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## Conveyor safety

Learning lessons protects workers and profits

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Martin Engineering's Training Manager, Jerad Heitzler, considers the lessons learnt from 2020 OSHA/MSHA Reports and how a focus on safety not only protects workers, but can also positively affect a company's bottom line



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A professional safety inspection takes a third-party perspective of aspects that workers often overlook.

The effect of the 2020 pandemic on the bulk material handling industry has been profound in both production and operations, but what impact did it have on safety? Injuries and deaths from conveyor accidents has generally plateaued since 2015 as compared to 20 or 30 years ago, where the annual number of worker fatalities were nearly 400 times of what they are today. With operational disruptions due to Covid 19, there was speculation that industrial injuries and fatalities might enjoy a statistical dip. Unfortunately, that doesn't seem to be the case.

Safety experts attribute some of the decrease in injuries and fatalities in the past decade partly to stringent regulation and reporting by the Mine Safety and Health Administration (MSHA) and Occupational Safety and Health Administration (OSHA). Contributing factors also include modern safety-minded equipment designs and operators addressing the root causes of injuries in bulk handling environments, rather than treating the symptoms.

According to industry expert R. Todd Swinderman, there are five root causes of conveyor injuries: a 'production

first' culture, 'low bid' purchasing, overly complex designs, too many rules, and understaffed / undertrained personnel. He pointed out, "A survey of the literature shows that companies who truly focus on safety are more productive, operate cleaner and safer facilities than their competitors, and have a higher share price."

## 2020 OSHA AND MSHA CONVEYOR-RELATED STATISTICS

The MSHA 2020 database reports 29 mining fatalities, making it the sixth consecutive year that mining fatalities were below 30. In 2017 and 2018, officials noticed an increase in fatalities in the 'powered haulage' category -- which includes conveyor belt accidents -- accounting for nearly 50 percent of all industrial fatalities. In response, MSHA initiated a multifaceted education and rulemaking campaign, and by 2020, powered haulage deaths dropped by 21 percent.

Pandemic protocols and increased MSHA intervention also resulted in lower dust-related issues. Inspectors visited all US underground mines at least four times and surface mines at least twice in 2020. Between March 1 and December 31 2020, MSHA issued 195 citations for

coronavirus-related sanitary violations. Greater scrutiny saw the mining industry achieve all-time-low average concentrations of respirable dust and respirable quartz in underground coal mines, as well as reduced exposure to dust and quartz for miners at the highest risk of overexposure to respirable dust.

On the other hand, early assessment of conveyor-related injury and fatality data in bulk handling industries outside of mining provided by OSHA and the Department of Labor (DOL) has been less positive. Regardless of 2020's temporary shutdowns or slowdowns, data show only 3 conveyor fatalities in bulk handling each year in 2019 and 2020, representing a nearly 75 percent drop in similar reporting to OSHA in 2017 (12 fatalities) and 2018 (11 fatalities). Although positive news on its surface, this significant discrepancy with no increased intervention on OSHA's part, and the dip occurring prior to the pandemic, points to issues with employer reporting.

Statistical inconsistency and specific 'problem' employers contributing to injury numbers sparked OSHA's new Site-Specific Targeting Directive (SST), announced in December 2020. SST focuses on non-construction establishments that have 20 or more employees with consistently high injury and illness rates. The directive also allows records-only inspections to occur when it is determined that incorrect data led to the establishment's inclusion in the program.

Experts will say that statistical analysis doesn't always divulge the full story, and other aspects must factor into any analysis. For example, reductions in employment due to automation results in fewer workers on site to get injured. Greater production goals, faster systems and larger belt loads can contribute to increased injuries, but conveyor equipment manufacturers have designed innovative conveyor components with a focus on safety intended to offset these changes. This has led to increased production and profits with fewer injuries and fatalities than in the past.

### EXAMINING THREE PREVENTABLE 2020 CONVEYOR INJURIES

"Reduced workplace injuries and fatalities is a positive trend, but there are still predictable and preventable injuries happening," said Dan Marshall, Product Engineer at Martin Engineering. "The goal of our Production Done Safely philosophy is to help bulk handlers achieve the greatest amount of production at the lowest cost of operation with the least number of injuries possible. We accomplish that through awareness, extensive training and safety-conscious equipment design."

The following examples display common injuries that could have been prevented through several established safety methods. Beyond the tragic loss for the workers and their loved ones, the companies in which the fatalities occurred were heavily fined. Consequently, some are also enduring ongoing litigation, serious morale issues and higher than normal turnover as a result.

#### AN UNFORTUNATE BEGINNING [3]

The first fatality is a common one. On a January morning in 2020, a 33-year-old worker was cleaning spillage around a running conveyor system at a facility in New Jersey. Listed as a temporary non-union worker,



Guarding restricts access and may require a specific procedure to unlock.

he got too close to the moving belt, and a piece of loose clothing came in contact with the belt, dragging him into a pinch point. He was strangled with the fabric before aid could be administered or the system shut down. This incident resulted in \$36,500 in fines from OSHA.

There were several details left out of the public report. One is the presence of guarding around the belt, which prevents limbs and objects from "breaking the plane" of the system. The "plane" is the line (generally indicated by the outside of the stringer) that, once crossed, becomes a hazard for this type of incident. Guarding is designed with mesh that prevents incidental contact but allows for inspection. Often there is a procedure required to remove guarding, and in some cases, removal triggers an automatic shutdown of the system.

It was not revealed in the report how much training the individual had received, but a trained worker would have been aware of the hazards around a moving belt with regards to loose-fitting clothing, long hair, etc. Also, the presence of a buddy or supervisor is unknown, but the implementation of work teams might have allowed a faster response to shut off the system or free the worker before asphyxiation occurred.

#### UNSAFE HOPPER ENTRY [4]

On an August day in Southern California, a 21-year-old worker with just over a year of experience at a sand and gravel mine noticed a clog in the drop chute of the cone crusher. After entering the vessel to remove the obstruction, while he was inside, material that had built up on the sides fell inward, encasing him up to his chest. Fire crews were able to extract him, but the injury damage



Industrial vibration improves material flow and reduces the chances of injury.

from the pressure and force of the material was too significant and he later died in the hospital. Citation and litigation data was not available for this case.

What was not revealed in the report was whether the worker was certified for confined space entry. Knowledge of chute entry rules specifies safety procedures for these types of actions, including clearing all loose material, which would have likely prevented the worker from entering the hopper.

There are safe and economical accessories designed to mitigate obstructions in chutes, hoppers, bins and silos. To prevent injuries and equipment damage associated with methods such as striking the sides of the vessel with mallets, stabbing at obstructions from below or dangerous chute entry, equipment manufacturers offer vibration and air cannon technologies.

Vibration at specified points agitates dust and fines that adhere to surfaces, preventing buildup that leads to clogging. Going one step further, air cannons use a forceful shot of pressurized air pointed toward the material flow to free build-up over wide areas of the vessel's surface. Air cannons not only prevent clogs but also promote the consistent flow of cargo through the process.



Air cannons are configured at a specific angle to enhance material flow.

### A FAST CONVEYOR [5]

In April of 2020, a 49-year-old worker in Illinois was using a broom to clean dust and spillage around the conveyor feed pit leading to a moving conveyor transporting dried manure to a transfer point. The worker accidentally slipped and fell onto the belt. He was quickly conveyed 100 feet to the blade cleaner at the discharge point where he suffered multiple life-threatening injuries and later died. According to the report, the employer was initially fined \$66,794, but was able to settle with OSHA for \$30,000. Any further pending litigation was unreported.

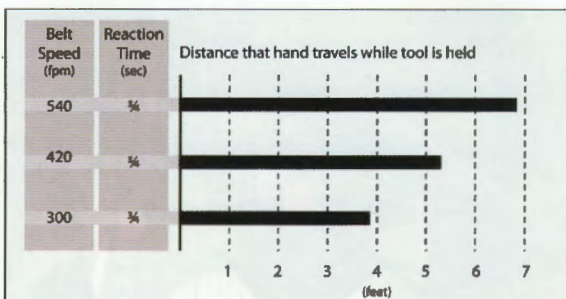
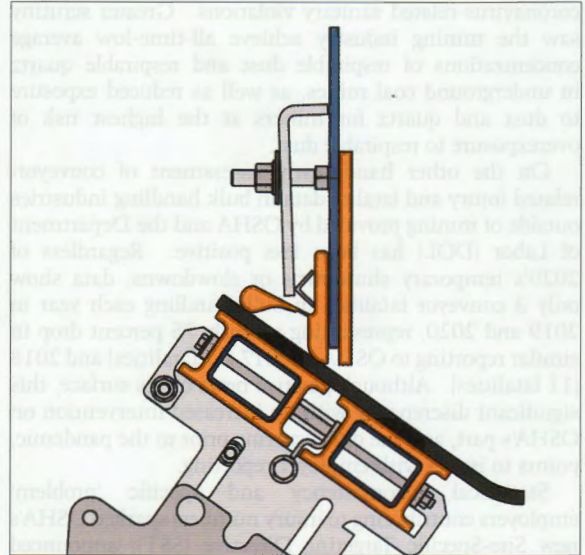


Figure 1 – Worker reaction times and drag distance for incidental contact with moving conveyor belt.



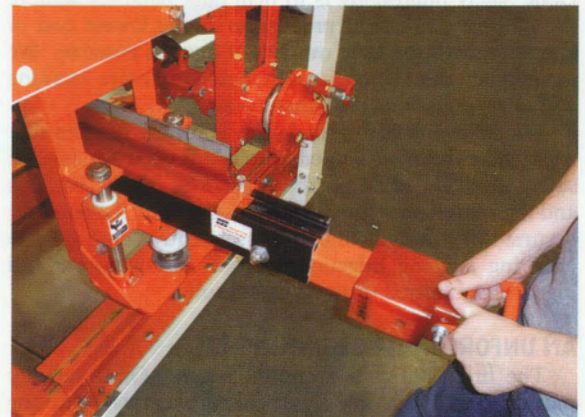
Components such as wear liners and skirt board seals reduce fugitive materials and cleanup hazards.

Conveyors in full production mode often move so fast that they can exceed the reaction time of even a highly-trained Olympic athlete. [Fig.1] When faced with a situation where a worker suddenly contacts the cargo side of the belt, the only hope may be another worker making it to the shutoff switch in time.

The report cited the presence of a guardrail but did not specify the circumstances by which it was crossed. However, the best practice is to prevent as much dust and spillage discharging from the system as possible, then clean safely during scheduled downtime. Employers can mitigate excessive dust and spillage by installing equipment specifically designed for sealing the conveyor belt and controlling emissions.

### ACCOUNTING FOR INJURIES

The importance of protecting workers should be the top priority for any employer. The loss felt by family coworkers after a workplace fatality can weigh heavily on the community and the staff, not to mention the financial consequences. Thus, investing in equipment and training



Some components are explicitly designed for safe service, such as track-mounted belt cleaners.

that protects workers from injury and illness is essentially investing in the community and the company culture.

In its 2002 white paper, the American Society of Safety Engineers (ASSE) concluded a direct, positive correlation between investment in Safety, Health and Environment (SH&E) and its subsequent return on investment (ROI). [6] The organization reported that of the American business executives polled, 95 percent believed workplace safety also has a positive impact on a company's financial performance. The same poll revealed that 61 percent believed their companies received an ROI of \$3 (USD) or more for each \$1 (USD) they invested in workplace safety.

Calculating these costs is specific to each operation, but in general, they can be broken down into "direct costs" and "indirect costs":

Direct costs are explicitly associated with the accident or illness. In general, these include fines, medical bills, insurance premiums, indemnity payments and temporary disability payments.

Indirect costs include a variety of other expenses resulting from the incident. They include: [Fig.2]

- Cleanup time and product loss
- Equipment repair / replacement
- Purchase / installation of safety components
- Overtime to fill in for the missing worker
- Cost of hiring, training and equipping new employees
- Legal fees and litigation costs
- Increased insurance premiums
- Production delays and missed shipment targets
- Reduced employee morale, greater absenteeism
- Negative publicity
- Increased scrutiny by regulators

### THE PRICE OF RECOVERING FROM AN ACCIDENT

"Tallying the direct and indirect costs, the impact of an accident on a company's bottom line can be devastating," said Marshall. "Safety rules aren't maliciously created to complicate operations or limit profit. When taken into account, they actually improve a company's bottom line."



Figure 2 – Direct and indirect costs of worker injuries and fatalities

To demonstrate the benefit of safety to a company's bottom line, OSHA created the online tool, 'Safety Pays,' which uses company-specific economic information to

OSHA Safety Pays Tool		The Safety Pays tool estimates the cost of a single crushing injury.
Average Direct Costs	\$56,557	
Average Indirect Costs	\$62,212	
Estimated Total Cost	\$118,769	
Additional Sales Necessary:		Assume that the company in this example has annual sales of \$10,000,000 with a 3 percent pre-tax profit margin.
To Cover Indirect Costs	\$777,658	Input your company's annual profits and the OSHA Safety Pays tool assesses the total cost of the injury.
To Cover Total Costs	\$1,484,612	OSHA draws direct costs from claim cost estimates provided by the National Council on Compensation Insurance.
		Indirect costs are provided by the Stanford University Department of Civil Engineering.

Figure 3 – OSHA Safety Pays Tool Example

assess the potential economic impact of occupational injuries on that firm's profitability.[7] The program estimates direct costs (claim cost estimates provided by the National Council on Compensation Insurance) and indirect costs (provided by the Stanford University Department of Civil Engineering) and weighs them against financial details supplied by the company. [Fig.3]

### RETURN ON PREVENTION (ROP)

The commonly used ROI model is calculated against a time frame in which the capital expenditure on new equipment is recaptured by the improvements. If a proposed project is within the budget expectations and has a payback period of less than one year, it is usually approved by plant management.

"The problem with the ROI model is it requires someone to get hurt to provide a benchmark for calculating return, and that's not a reasonable point of entry," Marshall explained. "Using the OSHA's Safety Pays tool to provide a cost model to calculate the ROP is a far more practical approach."

Working with abstract numbers implicitly creates pushback, making it more difficult for safety-conscious managers to obtain approval for their proposals. But the hard costs of worker injuries and fatalities are very real. The ROP model expresses the direction and strength of occupational safety and health programs in helping to achieve company goals.

### CONCLUSION

2020 was a year that brought changes in how companies approach safe operations, both in production and for individual workers. For the most part, the outcomes were positive. Although there was no dip in injuries and the year revealed gaps in reporting at OSHA, it also linked safety results to direct action from MSHA and created an environment that protected workers from dust-related illnesses and injuries.

The death or injury of a worker in a conveyor accident is always tragic. Investigations usually reveal the incident could have been partially or entirely prevented with practical and cost-effective safety improvements. The ROP on durable, well-designed conveyor accessories and professional training not only makes good financial sense, but also produces a culture of safety that ripples throughout the company's balance sheet ■