

Motor Decisions Matter_{SM} – A Motor Industry Collaborative Aims to Transform Corporate Decision-Making

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ABSTRACT

Motors fail every day, but in the rush to return equipment to service few motor managers take the time to evaluate their options. As a result of poor decisions many companies pay more than necessary to run their motors and are not taking the steps necessary to assure optimal performance. To address this situation, motor manufacturers, motor service centers, utilities, and government agencies are mobilizing a national awareness campaign to promote the benefits of effective motor management.

Companies that adopt a motor management program are in a stronger position to optimize their decisions when motors fail. Motor management includes a range of activities including establishing standardized repair/replace policies to evaluating current motor stock, identifying cost effective repair/replacement strategies through proper evaluation, drafting a written motor management plan (or policy) and communicating with suppliers to secure the availability of desired motors and motor repair services.

Amidst growing concern over escalating energy prices, the Motor Decisions Matter campaign reaches out to upper-level decision-makers to institutionalize motor management. This paper (accompanied by a separate poster session) provides background information on the campaign, explaining how this unique collaborative effort came together, and how it intends to highlight the benefits of sound motor management to senior-level managers.

Campaign Summary

In 2000, a diverse group of motor industry stakeholders, including motor manufacturers, motor service centers, utilities, and government agencies recognized that commercial and industrial customers were not making the most cost-effective decisions regarding when to repair or replace motors. Deciding whether or not to request premium-efficiency or standard efficiency motors further complicated the process as did requesting specific types of repair services. Each stakeholder agreed that raising national awareness on the benefits of evaluation and planning in advance of motor failure could help consumers make better, more cost-effective decisions.

The Motor Decisions Matter campaign is a vehicle to help mobilize national awareness of motor management. The goal of the campaign is to reach upper-level managers and raise their awareness of the energy, financial, and operation implications of common motor decisions.

The campaign's approach is to create a national message that can be reinforced by local programs through various industry associations (and their members) and other non-program related venues. More importantly, however, the campaign targets a key decision-making group that have historically been difficult to engage, senior-level managers, especially financial and operational managers. Effectively reaching this audience is crucial to affecting long-term corporate behavior. The campaign plans to introduce the benefits of motor management to this audience in a variety of ways, including: 1) placing high-level, "business-oriented" articles and public service advertising, 2) reprinting articles and information tools for local delivery via existing programs, 3) highlighting companies that have benefited from motor management, 4) making a compelling case that links effective motor management and business performance, and 5) recommending a motor management policy as an easy to implement strategy to confront a growing energy crisis.

Building national awareness of motor management benefits a variety of stakeholders. Individual companies that institutionalize a motor management system have the most to gain through significant energy and emission reductions, lower operating costs and increased process reliability. For energy-efficiency programs administered by utilities and state governments, the campaign presents an opportunity to increase the effectiveness of existing motor programs by incorporating a broader (motor management and ultimately a motor systems) approach into their industrial programs. For motor manufacturers, distributors, and service centers, the campaign offers an opportunity to grow their businesses through increased sales of products and services.

Problem Statement

Since the Energy Policy Act (EPAct) established minimum efficiency standards for motors in 1992, there has been increasing activity in the public and private sectors to promote motors with even greater efficiency, also known as "premium motors." However there are a variety of difficulties in getting customers to pay attention to motor efficiency, including: 1) high information costs, 2) undefined opportunity costs, 3) multiple stakeholders with different definitions of efficiency, 3) changes in motor terminology and technology, 4) a lack of awareness and adoption of motor management practices, 5) established business decisions patterns that re-enforce the "status quo", and 6) a lack of evaluation and analysis.

The Motor Market

The size and complexity of the motor market make it a difficult one to address. Many larger motors stay in service for over 20 years, which means turnover in motor stocks can take a long time. Approximately 12.4 million electric motors of more than 1 horsepower are in service in U.S. manufacturing plants. Nearly \$1 billion (\$862 million) is spent by 2 million new motors every year by original equipment manufacturers (OEMs), distributors, dealers and resellers. Approximately 2.9 million motors fail every year, with 600,000 resulting in replacement. The rest are repaired.

There are approximately 12 major motor manufacturers represented in the market. The distribution channels for motors include manufacturers, original equipment manufacturers (OEMs), distributors, and resellers/dealers (Figure 1).

Roughly 40 percent of new motors reach end-users as discrete, stand-alone components. Most of these are sold by distributors who may be large electrical supply houses, motor service centers, or specialty distributors.

The remaining 60 percent are sold to original equipment manufacturers for use as components in motor-driven equipment. Importantly, while many of these businesses sell and service motors, very few provide energy-efficiency services such as helping customers evaluate motor decisions or establish motor management plans. (Cockrill 2000)

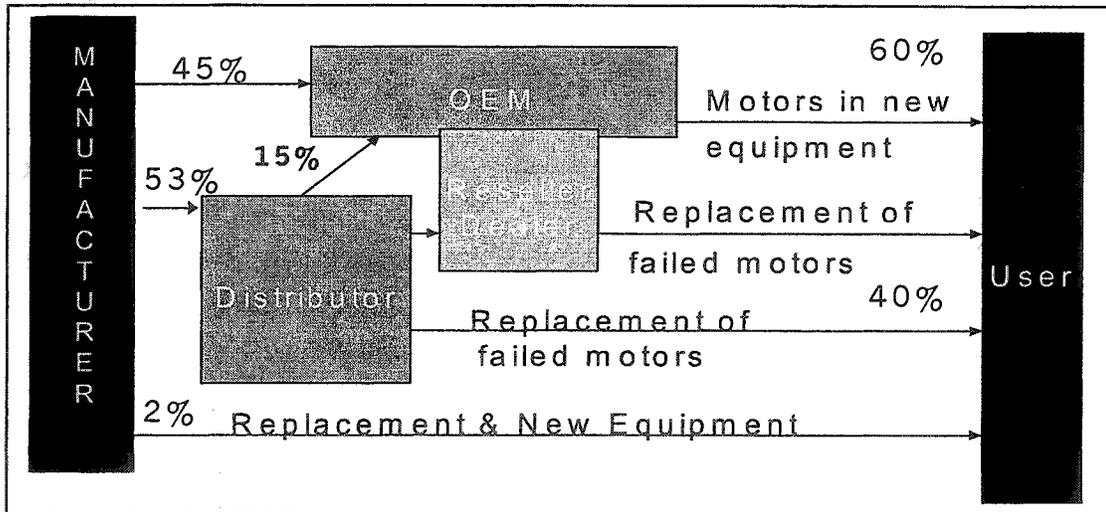


Figure 1. Percent of Motors Sold Through Distribution Channels (NEMA 2001)

Motor Decision-Making Process

Facility managers and engineers often lack the time and resources to think about motor management. As a result, the process to restore service when a motor does fail can resemble something close to “panic” – with little time for serious evaluation. Unfortunately, potential improvements in motor performance often fall short of the most immediate of all – getting the shaft to turn again.

Because there is little time to explore alternatives, facility staff can easily overlook recent advances in motor technology and their economic benefits. The costs associated with such short-term decision-making can be high, resulting in higher operational costs, poor equipment performance and unreliable service. For example, over the life of a 20 HP motor operating 8,000 hours per year energy costs can exceed \$80,000. Should the industrial customer pay \$600 to repair this motor, spend \$1,100 for a standard-efficiency (EPAct) motor or \$1,300 for a premium-efficiency motor? In this instance, the price premium spent on replacing a standard motor with a premium-efficiency motor is negligible compared to saving \$2,570 over the life of the motor.¹

¹ Based on 75 percent load factor, a 10 percent discount rate, an electricity rate of \$0.04/kWh, and 35 percent motor list price discount (using 1999 MotorMaster+ 3.0 data).

While these energy savings can be lucrative, they are not guaranteed. Managers can easily miss this opportunity when confronted with repair/replacement decisions because there is no time or easy way to evaluate the economics. Compounding the problem is the fact that few of those selling motors or motor repair services offer assistance to customers with regard to evaluation. Motor distributors, dealers and service centers are not to blame, they are only responding to customer demands. Customers simply do not demand evaluation and planning services very often. (Jones 2000)

In 1998, the U.S. Dept. of Energy (DOE) found that motor management – including motor planning, evaluation, analysis, procurement, and repair – to be an under-served market overall.

- Only 19 percent of personnel at U.S. industrial facilities were aware of “premium-efficiency” motors;
- Only 11 percent of customers reported having written specifications for motor purchases; (only two-thirds of these customers included efficiency in their specifications);
- Only 12 percent of customers reported that they consider lower energy costs of new motors in the rewind versus replace decisions; and
- Very few customers provide specifications to rewind contractors even though improper rewinding can reduce motor efficiency by 1-2 percent. (DOE 1998)

Inconsistent Definitions and Claims

With the onset of minimum federal efficiency standards, motor efficiency terminology has changed and is partially to blame for added confusion in the market. The nameplate on an older motor may indicate that it is “energy-efficient” when it is really below today’s standard efficiency levels. Today, more motor manufacturers are offering “premium-efficiency” products that exceed federal minimum efficiency standards. Unfortunately, there is still little consistency in what constitutes premium-efficiency among manufacturers even though their products are likely to reduce operating expenses in a cost-effective manner.

In addition to the confusion (or lack of awareness) with regard to specifying an efficient motor, there is even less awareness regarding how to specify a good motor repair. The Department of Energy and the Electrical Apparatus Service Association (EASA) have developed guidelines to help customers evaluate motor repair services. (EASA 1998; DOE 2000) Part of the problem is that few customers know that these tools exist. Motor service professionals could play a critical role in helping customers evaluate motor decisions using these and other tools.

The Efficiency Opportunity: What’s at Stake

Electric motor systems account for more than half of all electricity consumed in the United States and almost 70 percent of manufacturing sector electricity consumption. Motor electricity consumption can approach 90 percent of some industries’ (e.g. pulp and paper, textiles) total electricity bill. According to the U.S. Department of Energy, greater attention to motor management can reduce motor-related electricity costs by up to 18 percent while also boosting productivity, reliability *and* profitability. (DOE 1998)

According to DOE, motor-efficiency upgrades can achieve potential savings of about 19.8 billion kWh per year. Improved methods of repairing motors can contribute an additional 4.8 billion kWh of savings. Energy savings from motor system efficiency improvements are potentially much larger: 37-79 billion kWh per year.

With every decision to repair a motor and every decision to replace a motor, there is an opportunity to optimize motor-driven equipment and improve industrial productivity. The problem is that industrial decision-makers are not aware of this opportunity. If they are aware of the opportunity, there is seldom time enough to conduct the needed analysis. And if the analysis is available, there is no guarantee that the desired replacement motor or motor service is available.

Why Motor Market Stakeholders Came Together

During the Summer of 2000, the Consortium for Energy Efficiency (CEE) led a series of meetings with its members and the National Electrical Manufacturers Association (NEMA), the Electrical Apparatus Service Association (EASA), the Department of Energy-Office of Industrial Technologies (DOE-OIT), and the Environmental Protection Agency (ENERGY STAR®). While each of the organizations provides a valuable service to the industrial market for motors, each often delivers a different message (or no message at all) when it comes to motor efficiency and performance. Rather than debate the merits of repairing or replacing motors, CEE found consensus among the participants regarding the need for consistent specifications terminology and planning.

The Motor Decisions Matter campaign is an opportunity for various participating organizations to work together on a single national campaign while achieving their different goals. Through a single, collaborative campaign the energy-efficiency community can realize energy savings, manufacturers of new motors can increase sales of their high-end products and the motor services industry can attract and maintain more customers for high-quality motor repairs.

Public Energy-Efficiency Programs

The Consortium for Energy Efficiency (CEE), a national, non-profit public benefits corporation, promotes the manufacture and purchase of energy-efficient products and services. Its members include utilities, statewide and regional market transformation administrators, environmental groups, research organizations and state energy offices. Twelve of its members have programs that promote premium-efficiency motors as defined by CEE in 1996 and provide incentives in the order of \$5.5 million annually.

Utility programs targeted at industrial and commercial motor users can provide substantial value to key customers. Motors programs are among the most common and effective programs offered by utilities to their commercial and industrial customers. By enabling a customer to cost-effectively reduce its energy bill without compromising motor performance, a utility provides a valuable service. Utilities and others participate in CEE's Premium Efficiency Motors Initiative in a variety of ways, including:

- developing motor selection recommendations for educational campaigns;
- as the basis for purchasing specifications;

- customer rebates or financing for purchase of qualifying motors;
- distributor rebates for purchase or stocking of qualifying motors; and
- selection of qualifying motors as a condition for receiving a customized incentive

Local and regional programs participating in CEE's motors initiative are supporting the Motor Decisions Matter campaign, anticipating that it will help increase program effectiveness. Working closely with non-utility sponsors, such as motor manufactures, trade and professional associations, and service centers will likely increase the visibility of the motor management issue and provide additional allies in the market. For instance, the Northeast Energy Efficiency Partnerships (NEEP) expects to use the Motor Decisions Matter to complement its regional motor program, "MotorUp." The campaign will give MotorUp additional visibility and reach by equipping its members with materials that link it to the national campaign. By targeting financial decision-makers, the campaign will also potentially increase the program's effectiveness. According to NEEP Program Manager Jon Linn, "Once the national campaign is underway, the Northeast effort will be bolstered by weaving together materials and awareness among all participants. The regional and national efforts will work together to make the combined message more effective than the sum of its parts." (Linn 2001)

Motor Manufacturers

For more than 70 years, the National Electrical Manufacturers Association (NEMA) has been developing standards for the electrical manufacturing industry. The association represents nearly all of the motor manufacturers selling products in the United States. NEMA is interested in supporting a national motor awareness campaign and its members want to forward the campaign's materials to their distributors and sales representatives nationwide.

In late 2000, the member companies of the NEMA Motor and Generator Section established a NEMA Premium™ energy-efficiency motors program. This program provides high energy-efficient products that meet the needs and applications of users and original equipment manufacturers (OEMs) based on a consensus definition of "premium efficiency". It also provides for the use of a NEMA Premium logo for qualifying premium products. According to Rob Boteler of Emerson Motors, "When coupled with the NEMA Premium Motor program, the Motor Decisions Matter campaign will provide energy savings opportunities previously unrealized by American industrial and commercial firms." (NEMA 2000)

Motor Repair Industry

The Electrical Apparatus Service Association, Inc. (EASA) is an international trade organization of more than 2,500 electromechanical sales and service firms in 32 countries. EASA represents roughly 50 percent of the industry in the United States. Through its many engineering and educational programs, EASA provides members with a means of keeping up to date on materials, equipment, and state-of-the-art technology. EASA also supports the Motor Decisions Matter campaign and considers it an opportunity to enlighten its members about new service opportunities to add to their traditional repair and sales business. These

include motor management and improving energy efficiency. Just as important, the campaign will help convince end-users of the value of such services.

Federal Government

Both the U.S. Department of Energy (DOE) and the Environmental Protection Agency (EPA) support the Motor Decisions Matter Campaign. Since 1991 DOE's Motor Challenge program has developed a number of tools and services to help industrial customers realize motor and motor system savings, including Motor Master™ software and showcase demonstrations. Today, DOE's BestPractices, an initiative of the Department of Energy's Office of Industrial Technologies, offers a variety of tools to improve plant energy efficiency, enhance environmental performance, and increase productivity for a variety of industrial systems –motors, steam, compressed air, combined heat and power, and process heat – plant-wide. Motor Decisions Matter is an opportunity for DOE-OIT to make more industrial companies aware of its publicly available tools and services.

In addition, the ENERGY STAR® -a joint EPA and DOE program - is interested in finding new ways to encourage the design and manufacture of electric motors with improved energy performance. ENERGY STAR is a voluntary labeling program designed to identify and promote energy-efficient products, in order to reduce carbon dioxide emissions. On April 6, 2001, EPA issued a draft specification for an ENERGY STAR electric motor. The primary objective of the ENERGY STAR label is to recognize the subset of the market that is defined by the specification as “energy efficient.” To complement its motor activities, EPA supports the Motor Decisions Matter Campaign as yet another way to help increase consumer awareness of more efficient motors and motor management. The campaign could also help introduce and deliver the ENERGY STAR brand to industrial customers.

MDM Strategy

The strategy of the campaign is to develop a high-level, “business” message that translates the benefits of motor management into terms that senior plant and corporate management will understand and find compelling. CEE members and supporting industry stakeholders can then incorporate this message into their marketing materials. A marketing firm will be hired to help develop the campaign's identity, message and introductory materials. CEE and participating industry stakeholders will deliver the campaign in two ways:

Regionally and locally. Regional and local delivery is achieved through CEE members and participating industry stakeholders, such as EASA and NEMA members.

Nationally. CEE and the marketing firm will coordinate a three-year national marketing effort to support local implementation of the campaign. Those responding to the campaign will receive a Motor Decisions Tool Kit and referrals to participating utilities, and motor repair centers/distributors for further information and technical assistance.

MDM Products

While excellent information and tools exist regarding the purchase and repair of premium-efficiency motors, most industrial managers are either unaware of this information or how better motor management can benefit them. Packaging this information and creating a consistent message would allow CEE members and industry partners to quickly take advantage of this opportunity.

A set of initial evaluation and planning tools could help industrial customers develop the motor management plans that are being promoted by the campaign (Table 1). The goal is to introduce tools that can make the planning and evaluation process easier for the customer. Once these decisions are incorporated into a motor plan, it is more likely that an energy-efficient approach will be selected when motors fail. It is thought that the credibility of the MDM message and tools can help convince customers of the value behind motor management and planning.

To increase the likelihood that customers would be receptive to the tools and achieve success with them the Campaign's Advisory Committee is selecting tools that are simple, objective, easy to access, and free. Other more rigorous analysis tools could be referenced for future use. In addition, case studies will be included that demonstrate the potential benefits of motor projects.

Table 1. Motor Decisions Matter Tool Kit

| | |
|------------------------------------|--|
| Evaluation & Planning – | On-line Motor Policy Generator |
| <i>Reference:</i> | DOE-Management for Motor Driven Systems DOE-Motor Master Plus |
| Repair CMI – | Guidelines to a Good Motor Repair |
| <i>Reference:</i> | DOE Repair Tech Brief DOE Repair Spec EASA AR 100-1998 EASA Tech Note 16 EASA - A Guide To AC Motor Repair and Replacement |
| Replace – | CEE Motor Selection Brochure |
| <i>Reference:</i> | DOE Buying an Energy Efficient Electric Motor NEMA-CEE Premium Specifications Motor Master Plus |
| Case Studies | To Be Decided |

The campaign is planning to make these and other motor decision tools available through the campaign's web site and through a national clearinghouse. Campaign sponsors may also choose to make campaign materials and tools available to their members in the field. Marketing materials developed by the campaign will be used by the sponsors and their members to:

- raise awareness about the issue nationally (and through member programs),
- package existing decision-making tools, making them more accessible, and
- put interested customers in contact with campaign supporters to develop custom motor management plans and provide technical assistance.

MDM Status

Planning for the campaign started mid-year of 2000. Plans are underway to assemble campaign advisory committee of sponsors (Table 2). A marketing firm will be hired assist in the development of campaign materials and to prepare for the campaign's launch in June 2001. The first year of the national promotional phase of the campaign will run from June 2001 to June of 2002. After this time, the campaign will be modified to be consistent with the opportunities and market issues at that point. In Years 2 and 3, CEE will continue to provide its supporting role by making campaign materials available to campaign participants and maintaining national promotional efforts. As part of the campaign, an evaluation will be conducted during Year 3 to estimate the effect on the market.

Table 2. Motor Campaign Sponsors

| | |
|---------------------------------------|--|
| National Grid USA | Long Island Power Authority |
| Northwest Energy Efficiency Alliance | Midwest Energy Efficiency Alliance |
| Sacramento Municipal Utility District | Copper Development Association |
| Conectiv | Baldor Motors |
| NEMA | Northeast Energy Efficiency Partnerships |
| EASA | |

Conclusion

Motor Decisions Matter represents a unique opportunity for multiple stakeholders to speak with one voice on the value motor management brings to commercial and industrial customers. With recent changes in energy prices, supply and reliability, this message is an extremely timely one. For the first time, public energy-efficiency programs will be able to work hand-in-hand with motor manufacturers, service providers and the federal government on a national campaign, reinforcing a common definition and message to customers. Its success will also clear a path to tapping even greater savings afforded through motor system optimization.

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