

Total Quality Management for Mitigating Risk of Injuries to Upper Extremities Within Steel Mill Operations



This article is the second in a series of Safety First articles featuring the reports from the recipients of the 2012 Don B. Daily Memorial Fund. The first article in the series can be found in the October 2013 issue of *Iron & Steel Technology*.

With the assistance of the AIST Foundation through the Don B. Daily Memorial Fund, a team from West Virginia University Safety Management analyzed a total quality management (TQM) approach to safety in the steel manufacturing industry. After a participating steel mill was selected, the number of U.S. Occupational Safety and Health Administration (OSHA) reportable claims encountered over the last five years were reviewed. The highest number of OSHA reportable injuries for this facility comes in the form of hand, arm or head injuries. Of the reportable injuries spanning the last five years, nearly 70% were related to upper extremities — the area from the shoulders to the head, including human appendages. The most common injuries were cuts related to handling metal in manufacturing, such as scrap metal discharge or the physical process of cutting storage bands. The facility operates with a stringent policy regarding Kevlar gloves and upper sleeves to mitigate worker risk.

Over a number of visits to the facility, the opportunity was presented to view processes

related to steel manufacturing. With any facility containing an elevated “days away, restricted or transferred” (DART) score, the primary goal is to identify any potential gaps in the organization’s safety procedures to reduce worker injuries and the cost associated with workers’ compensation claims. This facility previously performed studies to implement job safety analysis (JSA) per task needed within the production of steel products. Coupling the OSHA reportable claims with the JSAs will help to discern the actual cause analysis for the incidents based on the available data. Insufficient accident investigation documents make root-cause analysis increasingly difficult for future mitigation of similar conditions. To achieve total quality management requires continual improvement from workers and complete upper management support to encourage safety culture shift.

Referring to the general points of TQM within a safety format, areas in the facility where change of approach will provide the highest rate of return to overall quality will be identified.

Hazards are ever-present in the steel plant environment, and a heightened awareness and emphasis on safety is a necessary priority for our industry. This monthly column, coordinated by members of the AIST Safety & Health Technology Committee, focuses on procedures and practices to promote a safe working environment for everyone.

Authors



Daniel E. Della-Giustina
 professor, Industrial and Management Systems Engineering, West Virginia University, Morgantown, W.Va., USA
daniel.della-giustina@mail.wvu.edu



Ben Sions
 Mid-Atlantic safety coordinator — Aggregate Division, LaFarge North America, Baltimore, Md., USA
benjamin.sions@lafarge.com

Contact

Comments are welcome. If you have questions about this topic or other safety issues, please contact safetyfirst@aist.org. Please include your full name, company name, mailing address and email in all correspondence.

According to National Safety Council research, upper extremities were the most frequent body injuries treated in hospital emergency rooms in 2007.

Objectives

Setting objectives for the organization is a vital tool for measuring success or failure and determining the specific areas where improvement must be focused. All objectives must be obtainable by the personnel. The objectives developed for the facility are as follows:

- Given an elevated DART score, management will review all incident reports over the last five years to determine patterns of incidents. They will take a proactive correction approach to employee safety in order to reduce DART below the national average.
- When selecting job-specific personal protective equipment (PPE), employees must perform dexterity tests to emulate the tasks they will perform on a routine basis according to the JSA.
- Under the policies monitoring the employee observation testing, workers or supervisors will observe no more than three tasks with a duration of five minutes or less.
- All workers will receive documented JSA training for their assigned tasks upon return from any OSHA reportable incidents, prior to returning to the work floor.

The project team's objective is to provide the facility with the tools to facilitate TQM within a safety department for the improvement of employee health and safety on a daily basis while improving the financial risk allocation of the organization. The long-term goal is to obtain ISO 18001 Safety and Health designation for the facility. This would be an achievable five-year goal for the organization with funds designated to improving safety at the workplace. By performing cost analysis, the facility will identify the direct cost savings from the reduction of incident rate (IR), experience modification rate (EMR) and DART.

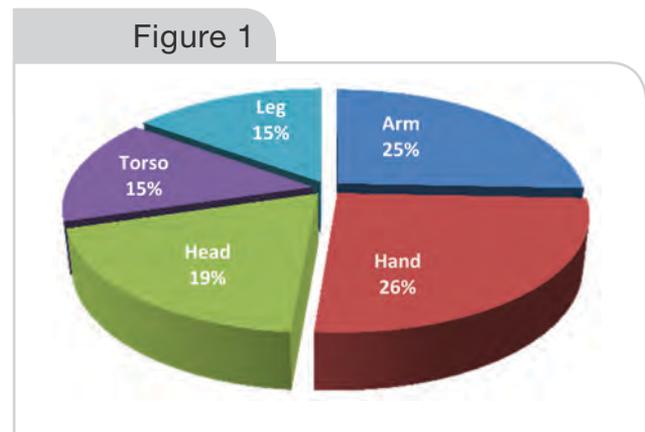
Methods

To enhance the ability for other facilities to duplicate this research, all categories obtained by the organization's OSHA logs were utilized. Though time-consuming, the first step was to break down each of the incidents. This breakdown includes number of cases, number of days and injuries/illness types. Selection of the appropriate amount of data is directly dependent on the amount of incident data to develop a credible

baseline for an organization (i.e., five or 10 years). This identifies who is getting hurt, how often, what caused the incident and where in the facility the incidents are taking place. One of the first questions to ask about facility injuries is: "Does the facility have repeat injuries by the same worker or workers performing the same tasks?" The data will be the indicator; however, management's response to the question will indicate the current safety culture of the facility. At this facility, data analysis shows a 43–63% annual injury rate per year by repeat employees. The term "repeat employee" is defined as a worker with two or more OSHA reportable injuries within five years. Time spent with both management and workers on the floor allows the safety professional to determine if the hazard has been mitigated or if it still exists. Effective personal communication with the workers will lead to improvement in the quality of their tasks. Communication barriers between management, workers and contractors must be identified to run a TQM program. This was documented independently through observations of interactions over six months to determine the true working relationship at the facility.

Analysis

Upper extremities encompassed 38 injuries over the last five years. This represents 50% of the facility's injuries. Figure 1 shows the percentage of OSHA reportable claims over the last five years. Seventy percent of the injuries are arm, hand and head injuries. Shipping/receiving has the highest amount of injuries, followed closely by the internal milling process. Upon further review, material handling, proper tool usage and body positioning were three visible reasons for injury occurrences.



OSHA reportable injuries over five years at the steelmaking facility.

The data also indicate a group of individuals obtaining multiple injuries over the five-year period. Upon identifying such data, a review of the employees' tasks was compared to the JSA. The findings indicate a gap in the JSA, which was missing some actual steps relevant to safety of the workers' tasks. Information absent from the JSA does not indicate the actual cause of the injury; however, if the information is based on best practices that employees are to be familiar with, and the facility fails to include them based on manufacturer recommendations, workers could be subject to unnecessary harm. While having the JSA is a positive step toward worker safety, continual improvements and review are imperative to maintain the highest quality of safety.

Repeat employees are 15% of the workforce, causing 55% of the OSHA reportable claims at the facility. Of the 1,800+ lost workdays, repeat employees are responsible for 70%, or more than 1,300 days. Employees with three or more reportable injuries in the last five years are considered high risk. The top five individuals account for 20 reportable incidents or 45% of "repeat employee" injuries, or 25% of all OSHA reportable injuries. If an incident does occur, emergency care is the number one priority. Once the victim is under the control of qualified medical professionals, accident investigation with control of the scene is vital to determine the root cause. Quality accident investigation requires facility control, documentation of the scene and interviews of eyewitnesses. Too often in a production-orientated company, the accident investigation is rushed, if not absent, to regain the production process. This leads to the accountability of management to oversee the investigations. If safety is valued at the facility, production will cease until the investigation is completed. For facilities with ongoing repeat injuries, a re-evaluation of the return-to-work policy is a must. When the physician releases the worker to return to duty, it is advisable for the organization to review all JSAs related to the worker's tasks, including changes to the process or policies prior to placing the worker back on the production floor. Some form of evaluation is necessary to verify the worker's ability to perform functions successfully. Documentation of training/retraining shall be signed and kept in the worker's file for review.

Communications with floor workers may warrant investigations on PPE. While the company was compliant with mandatory PPE, including offering multiple types, workers indicated some apprehension of new products, causing a greater potential for hand injuries. Workers suggest that snug-fitting gloves do not allow the opportunity to remove one's hand if a pinch point is encountered. While this is a relevant statement on behalf of the workers, the safety department should locate the pinch points. In this example, the JSA for

the machine needs to further identify the hazards. In addition, machine pinch points should provide engineering controls such as guards. Engineering controls are costly to implement; however, by completely engineering out the hazards, the facility will eliminate potential injuries, affording a safer environment.

Administrative controls are also needed for conformance with the safe work practices. Administrative controls will require continual review of employee behaviors to verify worker compliance. Personal protective equipment should be used as a last resort for controlling potential hazards. Within industry, PPE is a temporary solution affording time for facilities to implement engineering or administrative controls. In most organizations, management determines the PPE to be purchased for the facility. Upon management approval, the purchasing agent is then appointed to maintain supply for the facility. A critical step that is missed here is running the PPE products by the facility's safety and health department. The quality of the PPE purchased will directly influence the severity of the injuries received by the worker. By allowing the safety department to perform cost-benefit analysis using a proactive approach, the implementation of or transition from one product to another will reduce overall cost to the organization while gaining support from the workers.

Recommendations

When implementing TQM in a facility, organizations tend to struggle with the accountability of employee actions.

"Accountability has three required elements for success: personal accountability, workers' accountability and management accountability. Without all three elements, even the best safety programs will fail."

— James W. Stanley, president, FDRsafety

Two ways to prevent this from happening would include instituting educated leadership in the organization, and training or retraining the workforce to meet the safety requirements. This may require the hiring of a qualified safety professional to assist in program applications. Upper management must lead the workforce. The attitudes of employees are reflected by management's views. Safety managers conducting management by walking around will verify compliance by inspecting regularly. Line workers deal with hazards on a daily basis and would be helpful in the hazard identification process.

Management should create a workplace in which workers are encouraged to voice their ideas for

improving the quality of the products and safety function. Management should be aware of and receptive to the issues between workers and promote teamwork. To achieve best quality, train or retrain workers to use the best methods of achieving a quality product. Poor trainers will pass along mistakes that could potentially lower the quality of the overall product. Make sure training programs fit current job descriptions. Use highly trained employees who know the conditions or processes for task training. The company safety professional may not know all of the details on machinery, but the worker who uses it daily will. Management must look for continuous improvement by correcting mistakes and incidents and creating a safe workplace where accidents are engineered out of processes.

Conclusion

Companies' risk versus incident rates vary based on industry. The fact that one company may have lower incident rate does not mean that its environment is safer for its employees.

The safety management system the company chooses should be evaluated for performance. If incentives are given for safety performance, they should be directed at the success of the programs and employee involvement. New safety techniques and perspectives may be more effective than methods that have been used for numbers of years. Paradigm shifts that increase safety of the workplace ultimately reduce the company's costs while returning workers home to their families unharmed at the end of the day. ♦



- Design, fabrication & installation
- Thermoplastic & metal tanks
- Annealing, pickling & galvanizing lines
- Exhaust systems
- Modifications & repairs

*For the rod and wire,
metals, specialty steel
& hot dip galvanizing
industries*



PKG Equipment, Inc.

877.615.6460 (toll free)
www.pkgequipment.com