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If your operations rely on these workhorse machines, you may want to brush up on their care and feeding.

The true workhorses of industry, electric motors, provide the means to convert electrical energy into a meaningful and measurable output. Because they are so prevalent and critical to industry, the ability to accurately diagnose, predict and efficiently deal with motor problems is essential to maintenance, engineering and operations personnel.

One of the bigger challenges is being able to recognize, diagnose and remedy an evolving motor problem—*to the point that you can prevent an unexpected catastrophic event.* Understan ding the basic visual, mechanical and electrical maintenance techniques will help you in this quest to keep large electric motors on line and producing.

The U.S. Department of Energy estimates that approximately 63% of all electricity used in industry is for process motor system energy.

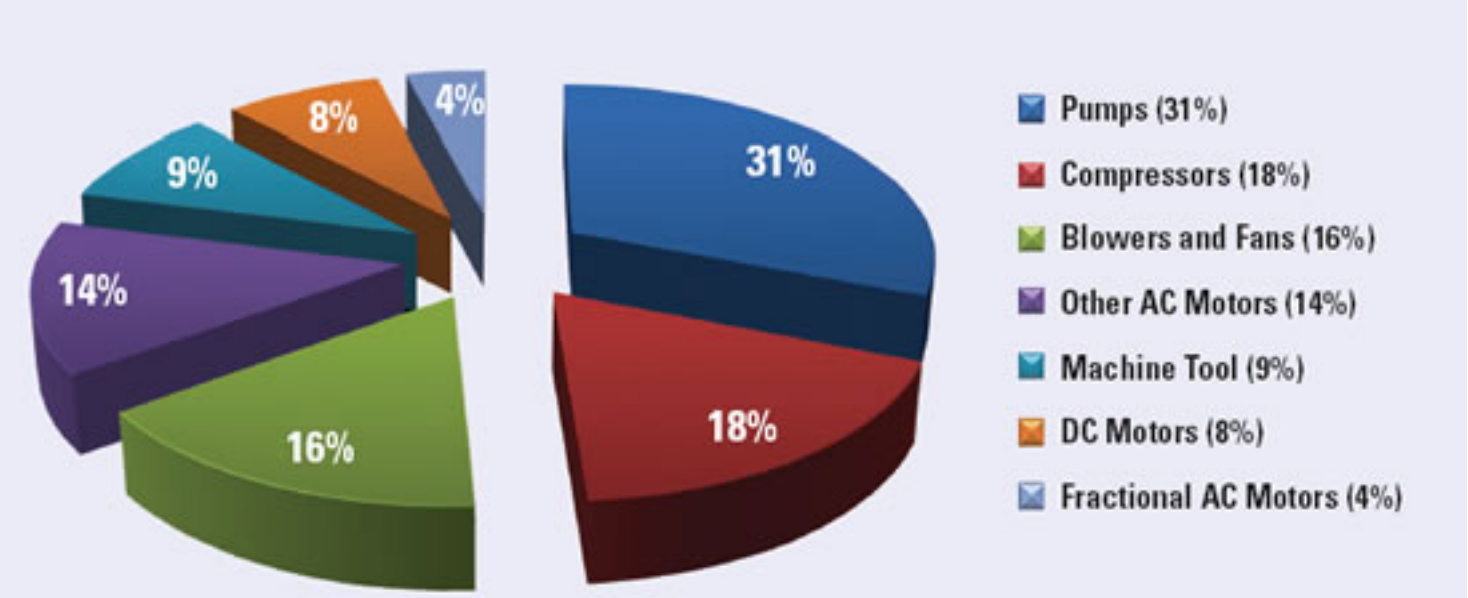

Fig. 1. Typical breakdown of energy usage, in percentage, by equipment type in an industrial facility *(Source: U.S. DOE)*

(Refer to Fig. 1 for a breakdown of the percent averages by equipment type.) Industrial motor use accounts for approximately 25% of the total electricity usage in the United States. Thus, it

makes sense that one would take all the necessary steps and precautions to assure long-term health and reliability of these vital machines, especially when they are of a larger horsepower.

Using guidance found within InterNational Electrical Testing Association (NETA) field-testing specifications, the ANSI/NETA MTS-2007 *Standard for Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems*
, this article will discuss some of the available maintenance trends and techniques that can assist owners and users of large electric motors. The focus will be primarily on medium-voltage AC induction (2.3 kV - 13.2 kV) machines.

First and foremost: understand the hazards!

Working on or near electrical equipment is by its very nature a hazardous task. Before any equipment is inspected or any maintenance is done, the person performing the tasks must be qualified and able to assess all hazards associated with the scope of work to be performed. If the person performing the work is not qualified, the end results could be significant equipment damage or possibly serious injury or death to personnel.

Some maintenance tasks require the work to be performed on energized equipment while it is in normal operation. Personnel should be familiar with—and comply with—the applicable OSHA, NFPA 70E, plant-specific and other electrical safety rules and regulations.

Whenever performing de-energized motor maintenance—*and before physically touching the motor* —one should be sure that the unit in question does not present a shock hazard to anyone that will be working on that particular motor. At a minimum, the affected parties should be notified, the machine should be locked out/tagged out, tried out, checked for the absence of voltage (live-dead-live), and the proper personnel protective grounds applied. Again, the key is to have a qualified worker perform these tasks to assure those in the area that an electrically safe condition has been obtained.

Electric motor basics

Motor Component Stresses				
Types of Stresses	Stator Winding	Rotor Assembly	Bearings	Shaft
Thermal	■	■	■	■
Electrical/Dielectric	■	■	■	
Mechanical	■	■	■	■
Dynamic		■	■	■
Shear				■
Vibration/Shock	■	■	■	■
Residual		■		■
Electromagnetic	■	■	■	■
Environmental	■	■	■	■

Fig. 2. The four basic components of electric motors can experience many different stresses that have the potential to cause failure. *(Source: EASA)*

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[redacted] failure of the motor can occur. [redacted] can [redacted] inspe[redacted] light. [redacted] if [redacted] rwidup@ shermco.com [redacted]