

Solid-State Illumination for Miners' Helmet Lights

Helmet-worn lighting systems for mining applications have long used incandescent sources in combination with reflectors to provide illumination. Recent developments in light-emitting diodes (LEDs) have resulted in the potential to improve the quantity and quality of light, while simultaneously using less energy and thereby increasing battery life. White LEDs tend to have increased short-wavelength content relative to incandescent lamps, with the potential for increased peripheral visibility in the dark (mesopic) conditions experienced in most mines.



LED helmet lighting prototype developed by the LRC project team.

Working with the National Institute of Occupational Safety and Health (NIOSH), the LRC developed a prototype miners' helmet lighting system using white LED sources that will be used in human factors evaluations of visibility in a simulated mining environment at NIOSH's Pittsburgh Research Laboratory.

During the Lighting Workshop held as part of the M.S. in Lighting curriculum, personnel from NIOSH hosted a field trip at the Safety Research Mine in Pittsburgh, Pennsylvania. The class toured a coal mine used to test lighting and other safety features and saw mine illumination systems in operation. Using this experience as a base, students developed and tested unique lighting solutions for mine lighting and presented their ideas to NIOSH engineers and researchers.

Sponsor

National Institute of Occupational Safety and Health



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The LRC is presently studying existing standards and specifications for mine lighting to determine whether they introduce unnecessary barriers to the adoption of LED lighting technology in mines and that they ensure safety and visibility.



Coal mines are visually challenging environments.

The LRC is also investigating the spectral shifts of incandescent and LED lighting systems as the battery systems they use discharge over time, to better understand how the spectral characteristics of LEDs might provide visibility advantages.



LRC students and faculty assemble at the entrance to the Safety Research Coal Mine in Pittsburgh.

Lighting
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