Six Key Elements of Gearmotor Optimization

How to Ensure Reliable Performance, Increased Efficiency and Lowest Total Cost of Ownership

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Choosing a gearmotor can be a relatively straightforward process, but engineers today are facing an expanded set of gearmotor requirements brought about by increased customer expectations. By knowing available input voltage, desired operating speed and torque requirement, one can begin to start in choosing an appropriate gearmotor. This paper will address those new enhanced requirements for not only the best performance and value option, but also increasing demands for lower operating costs, longer lifetimes and reduced total cost of ownership.

Gearmotors designed for high efficiency, installation flexibility and long life, maintenance-free operation can help achieve substantial cost-savings, avoid considerable downtime, and boost productivity well beyond what initially may have seemed possible. This is important considering that each piece of heavily relied upon handling machinery — including packaging equipment, conveyors, dispensers and sorters — benefits greatly from a cost-effective, energy efficient motor or gearmotor which, over an extended period, can lead to significant energy savings.

The more you know about the possibilities available to optimize your gearmotor selection, the greater your chances for making a choice that will be an enduring good decision for you and your customers.

Six High-Performing Gearmotor Characteristics

High Efficiency Motors (NEMA Premium Efficiency or IE3)

Efficiency, even in small motors, is important because increased efficiency can result in cooler running, longer life motors that help enable you to reduce operating costs and more quickly recoup your initial investment through savings in electricity consumption. New U.S. government (DOE) regulations were enacted in 2016 that require most AC motors over one horsepower to be designed to meet premium efficiency standards. For equipment sold in Europe, it is necessary to meet similar IE3 efficiency standards.

To meet these higher efficiency standards, motors are redesigned with low-loss grades of steel for the laminations and higher copper content, thus offering at least 15 percent lower losses than conventional designs. This also keeps motor windings in good shape because insulation isn't exposed to unnecessary high temperatures.

High efficiency AC gearmotors offer application versatility. In fixed speed applications, the AC gearmotor size and ratio can be chosen to provide the desired output speed and torque capability when simply plugged into line voltage, without need for any other power supply or control. For truly optimized efficiency, a variable frequency drive (VFD) can be used to improve system efficiency further by using only what's necessary to run the specific application.

Additionally, AC motors are virtually maintenance-free, compared to brush DC motors. As a bonus, high efficiency motors operate at a lower skin temperature, making them safer for employees exposed to direct contact.

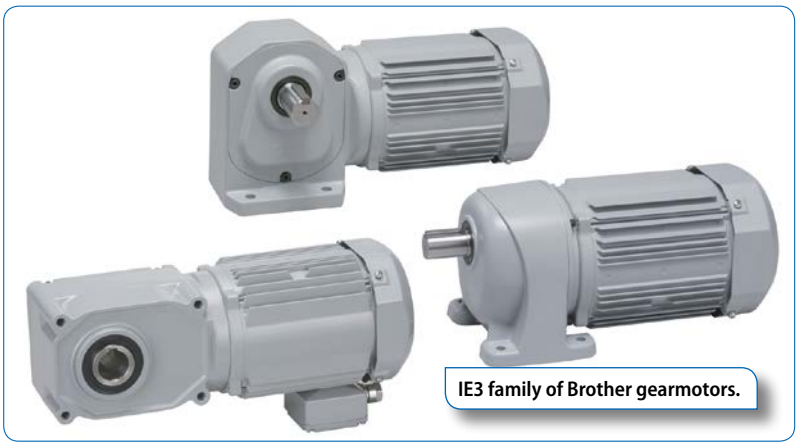
High Efficiency Gearboxes

Unless a "premium efficiency" motor is mated to a high efficiency gearbox, all the benefits can be lost. For example, right angle gearing is used in most material handling and conveyor applications. Traditionally, however, the predominant gear type used is worm gearing, the evolution of which goes back to Archimedes. Worm gear efficiencies drop as reduction ratio increases, to as little as 49 percent for a 300:1 ratio.

Worm gears also suffer from poor efficiency at reduced speeds — which are increasingly prevalent with the burgeoning popularity of Variable Frequency Drives (VFDs). Worm gears can decrease in efficiency by as much as 10 percent based on the input rpm. And, because worm gears use sliding friction, wear starts from first use.

A superior right angle gearing alternative is hypoid gearing technology, which can maintain efficiency above 85 per-

H1 food-grade grease from Brother Gearmotors.



IE3 family of Brother gearmotors.

cent throughout the motor's wide speed range. By contrast, hypoid gears increase in efficiency when reducing the input rpm, making their use with VFDs more effective at transmitting power in low speed/high torque applications. Typically, an inefficient worm gearmotor can be replaced with a hypoid gearmotor, often with smaller motor power, and the result can be the same amount of torque. Hypoid gearboxes employ hardened, all-steel gearing and, therefore, offer significantly longer lifetimes than worm gearboxes.

Today, many companies are looking to maximize installation flexibility. Hollow bore hypoid gearboxes are often preferable, as they allow for direct machine mounting without using a chain and sprocket or another coupling. The hollow bore mounting reduces maintenance and parts count, and helps reduce cleanup in washdown applications since it minimizes areas where dirt and bacteria can harbor. In addition, hollow bore hypoid gearboxes help improve safety because the lack of chain and sprockets in the units results in fewer potential pinch points for workers.

High-Grade Grease Lubrication

To greatly reduce downtime and maintenance costs, some gearmotors are filled with high-grade grease that lasts for the lifetime of the gearbox and can greatly reduce downtime and maintenance costs, compared to oil or conventional grease. High-grade grease-filled gearmotors also enhance installation flexibility as they do not typically require breathers, enabling them to be mounted in any direction without designating a mounting position upon ordering.

Triple Lip Shaft Seals

Triple lip shaft seals can also help eliminate costly downtime, as they are preferable to dual lip seals for protection against lubricant loss and dust penetration into the gearbox. Keeping harmful dust out also prevents grease contamination, which often causes premature failures in bearings and seals. Additionally, keeping the lubricant sealed inside the gearbox helps avoid maintenance by prolonging the life of gears, seals and bearings. Safety also improves, since there is less chance for lubricant to leak from the gearbox, which can interfere with machinery operation or be a potential risk for employees working near the machinery.

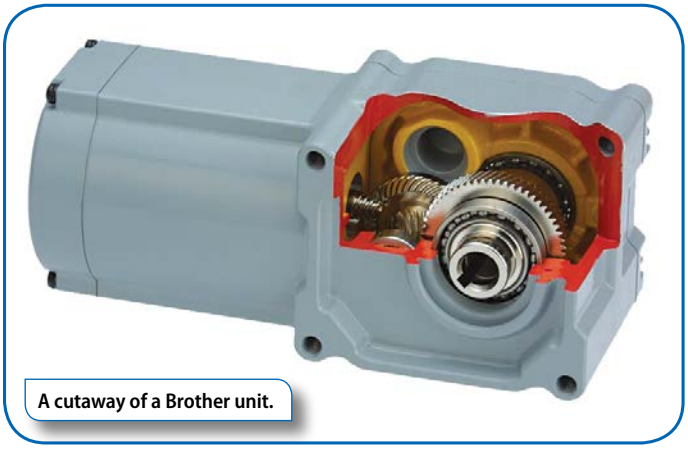
O-Ring Sealing

Compared to gasket sealing, O-ring seals help lower maintenance costs by providing a more positive seal to prevent lubricant leakage from the gearbox case. O-rings also have a longer life than gaskets, since they are usually placed on an internal connection between the gearbox case and cover and are therefore not exposed to the elements. Gaskets, on the other hand, are typically at least somewhat exposed to outer elements and can be prone to deterioration.

Protective Electrostatic Coating

Many gearmotors operate in less-than-perfect environmental conditions, with exposure to dampness, dust, vapors and extreme temperature variations: all of which can lead to premature failure or other problems. This can be particularly challenging for conventional wet paint or even powder coat finishes. A better solution is electrostatic coating, often called e-Coat. It combines the best elements of plating and painting to provide a superior protective finish.

In the e-Coat process, motor components like castings, extrusions or other external metal parts are immersed in a water-based solution containing a special paint emulsion. An



A cutaway of a Brother unit.

electric voltage is applied to the part causing the paint emulsion to condense onto the part, both inside and out. Thus, the part receives not only a fully protective coating, but is also fully insulated by the coating.

Gearmotors with this special electrostatic coating are protected from all kinds of environmental conditions, such as scratches/scrapes, caustic wash-down procedures as well as resistance to the harsh chemicals typically used in many processing plants.

In conclusion, it is possible today to do much more than turning a shaft when choosing a gearmotor. Knowing your options for enhanced performance, efficiency and lowest total cost of ownership allows you to make sure that your gearmotor choice is optimized to meet all your requirements. **PTE**

For more information:

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