LOTO and Grain Bins

Seasonal campaign on LOTO: https://icash.public-health.uiowa.edu/programs/seasonal-campaigns/fall-2018-lock-out-tag-out/

Summary of auger-related entanglement incidents occurring inside agricultural confined spaces

Cheng, Y. H., & Field, W. E. (2016). Summary of auger-related entanglement incidents occurring inside agricultural confined spaces. *Journal of agricultural safety and health*, *22*(2), 91-106.

Entanglements in energized equipment, including augers found in agricultural workplaces, have historically been a significant cause of traumatic injury. Incidents involving augers located inside agricultural confined spaces (primarily grain storage structures and forage silos), although relatively rare events, are a widely recognized problem due to the relative severity of the resulting injuries and the complexities of victim extrication. However, this problem is neither well documented nor elucidated in the research literature, other than anecdotal observations relating to medical treatment of auger-related injuries and citations for non-compliance with federal and state workplace safety regulations. A review of nearly 1,650 cases documented in the Purdue Agricultural Confined Spaces Incident Database from 1964 to 2013 identified 167 incidents involving entanglement in an energized auger that occurred while the victim was working inside an agricultural confined space. These incidents primarily included in-floor unloading augers, sweep augers, stirring augers, and auger components found on silo unloaders. Cases involving portable tube augers used to handle grain outside grain storage structures were not included. Based on analysis of the data, approximately 98% of known victims were male, with the 21-45 age group reporting the largest number of incidents. Nearly one-third (32.3%) of incidents were fatal, and lower limb amputation was the most frequently reported injury type. (It is believed that non-fatal incidents are grossly under-reported in the data set due to a lack of comprehensive reporting requirements, especially for most farms, feedlots, and seed processing operations, which are generally exempt from compliance with OSHA machine guarding, confined-space, and grain-handling standards.) The type of auger identified most frequently as the agent of injury was the exposed in-floor auger (48), which frequently resulted in amputation of one or more lower limbs when the victim stepped into an unguarded opening or well in the floor of the confined space. The primary reason identified as to why workers were exposed to energized augers in the cases documented was to assist in the removal of residual or out-of-condition grain. The large number of cases involving augers on top-unloading silo unloaders (36) was not anticipated. Silo unloaders also accounted for the largest number of documented fatalities (15). This analysis is the first known attempt to provide a better understanding of the frequency, severity, and causative factors of these incidents. Those key causative factors were found to be: (1) lack of or inadequate guarding, (2) unintentional energizing of components due to a lack of lockout/tagout training and provisions, and (3) exposure of untrained or inexperienced workers to energized and unguarded components during procedures to remove residual grain or other agricultural crops from storage structures. It is hoped that the results and recommendations

presented will raise awareness of the hazards related to using energized equipment in confined spaces as well as contribute to development of new evidenced-based educational resources, engineering safety standards, and workplace safety regulations.

Investigation of lockout/tagout procedure fail in machine maintenance process

Dewi, L. T. (2018). Investigation of Lockout/Tagout Procedure Failure in Machine Maintenance Process. *Jurnal Teknik Industri*, *20*(2), 135-140.

Lockout/tag out (LOTO) refers to specific practices and procedures to stop the release of hazardous energy and turnoff machinery and equipment during service or maintenance activities. An effective LOTO system will ensure the workers are protected from the unexpected conditions during maintenance activities. This paper focus on incidents of LOTO system failures in an electricity power industry. LOTO system had implemented for many years in the company, but many incidents of LOTO system failure was still happened. The purpose of the research was to investigate the cases of incident caused by LOTO procedure failures. The research was conducted using descriptive analytical approach to analyse the cases of incident to find the root causes and develop the solution. Main data used in the research was document of incidents and was analysed by Systematic Cause Analysis Technique (SCAT). The result of investigation showed the root causes of LOTO system failure were caused by individual, job and management factors. Based on SCAT chart synthesis, the control actions were identified. The identified control movement were improve operational procedure of LOTO and proposed job description of supervisor. Evaluation of control action concluded that basically the suggestions were feasible to implement and some adjustments were needed due to implementation.

Certified safe farm: Identifying and removing hazards on the farm

Rautiainen, R. H., Grafft, L. J., Kline, A. K., Madsen, M. D., Lange, J. L., & Donham, K. J. (2010). Certified safe farm: identifying and removing hazards on the farm. *Journal of agricultural safety and health*, *16*(2), 75-86.

This article describes the development of the Certified Safe Farm (CSF) on-farm safety review tools, characterizes the safety improvements among participating farms during the study period, and evaluates differences in background variables between low and high scoring farms. Average farm review scores on 185 study farms improved from 82 to 96 during the five-year study (0-100 scale, 85 required for CSF certification). A total of 1292 safety improvements were reported at an estimated cost of $650 per farm. A wide range of improvements were made, including adding 9 rollover protective structures (ROPS), 59 power take-off (PTO) master shields, and 207 slow-moving vehicle (SMV) emblems; improving lighting on 72 machines; placing 171 warning decals on machinery; shielding 77 moving parts; locking up 17 chemical storage areas, adding 83 lockout/tagout improvements; and making general housekeeping upgrades in 62 farm buildings. The local, trained farm reviewers and the CSF review process overall were well received by participating farmers. In addition to our earlier findings where higher farm review scores were associated with lower self-reported health outcome costs, we

found that those with higher farm work hours, younger age, pork production in confinement, beef production, poultry production, and reported exposure to agrichemicals had higher farm review scores than those who did not have these characteristics. Overall, the farm review process functioned as expected, encouraging physical improvements in the farm environment, and contributing to the multi-faceted CSF intervention program.