Occupational Health and Safety - Program 62

Program Overview

Program Description

Workplace injuries affect employee health, productivity, and job satisfaction and increase the cost of doing business. Efforts to reduce injuries and illnesses, medical costs, and losses in productivity and to improve overall morale are a critical part of electric power company operations. Within the electric power industry, typical risks result from poor ergonomic design in equipment. Misguided procedures and long-term or repetitive exposure to various physical agents continue to be a source of injury or illness. Companies must develop strategies for compliance with worker health and safety requirements for reliable, uninterrupted delivery of electricity to customers, in addition to strategies for meeting exposure standards. The U.S. Occupational Safety and Health Administration (OSHA) is anticipated to accelerate its regulatory agenda, which includes injury and illness record keeping, beryllium exposure, and slips, trips, and fall hazards.

The Electric Power Research Institute’s (EPRI) Occupational Health and Safety program provides scientific research needed to make informed decisions about control methods geared toward workplace injury and illness prevention. Products, tools, and design recommendations that emerge from this research help electric power companies maintain safer, healthier work environments and control labor-related costs. The research identifies injury and illness trends, develops cost-effective ergonomic interventions and designs, and addresses critical occupational exposure issues. The program serves as the foundation for occupational health and safety-related work within the electric utility industry.

Research Value

The EPRI Occupational Health and Safety Database is a valuable resource for tracking and benchmarking occupational injury and illness rates and costs. The Database contains more than one million worker-years of information from 18 electric power companies. The Database provides statistically powerful means to analyze injury data, allowing for exposure-specific analysis across the electric utility industry. EPRI is an innovative leader in occupational ergonomics, specializing in addressing the specific needs of the electric power sector. The program develops cost-effective ergonomic interventions for a range of workers and tasks and develops specifications for the ergonomic design of electric power facilities and equipment. The program also investigates occupational exposures that can affect health (for example, exposures to welding fumes and heat stress). Through its occupational health and safety research, EPRI helps the electric power industry develop effective tools for exposure monitoring and implement effective prevention strategies.

Approach

This program delivers research, data, analyses, and expertise that help electric power companies effectively address occupational health and safety issues. The program transfers the knowledge through many avenues:

- The Occupational Health and Safety Database annual report, which compiles information on injury and illness rates and statistical analyses drawn from unique, industry-specific data
- Easy-to-read handbooks and instructive DVDs describing ergonomic interventions and design guidelines
- Presentations on ergonomics to industry, the scientific community, and regulatory agencies
- Representation of the electric utility sector on the advisory council for the National Institute for Occupational Safety and Health's National Occupational Research Agenda
- Reports and peer-reviewed literature on toxic and potentially toxic workplace exposures that provide data for guideline setting by OSHA and for compliance with federal and state regulations
Accomplishments

The program provides timely, reliable, and comprehensive solutions to industry-specific research needs and offers practical implementation guidance. Program accomplishments include:

- improved worker health and safety through reduced workplace injuries (ergonomic solutions reduced strain and sprain injuries among power plant and line workers);
- reduced health care costs, now estimated at potentially millions of dollars per injury case for some injuries for individual electric companies;
- improved productivity and morale in a healthier workforce, as well as improved product quality; and
- the first ergonomic power plant design handbook, a key reference for design engineers.

Current Year Activities

Program R&D for 2012 will focus on refining the injury surveillance database, assessing ergonomic fleet vehicle maintenance and design, assessing ergonomics in new work environments related to renewable energy resources, characterizing occupational exposure to multiple metals in welding fumes and temperature extremes, and developing a comprehensive, industry-specific exposure database. Specific efforts will

- develop ergonomic interventions and design specifications for fleet vehicles to prevent chronic injuries resulting from inefficient design of tasks, tools, and equipment;
- provide accurate, quantitative data and statistical analyses on injury rates and trends and associated costs, including the 2012 Annual Occupational Health and Safety Statistics Report;
- develop descriptive summary reviews to highlight and communicate industry data on specific injury categories and causes (e.g., noise, temperature extremes, shift work);
- minimize the impact of specific occupational health outcomes through clarification of relationships among occurrence rates, occupational exposures, and lifestyle factors; and
- provide relevant scientific data for setting occupational guidelines on exposure to metals in welding fumes (for example, beryllium, hexavalent chromium) and on temperature extremes (for example, heat stress).

Estimated 2012 Program Funding

$1.5M

Program Manager

Gabor Mezei, 650-855-8908, gmezei@epri.com
Summary of Projects

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<tr>
<th>Project Number</th>
<th>Project Title</th>
<th>Description</th>
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<tbody>
<tr>
<td>P62.001</td>
<td>Occupational Health and Safety Database</td>
<td>This project produces the Occupational Health and Safety Database, a unique source of detailed, comprehensive, standardized injury and illness rates and statistical analyses specifically for the electricity industry. The database is updated with new information from multiple electric companies on an annual basis. An annual report on major injury trends and costs is prepared from information drawn from the database. The database also helps guide program priorities.</td>
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<tr>
<td>P62.002</td>
<td>Ergonomics Research</td>
<td>This research determines the role of ergonomic factors in current work task design and in implementation of tools and equipment, and suggests remedial interventions. Results provide impartial information for dealing with costs and complying with ergonomics guidelines and regulatory needs. In 2012, this project will address ergonomics issues related to the purchase, retrofit, operation, and maintenance of fleet vehicles and ergonomics issues in new occupational environments related to renewable energy generation (e.g., wind turbines, solar farms).</td>
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<tr>
<td>P62.003</td>
<td>Occupational Exposure and Health Studies</td>
<td>This research investigates relationships among injury and illness occurrence rates, lifestyle factors, and workplace exposures (e.g., welding fumes, heat stress, and noise). Exposure characterization and epidemiologic research address occupational and lifestyle factors potentially associated with injuries and illnesses, and statistical analyses of existing occupational exposure and health information provide further insight. Current issues include exposure to metals in welding fumes (e.g., hexavalent chromium, beryllium), heat stress, and noise. Development of a comprehensive exposure database will also contribute to significant cost savings in exposure monitoring by pooling available industrial hygiene data from participating companies.</td>
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P62.001 Occupational Health and Safety Database (101907)

Key Research Question

To maintain a healthy workforce, improve productivity, and control health care costs, electric power companies need access to accurate illness and injury incidence rates and cost impacts. For comprehensive databases, the National Academy of Sciences recommends coding of injury/illness data using standardized procedures and precise, consistent descriptions. Only a comprehensive, industry-specific database containing populated standardized fields from multiple companies provides a robust foundation needed for informed preventive measures.

Approach

Updated yearly, the Occupational Health and Safety Database (OHSD) is a unique source for detailed, comprehensive, standardized injury and illness rates across the electricity industry. The OHSD also enables monitoring and evaluation of workforce injury and illness trends and provides a basis for identifying high-risk occupations, quantifying costs and lost time, and setting research priorities. In addition, the database is a powerful tool for benchmarking and safety program evaluation for participating companies. The database is the source of information for tailored analyses for individual electric companies, selective descriptive analyses by injury type or cause, and for the Annual Occupational Health and Safety Statistics Report, providing statistical analyses for the electricity industry.
Impact

- Enables medical cost control by identifying injury trends and tracking related costs
- Contributes to reduction of injury and illness rates
- Supports benchmarking and continual injury monitoring
- Provides information for establishing health and safety program priorities and for estimating the impact of prevention programs
- Directs health and safety research
- Aids in assessment of the effectiveness of injury and illness prevention programs

How to Apply Results

Occupational health and safety staff at participating electric companies will use project information and analyses to monitor and control health care costs, improve health and safety programs, and reduce occupational illness and injury rates. Information from this project can also be used to identify health and safety research gaps.

2012 Products

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<tr>
<td>This technical report continues a series of reports that provide quantitative, detailed injury and illness incidence rates and strategic economic impacts from trends analyses based on information from the EPRI Occupational Health and Safety Database.</td>
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P62.002 Ergonomics Research (102993)

Key Research Question

Musculoskeletal (strain and sprain) injuries currently account for more than 40% of total medical costs for electric power companies. EPRI statistical analyses found that in just four companies, there was a loss of more than 70 full-time-equivalent employees for one full year owing to these injuries. Reduction of injury rates and associated costs depends on prevention of chronic injuries resulting from inefficient design of tasks, tools, and equipment. Evaluation of existing designs and development of ergonomic interventions are essential to strain and sprain injury prevention.

Approach

The aim of this project is to develop specific interventions to prevent chronic injuries resulting from inefficient design of tasks, tools, and equipment. Effective ergonomic interventions can reduce injury rates and associated costs. Research results also provide objective information relevant to compliance with ergonomics guidelines and regulations. In 2012, research will continue to focus on ergonomics issues related to fleet vehicles in the electric power industry and ergonomics issues in new occupational environments related to renewable energy generation (e.g., wind turbines, solar power plants).

Impact

- Provides ergonomic evaluation and intervention that can help companies reduce injury rates and associated costs through prevention
- Helps improve worker job satisfaction and productivity
- Helps ensure compliance with ergonomics guidelines and regulations

How to Apply Results

Application of EPRI ergonomics research results can help prevent chronic injuries among electric industry workers through improved work practices and ergonomically designed tools and equipment. These interventions can also help ensure workforce compliance with ergonomics guidelines and regulations. Results from the fleet
vehicles project can help electric companies prevent vehicle-related injuries associated with ergonomically poor entry and exit design, seating, and access to parts, tools, and equipment. Implementation of ergonomic interventions requires an investment of time and money; however, many recommended interventions are low in cost.

2012 Products

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<tr>
<td>Fleet Process Guidelines for Selection of Fleet Vehicles: This technical report will clearly outline the process for specification, selection, and purchase of fleet vehicles for use in the electric power industry. The report will include flow charts, decision trees, and checklists used to aid departments responsible for fleet vehicle purchase.</td>
<td>12/31/12</td>
<td>Technical Report</td>
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Future Year Products

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<td>Ergonomic Interventions Evaluation: This peer-reviewed paper will summarize methods used for an assessment of measured results in overhead linemen/women ergonomic work.</td>
<td>12/31/13</td>
<td>Peer Literature</td>
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P62.003 Occupational Exposure and Health Studies (055833)

Key Research Question

Adverse health effects can result from occupational exposure to physical and chemical agents (e.g., heat, noise, beryllium, hexavalent chromium). The updated OSHA regulatory agenda includes—among other issues—an injury and illness prevention program, exposure to beryllium, and walking/working surfaces posing slip, trip, and fall hazards. Occupational exposure to temperature extremes (e.g., heat stress in power plants and in areas with hot climate) continues to result in potential health hazards and loss of productivity.

Approach

Scientific research in this project provides relevant data for setting standards and guidelines and for developing appropriate strategies to comply with OSHA regulations for exposure to metals in welding fumes (such as beryllium and other toxic substances). Expanding previous work on exposure to hexavalent chromium during welding, data on exposure to other metals in welding fumes (e.g., beryllium) will be collected and assembled in a systematic fashion to meet OSHA’s objective data requirement. Air sampling data from multiple electric power companies will be collected and analyzed to determine the potential for overexposure to beryllium and other metals in various work situations. Work to develop an exposure database that captures a wide range of industrywide exposures is also planned and will form the basis of a job-exposure matrix. Specific focus will be placed on the characterization of physical stressors, including heat stress in various work environments, and noise exposure and hearing loss prevention. Future EPRI program work will characterize shift work within electric utilities, assess the degree of maladaptation, and design possible interventions for these workers.

Impact

- Provides knowledge necessary for developing preventive measures to minimize the health impact of environmental exposures
- Helps ensure compliance with exposure standards
- Offers the opportunity to improve worker health, morale, and productivity
• Reduces health-related costs
• Provides information about health risks associated with power plant occupational exposures that can be used to address proposed regulatory limits and to effectively protect and communicate with workers
• Provides a comprehensive exposure database that will contribute to significant cost saving in exposure monitoring by pooling available industrial hygiene data from participating companies

How to Apply Results

Results from this work can be used to assess potential health risks associated with occupational exposures and to develop preventive measures, including appropriate work practices that electric companies can implement. Electric company occupational health and safety staff also will use results to determine compliance with exposure standards. In addition, results may provide input to exposure standard formulation.

2012 Products

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<tr>
<td>Electric Utility Industry Occupational Exposure Database: This exposure database report will identify and include all exposure factors that can be used to inform utility professionals, exposure assessment experts, and epidemiologists assessing health and safety issues related to work near electric facilities. Development of a comprehensive exposure database will also contribute to significant cost saving in exposure monitoring by pooling available industrial hygiene data from participating companies.</td>
<td>12/31/12</td>
<td>Technical Report</td>
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<td>Heat Stress in the Electric Utility Industry: A review of the most recent literature on heat stress, with a focus on impacts within the electric utility industry, is planned. This technical report will identify those occupations, tasks, or locations most likely at risk of heat stress; review heat stress management practices currently used; and identify gaps in research.</td>
<td>12/31/12</td>
<td>Technical Report</td>
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Future Year Products

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<tr>
<td>Shift Work Among Electric Utility Workers: This technical report summarizes findings from a pilot study that monitors human rest and activity cycles and hormone levels to identify workers who appear maladapted to their shift-work schedule. If maladaptation is present among electric utility workers, future work should identify possible factors in daily life to target intervention methods.</td>
<td>12/31/13</td>
<td>Technical Report</td>
</tr>
<tr>
<td>Heat Stress Laboratory and Field Studies: This technical report will describe research on calorimetric laboratory and field studies aimed at quantitatively characterizing heat stress for specific occupations.</td>
<td>12/31/13</td>
<td>Technical Report</td>
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Supplemental Projects

Occupational Exposure to Physical Stressors: Intervention and Prevention (072036)

Background, Objectives, and New Learnings

Occupational exposures to physical stressors such as noise are prevalent within the electric utility industry. During 1995-2009, the EPRI Occupational Health and Safety Database, which tracks illness and injury for eighteen member utilities, showed that hearing loss or impairment resulted in 3% of total utility worker injuries. If constantly exposed to noise, workers may experience progressive hearing loss slowly over time, which in turn may affect their ability to perform safely and translate to an indirect number of acute workplace injuries.

Noise-induced hearing loss has been implicated in workplace accidents. Auditory changes are progressive, possibly placing workers at risk for accidents. Traditionally, workers are enrolled in hearing conservation programs after an action level of 85 decibels (dB) is met. Noise surveys capture environments requiring action but are not conducted at multiple time points; consequently, noisy environments may be underestimated. According to published studies in the aluminum industry, annual audiometry data capture hearing loss once it has occurred and the most vulnerable workers actually may fall below the accepted permissible exposure limit. Since opportunities to intervene prior to hearing loss are limited using annual audiometry, data gaps exist for workers who may be just below 85 dB and who may potentially have preventable workplace hearing loss.

Workers may use personal protective gear such as ear muffs and ear plugs that modify exposure; hence, measured ambient or personal exposure levels may not reflect actual exposure. Novel in-ear dosimetry technology—devices that fit like an earplug and measure attenuated noise from within the ear canal—could be used to address worker discomfort and potential exposure modification issues. In addition, the dosimeter could be programmed to advise the worker and/or her/his supervisor when pre-set exposure limits are exceeded. Thus, a worker would get feedback on exposure above that pre-set limit and on her/his daily dose at the end of the shift, both of which could assist in guiding personal protective equipment use.

Project Approach and Summary

In this project, research will evaluate the dosimeter using built-in feedback systems as an intervention method for preventing noise-induced hearing loss and will examine the relationship between noise levels and risk of acute occupational injury. Results will provide quantitative noise dosimetry, an assessment of the dosimeter as an intervention method and a potential leading indicator for noise-induced hearing loss and other injuries. By the end of the project, results should provide a method for assessing a state-of-the-art intervention method and an assessment of noise-induced hearing loss as a leading indicator for a number of acute workplace injuries.

Benefits

Workplace injuries are traditionally targeted using interventions proximal to the acute event, such as behavioral factors, rather than distal factors, such as other exposures. Furthermore, hearing loss is often attributed to workers’ lack of compliance, lack of supervision, or inappropriate use of personal protective equipment. This project assesses a potential leading indicator, not only of hearing loss, but also of workplace injuries. The developed intervention, if successfully applied, may result in reduced frequency of hearing loss and occurrence of acute injuries in the workforce, with associated potential cost savings and improved worker health and performance.

Occupational hygienists, managers, and safety specialists within electric utilities may use the in-ear dosimeter as a means to train their workers on the effective use of hearing protection and to clarify whether workplace noise is a contributor to other occupational injuries. Additional benefits derived from the work include an improved method to comply with OSHA “Employee Notification” requirements (1910.95).