Meeting Mining Challenges

LED fixtures lessen energy consumption and improve productivity

by Nate Klieve and Melissa Stephany

These are critical times for the mining industry. Pressures from government, customers, and other stakeholders continue to build to operate more sustainably. In addition to these challenges and growing regulations, mining and mineral processing companies are looking for ways to reduce escalating energy costs and consumption. Mineral prices continue to fall forcing mines to operate more efficiently in response to this competitive environment. Lighting is one of the factors that mines are evaluating as a way to meet these rising demands.

Mining Regulations: A growing trend worldwide

Environmental protection standards in the U.S. are some of the most stringent in the world and often serve as models for developing nations. According to the Southwest Energy Efficiency Project, energy represents more than 15 percent of total production costs in American mining. Industry leaders are beginning to realize the available technologies to better manage energy consumption, costs, supply and pressures from international and national regulations. The use of advanced technologies, including automation, satellite communications, smart sensors and robotics have become more common in mining. Computers and microprocessors are responsible for making machinery more efficient and reliable. With escalating taxation and the increasing costs and demands of labor, mines are taking every opportunity to remain competitive.

According to a Department of Energy Industrial Technologies report entitled "Mining Industry Bandwidth Study," the U.S. mining industry consumes approximately 1,246 trillion btu/year (TBtu/yr). This bandwidth analysis estimates that investments in state of the art equipment and further research could reduce that amount to 579 TBtu/yr. That would be more than a 50 percent decrease in energy consumption. Whatever the motivators, a host of companies are committing to this effort.

LED fixtures and the Mining Industry

Mining facilities rely on products that are engineered to perform through extreme temperature variations, high precipitation, excessive vibrations, and in hazardous locations. This equipment must perform in abusive conditions with absolutely no margin for error. LED lighting can meet these challenges while helping mine sites improve their bottom line. Energy efficient lighting is a key component in helping mining companies reduce energy consumption, virtually eliminate maintenance and improve worker safety.

LED technology is emerging as a huge factor in making mines more sustainable. LEDs use between 50 to 90 percent less energy than traditional fixtures, which significantly reduces costs as well as carbon emission. LED lights also bring the advantage of durability. LEDs are solid state devices containing no moving parts and no filaments or fragile glass to break, thus eliminating the risk of damage during transportation, installation and operation, even in the toughest environments. In addition, a standard LED is rated for 50,000 hours. Based on the length a fixture is illuminated per day, here is what a 50,000 lifetime translates into:

Hours of Operation: 24 hours a day — 5.7 years; 18 hours per day — 7.6 years; 12 hours per day — 11.4 years and 8 hours per day — 17.1 years.

With the emergence of LED technology, the lighting industry has been faced with a new challenge — for the first time, a light source exists that could potentially outlive other components of a fixture. This is why it's important that a mine operator choose wisely when upgrading to LED. The lifetime of all fixture components — not just the LED chip — must be considered. Not all manufacturers build fixtures around the long life of the light source, so all parts should be analyzed to avoid the risk of early failure.

Another cost effective feature of LEDs is that they restrike instantly following a power interruption. This valuable feature reduces expensive downtime for mine sites that were subject to a long wait time as their lighting "warmed up."

LEDs and light control

Light distribution is controlled by strategic placement of LEDs and efficient use of optics to illuminate a specific point. Simply put, LEDs put the light exactly where you want it. Furthermore, with the optical design of traditional lighting fixtures, the area directly below the fixture is illuminated much better than the outlying areas. In contrast, the directional characteristics of LEDs allow for higher uniformity in the entire targeted area.

An additional advantage that LED technology offers is the reduction or elimination of light pollution. Traditional light sources project light 360 degrees around the fixture and utilize reflectors to control light, but LEDs can bring this control to another level. The beam and light spill are controlled using the directional capabilities of the LED optics. This is especially important to some mines that are highly regulated for their light pollution due to the presence of observatories near the sites.

LEDs and safety

Both surface and underground mining have inherent risks. These risks are especially present during maintenance tasks — both routine and unscheduled. Labor and time dedicated to maintenance accounts for 25 to 35 percent of a mine's operating costs and is a major expense of all operations. In general, necessary maintenance tasks are significantly reduced when mines utilize LED technology. When mines don't need to send their employees into hazardous conditions on tall equipment to maintain light fixtures, they are avoiding situations that have been known to claim lives.

It has been estimated that 140 mining accidents between 2002-2006 involved a loss of over 3668 person days. Many of these may have been avoided by using LED lighting technology. In hazardous conditions like those prevailing in mines or oil rigs, LED lights can help improve the visual performance of workers allowing them to better detect potential hazards. Estimates by researchers at National Institute for Occupational Safety and Health suggest that the use of LED lights in the American mining sector could reduce the risk of accidents during these dangerous maintenance tasks.

Change is upon us

The ever increasing environmental regulations, along with the need to lessen costs and increase productivity are placing tremendous pressure on mining operators. LED lighting can offer the solution to many challenges that they face. The introduction of new technology, process improvements, and operational changes can significantly improve a mine's financial performance.

LED Fixtures Help Mines:

- Virtually eliminate lighting maintenance;
- Reduce energy costs;
- Lessen carbon footprint; and
- Improve safety

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A privately held company founded in 1892, Phoenix Products Company serves mining, port and marine industries that all require unique solutions to equipment lighting. Over 120 years later, they continue to be a leading lighting manufacturer of high quality, durable products that are built to withstand even the harshest of conditions. For more information on Phoenix Products Company, please visit their website at www.phoenixproducts.com.

300W Floodlights (Phoenix Products - ModCom® Hi fixtures) on a shovel on an iron ore mine in North America.