options for significant portions of the training needs. In 2001, we began implementation with general success but also with a set of problems: commercial products that did not target our types of work, software compatibility, certain employees with limited computer skills, complex recordkeeping, and resistance to change. The approach learned from 3 years of experience and over 60,000 training modules completed include: extensive beta testing is performed of new courses, a training help desk is provided to answer the never-ending questions, an expensive Learning Management System (LMS) was purchased to track both classroom and online classes, the LMS was linked to human resources to ensure reports to operations show only current employees, and the need for regular updating of the modules.
Implementation requires early and regular coordination with the IT staff for the system to work smoothly. EHS managers considering e-learning would benefit from our experience, particularly the point that the content of the training is only one component of the implementation and is the easiest to control.

168.

MANAGEMENT STRATEGY FOR RESPONSE TO RESTRICTION OF HAZARDOUS SUBSTANCES (ROHS) INFORMATION REQUESTS. R. Rottersman, C. Simmons, G. Crawford, Boelter & Yates Inc., Park Ridge, IL.

Situation: A process was needed to respond to customer requests for documented compliance with the European Commission's Restriction of Hazardous Substances (RoHS) Directive. This legislation restricts the sale of electronic products in Europe containing certain hazardous substances after January 1, 2006.

Problem: Our client is a medium sized manufacturing company that is not currently registered to the ISO 14001 Environmental Management System. No systems were in place to respond to the customer requests for information on products affected by the RoHS. The company needed to put together a team to develop a process and the necessary documentation to address the customer requests using existing resources.

Resolution: A team of employees from the Environmental, Health and Safety (EHS), Sales, Purchasing, Manufacturing, and Engineering Departments developed a process and procedure for documenting tracking requests and responses. The procedure includes a detailed process flowchart with guidance for decision making through every step. The EHS coordinator is the key player in the process and is responsible for tracking the requests and insuring resolution

Benefit to Others: As more companies conduct business on a global basis, the need to be informed and comply with environmental legislation in other countries and regions of the world becomes critical to the success of businesses. The EHS Department often is the lead on developing the programs, processes, and procedures for compliance. This project and program will assist others by providing a management strategy that has been used to respond to similar requests.

169.

IMPROVING THE EFFECTIVENESS OF EH&S AUDITS WHILE REDUCING COSTS. R. Lizotte, Texas Instruments Incorporated, Attleboro, MA; S. Sleeman, Sleeman Hanley & DiNitto Inc., Boston, MA; B. Russell, Systems Approach, West Simsbury, CT.

Looking for a way to cut costs and still provide the valueadded benefit of on site EH&S assessments and audits? We were encountered with a situation to reduce costs yet still maintain high level EH&S performance. Our existing system of sending out subject matter experts to help newly obtained or formed organizations understand and implement the myriad of EH&S requirements was becoming a drain on resources while not always providing the expected results. Evaluating and then providing assistance to sites had become more complicated and expensive when you considered that the majority of our manufacturing sites had moved into the international area. Our solution came in the form of a web-based tool called the *EHS Knowledgebank* (formally Easy Audit *Online*). The application became our repository for EH&S information that integrated regulatory requirements, audit questions/findings, and action plan management into one tool. It enabled us to gather and track site-specific EH&S information and activities from a number of separate operations around the world on a real-time basis. We will share our detailed experiences in China, and other locales, where we used local EH&S professionals to assist our operations. We will also illustrate how we were able to assess the significance of audit findings by viewing photographs uploaded during the review. The combination of access to our internal standards and local regulatory requirements, supplemented by local EH&S expertise, has helped identify potential issues and saved significant time and resources for the company. With more and more emphasis on process reengineering, we have found the Internet tool, in combination with local EH&S experts, a cost-effective alternative for any company to consider.

Podium 123. Personal Protective Clothing and Equipment

Papers 170–178

170.

THE MULTILAYER SYSTEM OF MATERIALS FOR SMART CLOTHING PROTECTING AGAINST COLD. A. Kurczewska, Central Institute for Labour Protection-National Research Institute, Lodz, Poland.

The materials for constructing "smart" clothing, that is clothing that, on its own, supports thermoregulation processes of the body, has been tested. The concept assumes a multilayer system of materials that cooperates changing its isolation in response to changes of environment and body temperatures. The system consists of electrically-heated material, "active" insulation, and thermoactive membrane. As the first layer, the material with electroconductive yarn has been proposed. There have been tested and compared electrically-heated materials with different electroconductive yarns. The most efficient ones have been selected, put into the multilayer system, and then tested. All the tests have been conducted on apparatus that have been worked out in Central Institute for Labour Protection-National Research Institute.

171.

PREDICTING COMPENSABLE VERSUS UNCOMPENSABLE HEAT STRESS FROM PHYSIOLOGICAL STATE. T. Bernard, C. Ashley, V. Caravello, University of South Florida, Tampa, FL.

The level of heat stress is dictated by environment, metabolic rate, and clothing. The physiological state in response to the heat stress can be seen in heart rate, core temperature, and skin temperature. A convenience set of data was used to examine the ability of physiological state to predict level of heat stress (i.e., compensable vs. uncompensable). The study trials were designed to find the transition point between compensable and uncompensable heat stress as it relates to environment, clothing, and work demands. The individual trials began with a low level of heat stress that allowed a physiological steady-state to be established, and then the environmental contribution was increased in small steps every 5 minutes. The upper limit of compensable heat stress was identified as the critical level of heat stress, and the physiological state noted. The physiological states at 15 min prior to and after the critical level were also noted. The pre-critical and critical levels were compensable heat stress and the post-critical level was uncompensated heat stress. The data set included 1461 observations over gender, 10 clothing ensembles, and 3 levels of metabolic rate. Logistical regression was used to predict the level of heat stress from the independent variables of skin temperature, core temperature, and heart rate along with potential effect modifiers of gender, clothing, and metabolic demands. Significant predictors were heart rate, skin temperature, gender, and metabolic demands. Most of the predictive power was in heart rate, skin temperature, and gender; skin temperature was the single best predictor. The results tentatively point to novel methods of personal monitoring and reporting risk in real time.

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