

One way distributors can help customers plan motor replacement or repair and add value is by offering predictive maintenance, such as thermograph imaging to point out motors that are running hot. Other methods of identifying failure candidates include vibration and current signature analysis.

*Photo: Snell Infrared, Montpelier, Vt.*

# Money-saving motor decisions

Accompany customers on the road to motor failure, and they'll thank you for it.

These days, every chance you have to help customers save money must be exhausted. An often overlooked opportunity: Many industrial motors are being repaired again and again when they actually should be replaced upon failure. Upgrading to energy-efficient or National Electrical Manufacturers Assn. (NEMA) premium-efficiency motors will more than likely save your customers money in the long-term. But, proper motor replacements are best planned in advance rather than hastily arranged during downtime.

While the up-front investment is larger for energy-efficient motors, the acquisition cost of a motor is only a small portion of the lifetime ownership cost of operating and maintaining the motor. According to the Consortium for

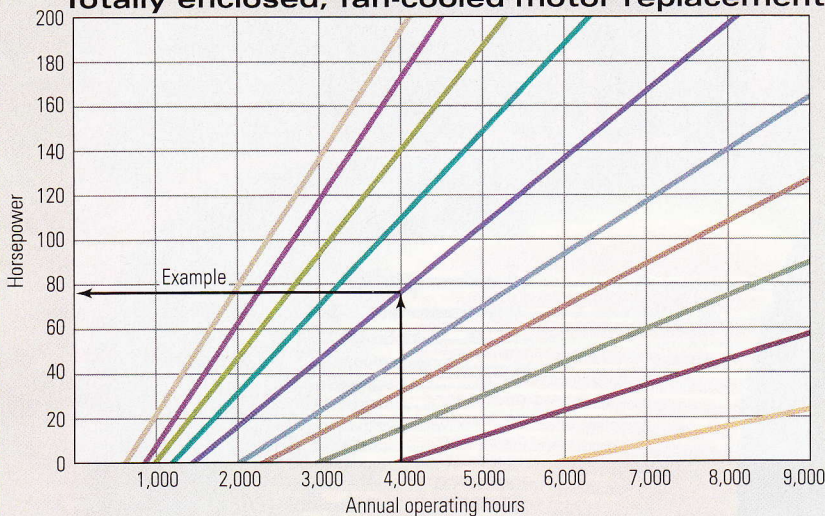
Energy Efficiency (CEE), the average standard efficiency motor can consume 40 to 60 times its initial purchase price in electricity during a typical 10-yr operating period. While the advantages of upgrading are clear, customers do face obstacles. With minimal investment, a distributor can become proactive in helping customers implement a motor plan before a downtime situation results in quick, unguided decisions. The value-added service may earn repeat business.

Motor planning can help customers link capital and operating budgets. Customers capture savings they don't normally have time to consider, and managers make decisions more quickly. Pre-planning also reduces downtime because distributors and repair shops are prepared to respond.

---

Elizabeth Lear, Managing Editor

## Totally enclosed, fan-cooled motor replacement



In this sample horsepower breakpoint chart, the hp breakpoint is about 75 hp for facility operating hours of 4,000/yr and an average electricity cost of \$0.08/kWh. So, at failure, a totally enclosed, fan-cooled motor at 75 hp or below that is not already energy-efficient should be replaced with an efficient model. This chart is based on 1,800-rpm data. The chart assumes a 2-yr or less payback, average motor loads of 75%, and 40% average discount rates off new motor list price.

Source: "Horsepower," Industrial Electrotechnology Laboratory

## Making plans

For every six motors that fail, one is replaced with a new motor, while five are either repaired or replaced with a rebuilt motor, according to Rob Boteler, director of marketing, Emerson Motor Technologies, St. Louis. The latter five represent opportunities for NEMA premium-efficiency motor replacement, points out Boteler, who also chairs the Energy Management Task Force for NEMA. Making the transition happen just takes a little forethought.

Any facilities manager developing a motor plan will need the involvement of distributors and suppliers to make sure products are in stock when needed, either through purchase of a spare or arranging for a distributor to stock a replacement. By understanding the basics of a solid motor management plan, the distributor is ready to help.

The Electric Apparatus Service Assn. (EASA) encourages its distributor members to initiate discussion with their customers regarding the need for a formalized action plan. Some plant engineers have an idea of what they'd do in a given motor failure situation, but if

it's not down on paper, may just opt for the quickest solution during downtime.

Because energy consumption is such a large part of a motor's total life cycle cost, one may wonder why every plant doesn't already have a plan. Linda Raynes, EASA President and CEO, says there may be hesitation because a customer thinks a large asset management program is required, or there's a need to do a complete motor inventory. Actually, in some cases, she says, merely making a decision on whether to replace or repair key motors once they fail helps immensely. And, many utility campaigns and other efficiency awareness efforts tend to overlook small and medium-size plants, where a basic spreadsheet is likely all that is needed to document a motor plan.

## Keeping inventory

The Motor Decisions Matter campaign's "Motor Planning Kit" suggests that the most comprehensive approach to planning motor decisions requires an inventory, or complete list of facility motors. A repair/replace decision should be documented for each motor

along with a list of spares. One of the areas where a distributor can really help a customer is with an inventory. This includes identifying critical motors and assisting the customer in setting up inventory tracking. This can be absorbed as a marketing cost, but Neal Elliot, spokesperson for the Motor Decisions Matter campaign, says some distributors have succeeded in offering it on a fee-for-service basis. Distributors can also look at and track past customer behavior to identify trends.

"I think this is where we're moving to the proactive to reach out and offer a service to the client," says Elliot.

Boteler emphasizes the importance of talking not only to integrators and engineers, but also to upper management, approaching total facility evaluation and motor upgrades as an investment. Emerson offers spreadsheet tools to help build an inventory of a facility, taking into consideration the particular energy costs, motor age, actual hours of operation, and so forth.

When the distributor shares information on motor purchases and service, and the customer returns information on which motors are critical, that helps the distributor know what motors to stock for a customer. With a communicative relationship, the motor purchase moves from a commodity purchase where the lowest bidding supplier gets the sale, to a distributor being able to charge more for value-added service. While this approach is common in other businesses, it is not something that's historically been done well by the vast majority of motor or drive shops, says Elliot.

When a distributor knows what his customers are using and can predict their needs, he can stock a motor that 40 of his customers use, because there's a good chance it will be sold. And, stocking the premium model avails the option of selling up. Stocking a specialty motor though, is a service customers should expect to pay for, whether in the purchase price or as a fee.

Manufacturers are helping in this effort. For example, Emerson offers price incentives to distributors, to ensure

their premium efficiency products are immediately available when the end user needs a replacement.

"If you're smart and you show value, you can get out of this nickel-and-dime game, which is a part of what's hurting the motor industry," says Elliot. If you differentiate yourself with a value-added relationship, you'll make more profit on sales and earn loyalty.

## Selling efficiency

Common sense says everyone should buy the most efficient motors available for the job. But, premium-efficiency motors do carry a higher initial price tag than standard-efficiency motors. A distributor who understands efficiency issues can help determine whether an efficient motor is actually the best choice for a particular application — and sell a customer on the upgrade. This goes beyond promising lower electric bills.

Aside from lower energy costs, new energy-efficient and premium-effi-

## Motor management plan

A motor plan can be simple or very detailed. Any plan is better than none. The "Motor Planning Kit" suggests facilities managers do the following:

- Establish a motor purchase policy to simplify the process of buying a premium-efficiency motor, when appropriate, so the purchase paperwork does not create an unnecessary impediment.
- Identify the facility's horsepower breakpoint and make repair/replace decisions based on it or another decision rule determined prior to motor failure.
- Replace motors right away with the best spares available as economically feasible.
- Form a relationship with motor experts at your distributor.
- Develop your own motor repair specification for each of the motor repair facilities with which you work.
- Establish an inventory of all motors operating in the plant with special attention on motors critical to the process for your product/service.
- Track motor performance every time a motor is taken out of service.

## Knowledge is power

A wealth of information detailing efficiency, motor selection, and motor plan development is available free-of-charge on the Web. Sure, customers can download these on their own, but there's a lot of value in pointing out a particular piece that may be helpful, says Elliot.

- At the Motor Decisions Matter campaign Web site, download the "Motor Planning Kit" and link to other efficiency resources.

### [www.motorsmatter.org](http://www.motorsmatter.org)

- The Office of Industrial Technologies Clearinghouse offers literature and media to help increase industrial energy efficiency and productivity while reducing waste and pollution. Request the "Horsepower" bulletin with breakpoint charts and MotorMaster+ software.

### [www.oit.doe.gov/clearinghouse/](http://www.oit.doe.gov/clearinghouse/)

- EASA offers do's and don'ts on how to maintain efficiency when rebuilding motors. Members only section offers technical information, but an accessible industry info section offers guides for understanding efficiency and making repair decisions. Information on EASA's national convention in June is available.

### [www.easa.com](http://www.easa.com)

- Advanced Energy offers methods for identifying motors in a single facility or company-wide. Motor survey how-to guide explains how to gather data such as motor load and nameplate information.

### [www.advancedenergy.org/industrial/publications](http://www.advancedenergy.org/industrial/publications)

ciency motors have other benefits as well, according to "Efficient Motors: Selection and Application Considerations," from the CEE, including:

- ✓ Many efficient motors run cooler and are more likely to withstand voltage variations and harmonics better than less efficient motors.
- ✓ Many efficient motors have a slightly higher power factor on average than their standard counterparts.
- ✓ Most efficient motors operate more quietly than standard motors.
- ✓ Manufacturers often provide extended warranties on efficient motors.

But, Raynes cautions that it's never a black-and-white decision. A premium-efficiency motor, for instance, doesn't necessarily run cooler. Each application is different and needs to be treated as such.

EASA's "Understanding Energy Efficient Motors" warns of several other common misconceptions regarding energy-efficient motors, and states that an oversized motor is not necessarily less efficient, and a more efficient motor does not always have a higher power factor. One thing that can offset the efficiencies of a premium motor is high in-rush current, which can translate to high peak demand charges, notes Boteler.

Sometimes repair is a more viable

option than replacement, even in terms of efficiency. EASA is currently undertaking a study with its U.K. sister organization, the Assn. of Electrical and Mechanical Trades, to determine the impact of rewinding on large motor efficiency. A similar study was conducted previously on small motors and found that they can be rewound without compromising efficiency. The results of the large motor study are slated for release later this year.

In many cases the payback on purchasing an efficient motor is relatively short. Distributor and service providers should be able to help customers gauge the real payback period for a given application. Raynes says that in some cases people assume greater potential energy savings than is realistic. The whole application really needs to be examined because a premium motor coupled to an inefficient drive isn't going to realize cost savings.

Customers may look to a distributor to help determine potential energy savings of premium-efficiency motors for their particular processes. Distributors should be prepared, for example, to compare the operating cost of an existing standard motor with an appropriately sized energy-efficient replacement. To do this, you'll need to determine operat-

ing hours, efficiency improvement, values, and load. Keep in mind that most electric motors are designed to run at 50 to 100% of rated load, and maximum efficiency is near 75%. Resources are available from government agencies, trade associations, and motor manufacturers to walk both you and your customers through this process.

The Motor Challenge fact sheet "Determining Electric Motor Load and

Efficiency" offers several load and efficiency calculation methods. It recommends surveying and testing all motors running more than 1,000 hr/yr and dividing into the following categories:

- ✓ Motors that are significantly oversized and under loaded — replace with more efficient, properly sized models at the next opportunity, such as scheduled plant downtime.
- ✓ Motors that are moderately over-

sized and under loaded — replace with more efficient, properly sized motors when they fail.


- ✓ Motors that are properly sized but standard efficiency — replace most of these with energy-efficient models when they fail. The cost effectiveness of an energy-efficient motor depends on the number of hours the motor is used, electricity price, and the energy-efficient motor purchase price.

Several software calculation tools can also help determine efficiency and suggest proper replacements. For example, MotorMaster+ software automatically determines motor load and efficiency values when measured values are entered into its motor inventory module. A built-in database provides new motor price and performance data and other energy management features, such as replacement analysis, maintenance logging, inventory control, energy savings, and life cycle cost analysis. This software is available from the Dept. of Energy (DOE) Office of Industrial Technologies. Individual motor manufacturers also offer software tools based on their product lines. For instance, Baldor Electric Co., Fort Smith, Ark., recently introduced BEST software, which calculates the annual electricity of an existing motor, based on nominal efficiency, compared to efficiency of the company's standard and premium-efficiency motors. The complimentary software recommends, by catalog number, the best Baldor motor for the applications and notes the payback period in months for replacing the existing motor.

Horsepower breakpoint charts are another tool that can help with repair/replace decisions. Outlined in the Industrial Electrotechnology Laboratory's "Horsepower" bulletin, these charts use electricity prices, annual operating hours, motor enclosure type, and motor speed to determine a motor horsepower breakpoint. Motors above the breakpoint are repaired, and those below the breakpoint are replaced. Chart are available for totally enclosed fan cooled and open drip proof motors, and three speeds: 1,200, 1,800, and 3,600 rpm. ■

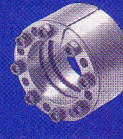
To comment on this article, e-mail [llear@penton.com](mailto:llear@penton.com).



# B-LOC BEATS EM ALL







**For over 20 years, our goal has been to provide the widest selection of Keyless Frictional Shaft/Hub Locking Devices at the best price from the largest inventory in the business. It's no wonder industry relies on us, and no surprise that we continue to beat the competition every time.**

**NEW COMPLETE LINE CATALOG!**



## B-LOC

KEYLESS SHAFT/HUB LOCKING DEVICES

### 800-865-7756

B-LOC CORP. 26 GILBERT STREET, MONROE, NY 10950 TEL: 845-782-5650 FAX: 845-783-0271

[www.b-loc.com](http://www.b-loc.com)

Circle 31