuous one with potential savings waiting behind every motor-related decision. To capture this opportunity, senior managers are supporting the creation of motor management systems and motor repair-replacement policies for all their plants. As the motor-efficiency projects below demonstrate, the investment required is modest and quickly recouped in the

form of enhanced productivity, reduced operating costs, lower maintenance costs.

WEYERHAEUSER. Weyerhaeuser has saved an estimated \$2.5 million in energy costs since implementing a motor management plan five years ago. To develop its motor management system, Weyerhaeuser developed a cross-functional team to examine current motor purchasing and rebuild practices and to make a corporate decision concerning how this should be done in the future.

One of the major goals was to reduce the “total cost of ownership” of motors and motor-driven equipment. This involved looking at energy costs and how purchasing and installing premium energy efficient motors can reduce energy costs. Another important task was to inventory the company's motors. Data recorded included motor descriptions, full nameplate data, the age of the

motor, operating hours per year, operating efficiency, ammeter load checks, rewind history, as well as special electrical and mechanical characteristics.

Upon completion of its examination, Weyerhaeuser was able to make the following conclusions about its new motor management policy:

- All new motors purchased shall be IEEE Standard 841-1994 motors.
- All motors 50 HP or less that fail should be replaced with new IEEE Standard 841-1994 motors.
- All motors greater than 50 HP that fail should be evaluated using MotorMaster+.
- All motor repairs should follow a specific written Motor Repair and Rewind Specification.
- Life cycle cost for all existing motors should be evaluated using MotorMaster+, a motor systems management program distributed by the US Department of Energy's Best Practices Program. (See MDM website for details)

Development of a motor management plan and decision tree has helped to keep Weyerhaeuser's operation running smoothly by streamlining the way motor decisions are made, creating specifications for motor repair and rewinding, and helping to reduce energy and maintenance costs.

CROWN PACIFIC LUMBER. In late 2000 and 2001, Crown Pacific was involved in an extensive upgrade of its Gilchrist Mill. At the same time, electricity prices were expected to increase about 20 percent in the area.



Todd Hester, Electrical Superintendent at Crown Pacific Lumber, instituted a plan to review motor operating costs in the company's procedure for all motor repair/replace decisions.

In an effort to help lessen the cost of the rate hike, the mill electrical superintendent, Todd Hester, completed an inventory of the mill's 300 motors ranging in size from 3 hp to 600 hp. The data collected included motor ID number and location, amps and volts, nameplate data, original cost, vendor, number of rewinds and repairs, date put into service,

bearing numbers and type, lubrication data, annual operating hours and annual operating costs. Later this information was downloaded into a computer for future

analysis to determine whether it was more cost-effective to repair or replace a failed motor and to track maintenance information.

After inventorying about 10 motors, it was discovered that two motors were each costing Crown Pacific about \$49,000 per year in electrical costs. The annual cost to run each motor was eight times the cost to buy a new one. Both motors were used to operate the mill's two main air compressors. The inventory triggered further analysis. The company learned that with the addition of a new control system they could substantially reduce the run time for one of the air compressor motors, reducing the number of motors needed from two down to one, without sacrificing performance. Preliminary calculations indicated savings of about 2 million kWh per year, or about \$60,000-\$102,000 in energy costs, providing a payback period on the control system of less than two years.

Before Crown Pacific's introduction of a motor management system, motors were automatically sent out for repair when they failed, regardless of performance. Now the company routinely performs a more thorough analysis of repair/replace options.

"We didn't have the tools to see what to do with the motor," says Todd Hester, Crown Pacific's electrical superintendent. "Now we can look at the database and know whether or not to rewind the motor or to purchase a new or energy-efficient motor."

Crown Pacific is now in the process of establishing a formal policy on conducting this type of analysis on each failed motor. For more information on Crown Pacific and motor management, see the case study on the MDM website (www.motorsmatter.org).

How can my company get started?

Developing a motor plan puts managers in the driver's seat to make the most cost-effective decisions when motors fail. And by embracing electric motors as a cost of production, the same way American industry looks at labor costs and material costs, managers can improve their facility's overall efficiency and its bottom line. For more information about Motor Decisions Matter, visit www.motorsmatter.org or contact the DOE's Office of Industrial Technologies Clearinghouse at 800-862-2086. ■

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