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CONTROLLING CONVEYOR SYSTEM SAFETY, EFFICIENCY

Steps producers can take to improve production and reduce risks

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All new conveyor systems will inevitably succumb to the punishing bulk handling environment and begin the slow process of degradation.

Systems will eventually require more time and labor for maintenance, leading to shorter spans between outages, longer periods of downtime and an ever-increasing cost of operation.

This is all accompanied by an increased chance of injury or fatality because workers are progressively exposed to equipment in order to perform cleaning, maintenance and fabricate short-term fixes to long-term problems. Total system replacements are cost prohibitive, but to remain compliant and meet ever-increasing production demands, upgrades and repairs are unavoidable.

When examining system safety, improving efficiencies and reducing risks can be achieved by utilizing control methods to alleviate hazards. The consensus among safety professionals is that the most effective way to mitigate risks is to design hazards out of components or systems. This usually requires a greater initial capital investment than short-term fixes, but yields more cost-effective and durable results.

HIERARCHY OF CONTROL METHODS

Examining the Occupational Safety & Health Administration accident database reveals the dangers of working around conveyors.

Studies revealed that the highest prevalence of accidents are near locations where cleaning and maintenance activities most frequently take place: take-up pulley, tail pulley and head pulley. Designs should be forward-thinking, exceed compliance standards and enhance an operator's ability to incorporate future upgrades easily and cost-effectively by taking a modular approach.

Designing hazards out of systems means minimizing risk with the intent to bolster safety on them. The methods of protecting workers can vary greatly and, in many cases, it will be necessary to use more than one control method by incorporating lower-ranking controls. Lower-ranking approaches are best considered as support measures rather than solutions in and of themselves, though.

Studies show that conveying-related accidents tend to happen where cleaning and maintenance activities frequently take place.

Personal protective equipment, including respirators, safety goggles, blast shields, hard hats, hearing protectors, gloves, face shields and footwear, provide barriers between the wearer and the hazard. The downside is that they can be worn improperly, may be uncomfortable to use through

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an entire shift, can be difficult to monitor and offer a false sense of security. The bottom line, however, is that they do not address the source of the problem.

Administrative controls create policies that articulate a commitment to safety, but written guidelines can easily be shelved and forgotten. These controls can be taken a step further by establishing active procedures to minimize the risks.

For example, supervisors can schedule shifts that limit exposure and require more training for personnel. Still, these positive steps do not remove the exposure and causes of hazards.

Warning signage is generally required by law, so this is less of a method than a compliance issue. It should be posted in plain sight, clearly understood and washed when dirty or replaced when faded. Like most lower-tier methods, signs do not remove the hazard and are easily ignored.

Installing systems such as engineering controls that allow remote monitoring and control of equipment – or guards such as gates and inspection doors that obstruct access – greatly reduce exposure. Again, though, these do not remove hazards.

Using the substitute method replaces something that produces a hazard with a piece of equipment or a change in material that eliminates the hazard. For example, manual clearing of a clogged hopper could be replaced by installing remotely triggered air cannons.

Examples of eliminating by design are longer, taller and more tightly sealed loading chutes to control dust and spillage, or heavy-duty primary and secondary cleaners to minimize carryback. By using hazard identification and risk-assessment methods early in the design process, engineers can create the safest, most efficient system for their space, budget and application.

PREVENTION THROUGH DESIGN COSTS

Another way of saying "eliminate by design" is prevention through design, a term used by the National Institute of Occupational Safety & Health (NIOSH).

As a department of the U.S. Centers for Disease Control & Prevention (CDC), NIOSH spearheaded the prevention-through-design initiative. In its report, NIOSH points

out that, while the underlying causes vary, studies of workplace accidents implicate "system design" in 37 percent of job-related fatalities.

Cost is most often the main inhibitor to prevention through design, which is why it's best to implement safer designs in the planning and initial construction stages rather than retrofitting systems later. The added engineering cost of prevention through design is often less than an additional 10 percent of engineering, but it presents enormous benefits in improved safety and increased productivity.

The cost of prevention through design initiatives after initial construction can be three to five times as much as when the improvement is incorporated in the design stage. The biggest cause of expensive retroactive improvements is cutting corners initially by seeking lowest-bid contracts.

LOW-BID PROCESS & LIFE CYCLE COST

Although the policy is generally not explicitly stated by companies, the low-bid process is usually an implied rule that is baked into a company's culture.

It encourages bidders to follow a belt conveyor design methodology that is based on getting the maximum load on the conveyor belt and the minimum compliance with regulations using the lowest price materials, components and manufacturing processes available.

But when companies buy on price, the benefits are often short-lived and costs increase over time, eventually resulting in losses. In contrast, when purchases are made based on lowest long-term cost, benefits usually continue to accrue and costs are lower, resulting in a net savings over time.

DESIGN HIERARCHY

Rather than meeting minimum compliance standards, conveyor systems should exceed all code, safety and regulatory requirements using global best practices.

By designing systems to minimize risk and the escape and accumulation of fugitive material, workplaces are made safer and equipment is easier to maintain.

Life cycle costing should play into all component decisions. Buying on life cycle cost and anticipating the future use of problem-solving components in the basic configuration of the conveyor provides improved safety and access, without increasing the structural steel requirements or significantly increasing the overall price. It also raises the possibility for easier system upgrades in the future.

BEST PRACTICES

Installing or providing for maintenance-minded solutions in the loading zone can greatly improve safety and reduce man-hours and downtime. These components include slide-in and slide-out idlers, impact cradles and support cradles.

On larger conveyors, maintenance aids such as overhead monorails or jib cranes assist in the movement and replacement of components.

Designers should also ensure adequate access to utilities – typically electricity and compressed air – to facilitate maintenance and performance. Next-generation conveyor designs may even feature a specially-engineered idler capped with an independent power generator that uses the conveyor's movement to generate power for an array of autonomous equipment.

Dust, spillage and belt tracking are top concerns for safety professionals. Field

tests show that enlarged skirtboards and engineered settling zones promote dust settling and reduce fugitive material. Curved loading and discharge chutes control the cargo for centered placement and reduced turbulence. As the load is centered on the belt, guides ensure even travel through the take-up to promote consistent belt tracking.

Any transfer point is prone to buildup and clogging under the right conditions, be it ambient humidity, material wetness, volume or surface grade. Flow aids such as vibrators or air cannons on chutes can sustain material movement, improve equipment life and reduce the safety hazards associated with manually clearing clogs.

CONCLUSION

Engineering safer conveyors is a long-term strategy. Although design absorbs less than 10 percent of the total budget of a project, additional upfront engineering and applying a life cycle-cost methodology to the selection and purchase of conveyor components proves beneficial.

By encouraging the use of controls at the planning stage, as well as the design hierarchy at the design stage, systems will likely meet the demands of modern production and safety regulations, with a longer operational life, fewer stoppages and a lower cost of operation. **P&Q**

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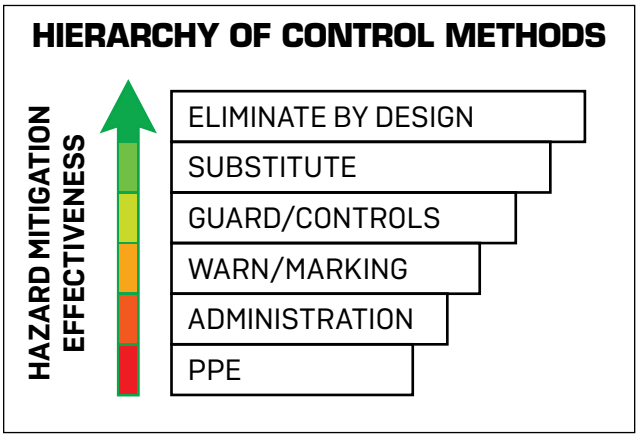

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An assortment of control methods can be implemented to elevate safety around conveyors, but each method delivers a different level of effectiveness.