

# Mining for Solutions

## High-efficiency, heavy-duty motors offer key to reducing energy consumption and downtime

Chris Medinger, product marketing specialist, Leeson Electric

**Increasing pressure on many fronts is compelling mine operators to thoroughly examine every phase of their operations.** Fluctuating demand that whipsaws mineral prices, government-imposed environmental regulations and rising operating costs related to maintenance downtime all pose serious challenges for the mining sector. Add pressure from customers and stakeholders for more sustainable operations as well as union demands for higher wages, and you have a scenario that requires mine operators to exercise every possible option to achieve more efficient operations.

### Variable costs of doing business affect the bottom line

To achieve sustainable operations as well as long-term viability and profitability, mining must do everything it can to conquer the myriad variables affecting operating expenses, two significant ones being reducing energy costs and downtime. Let's examine these two and how high-efficiency, heavy-duty motors address these challenges.

### Reducing energy costs

A typical mining environment is notorious for being one of the harshest working environments on the planet. Critical ambient conditions, solid contamination (dust) and severe processes are just some of the major factors present at a mine site. Motors are used above and underground in non-hazardous mines and open pit quarries that typically mine iron ore, platinum, gold and rare earth metals. Applications include conveyors, pumps, fans, smaller winches, crushers, smaller mills and flotation tank agitator motors. High-efficiency, heavy-duty motors can extend the life and performance of mining equipment while reducing the downtime and costs associated with ongoing maintenance. Using the latest technology, some motor manufacturers are able to engineer energy-efficient designs that also stand up to the hostile mining environment.

Mining and metals production is an energy-intensive process, with a significant proportion of energy consumption coming from purchased electricity. According to the Southwest Energy Efficiency Alliance, a metal mining company's energy expenditures can consume between 20 percent and 40 percent of its total production costs in American mining. However, today's highly efficient motors, drives and mechanical power transmission products can significantly reduce this energy consumption.

The U.S. Department of Energy's (DOE) manufacturing and mining energy analysis study explored and compared main industrial market verticals and energy use by major

process systems. The study noted that the mining industry was ranked as the third-highest energy user of motor driven systems among 10 major industry verticals.

Mining projects that may involve the upgrade to high-efficiency motors include:

- Retrofitting or replacing underground support systems such as ventilation fans and air systems
- Upgrading motors or replacing conveyor systems
- Efficiency improvements to crushing, separating or materials transportation processes
- Retrofitting pumping systems in mine dewatering, slurries transportation and tailings disposal
- Improvements in extraction and refining processes
- Improvements in control systems or sensors
- Installing variable speed drives for pumps, compressors and operating fans at part load capacity

To encourage mining companies to retrofit standard motors to high-efficiency motors, many incentives and rebates are offered. For example, in 2010, U.S. Senator Blanche Lincoln introduced legislation to create a rebate program to boost the manufacturing sector and promote energy efficiency by encouraging the sale of high-efficiency industrial motors. The program provided a \$25 per-horsepower rebate for customers who purchased a high-efficiency motor for industrial and commercial use in everything from fans and compressors to food processing, mining, water pumps and commercial buildings.

Pacific Gas & Electric (PG&E) has developed a Retrofit Incentive Program for its industrial customers. This involves the installation of energy efficient motors or systems customized to their facilities. Additionally, PG&E offers rebates to customers who install qualified high efficiency products.

As a minimum requirement, electric motors for the mining and mineral sector need to:

- Meet global mining industry requirements, yet be flexible for adaptation to local legislation
- Be robust to meet the aggressive nature of the environment
- Be highly reliable and never be the component in the drive train responsible for unplanned downtime

### Reducing downtime costs

Mining equipment is the lifeblood of the operation. Consider these staggering costs of downtime: According to Caterpillar, it's estimated that the total cost of unscheduled downtime can be as much as 15 times that of a scheduled event. Mining companies are susceptible to \$180,000 in lost production per incident. This includes lost production time accumulating in \$3,000 an hour per incident, and 60 hours of downtime per incident. Maintenance, because of its impact on return on

capital, is a key driver of performance. By reducing maintenance costs, companies can improve their performance.

## Motors

The mining segment is very diversified and has different processes for mining of assorted minerals or stones. In all these processes, electric motors are used as driving energy in a large scale to extract, transport, crush and separate metals. Peripheral systems such as pumping and recycling of fluids, treatment and control in the emission of pollutants like toxic dust and gases also use motors.

Mincom's 2010 annual survey of executives at the leading North American mining companies found that 67 percent of them are concerned about improving performance and operational effectiveness. To that end, high-efficiency, heavy-duty motors can play a key contribution.

There are well over 1.2 billion electric motors, of all types, used throughout the United States. However, electric motors are often out-of-sight, out-of-mind until production is down due to a burnout or catastrophic bearing failure.

Preventive maintenance and regular analysis of motors' load test performance are essential keys to a reliable motor. Selecting the right high-efficiency, heavy-duty motor for mining equipment is also a critical step for OEMs and end-users. When a motor is put into an application that it was NOT designed for, it will cause many kinds of repetitive re-

pair issues that even the best preventive maintenance practices will not correct.

Various type series helps in the selection of the right motor for each operating mode required, whether constant speed, variable, or direct drive. Robust, reliable motors are perfect for belt conveyors and for modernizing existing systems.

## Common motor failures

More motors fail due to bearing problems than for any other reason. The leading cause of bearing failures relates to a variety of issues surrounding lubrication. Antifriction bearings should be re-lubricated on a regular basis. The lubrication schedule depends greatly on the motor's operating environment and service conditions. While failures may occur due to lack of lubrication, bearings may also fail due to grease contaminated by water or other materials.

The second most common cause of motor failures is stator-winding failures. To ensure long motor life, it is important the motor operate within the temperature class of its insulation system and be kept clean and free of particle build up on the frame surface, air inlet and fans.

## Conclusion

Mining companies are looking at cutting costs by, among other things, using more efficient equipment to ease energy demand and reduce downtime. Increasing investment in high-efficiency, heavy-duty motors would separate profitable, growth-oriented companies from the pack and equip them with a sustainable competitive advantage.

The payback times for motor investments can be within a couple of years and offers a positive impact on both the environment and the operation. The mining community is being challenged to find electrical equipment and sys-

tems solutions that make mining operations reliable, efficient and continuous; safer and protected. Sustainable, high-efficiency, heavy-duty motors are one way to achieve these goals.

### For more information:

Leeson Electric  
Phone: (262) 377-8810  
[www.leeson.com](http://www.leeson.com)



**Chris Medinger** is product marketing specialist with Leeson Electric and may be reached at (262) 387-5410 or [chris.medinger@leeson.com](mailto:chris.medinger@leeson.com). Leeson is a Regal brand located in Grafton, WI. Regal Beloit Corporation is a leading manufacturer of electric motors, mechanical and electrical motion controls and power generation products serving markets throughout the world. Regal is headquartered in Beloit, Wisconsin, and has manufacturing, sales and service facilities throughout the United States, Canada, Mexico, Europe and Asia.

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