Pneumatic Conveying Systems Health & Safety: Exploring ROI, Part 1

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Explore the most common areas of increased profitability and safety when implementing a vacuum conveying system for the transport of bulk dry materials.

Workplace injuries in any organization take a bite out of profits. There is a wealth of data, statistics, and surveys from scores of organizations regarding occupational illness and injuries. The statistics regarding the number of injuries and illnesses that occur on the job and purported annual costs of $250 billion is astronomical and difficult to digest at an organizational level and can therefore dilute the significance of injury costs to a single organization.

To bring these costs closer to an organizational level, it is necessary to first identify the most common injuries and illnesses in the manufacturing arena. In the goods producing industry, which accounts for account for 35 percent of all occupational illness and injury cases, “manual materials handling is the principal source of compensable injuries,” according to OSHA.

When practical, designing the hazard out of the process through engineering is the best practice for reducing them. While four out of five manual materials handling injuries affect the back (lifting, repetitive motion, slips, and falls), when manually transporting bulk dry materials, additional safety hazards such as poor respiratory environment and fugitive dust problems – hazards that can be effectively eliminated with pneumatic conveying systems – are present.

Pneumatic conveyors use vacuum to gently and quickly move materials from point to point with nothing in the way to impede the efficiency of its movement. Used to convey, batch, and weigh dry materials from fine powders to plastic pellets and caps, pneumatic conveyors consist of five basic pieces of equipment that come together to work as one – a pick up point, convey tubing, a vacuum receiver, a vacuum producer, and a control module.

From simple systems that semi-automate a process to more sophisticated systems that offer complete automation, improved safety *always* enters the equation when utilizing a pneumatic conveying system. While there is no single equation to determine the return on investment (ROI) that fits all organizations engineering out a safety hazard, data does exist to help determine how pneumatic conveyors contribute to the bottom line in terms of reduced or eliminated hazards, and gains in productivity.

OSHA’s $afety Pays [1] (SP) worksheet, which calculates costs associated with specific injuries and includes a dollar amount of additional sales (and increased production) needed to cover those costs, can assist managers in quantifying the

benefits of reducing or eliminating hazards when implementing a pneumatic conveying system.

One of the most effective methods to justify costs of ergonomic improvements is through production enhancements. Just shaving seconds from a single process can have a huge impact. An example from ASSE's website, ROI of Ergonomic Improvements: *Demonstrating Value to the Business* [2], validates how shaving 3.2 seconds from a task can reduce direct labor costs by $29,000 per year.

Utilizing a bag dump station, like the one shown here, can eliminate the need to carry ingredients to another level, reducing fall hazards.

Fall Hazards

It is not unusual for organizations to seek out pneumatic conveying solutions for the express purpose of eradicating ergonomic hazards. A common dilemma in the industrial world is the manual transport of materials to raised platforms where ingredients are dumped into hoppers. This action represents not only ergonomic hazards, but also a fall hazard. Although the majority of organizations seeking to eliminate this type of hazard have yet to experience a fall event, proactive executives seek out automated solutions to safeguard workers.

When increased demand turned up the notch on production for a particular product, a chemical manufacturer's primary goal was to eradicate an ergonomic issue by removing the need for workers to dump 20-40 drums containing powder chemicals, that weighed up to 225 pounds each, from a raised platform. Although the company hadn't had any injuries with that process, its policy was to wipe out any potential.

Although the job required a single operator, the organization staffed it with two people to reduce the potential for injuries. The company tried a bucket elevator. That method, however, created a lot of dust in the air and still presented an over-exertion hazard when dumping the product into the elevator. The company also considered a hoist system, but that would have required operators to do some drum handling which would have made the process significantly slower than their existing method.

The size of the pneumatic conveying system depends upon the desired speed at which product is transferred from one place to another as well as the distance between two transfer points. Because the company wanted to eliminate an ergonomic issue and timing wasn't an issue, it chose to utilize a smaller conveying system.

To move several hundred pounds of material in 30 minutes, a VAC-U-MAX MDL105017T Tube Hopper was utilized to transfer the claylike material up a level into a volumetric feeder. Another MDL015017T Tube Hopper was also added to a separate line that pulled granular material from awkward shaped drums weighing over 200 pounds each, up into a liquid mixing tank.

Although the time to transfer the products stayed relatively the same with the new

units, the job went from requiring two people to a single operator and eliminated a hazard. The company wasn't looking to cut any people, but they did save some money by it and the unit paid for itself in the first year of use.

Elevated falls are less frequent but more severe than same-level falls in the workplace. In 2011, falls, slips, and trips claimed the lives of 666 workers and one in four resulted from a fall of less than ten feet.

The manufacturing industry experienced 47 of the fall fatalities in 2011. OSHA's SP worksheet does not include cost data for fatalities, but a 2003 mean estimate of direct costs for a single fatality in the workplace was approximately $900,000.

Direct costs are budgeted costs, or insured costs. Indirect costs are those that are not budgeted (not insured) and eat away at profits. Indirect costs are estimated to be anywhere from two to twenty times the direct cost. These costs include training replacement employees, accident investigation and implementation of corrective measures, lost productivity, fines and penalties, repairs, and any other costs not covered by insurance, including loss of employee morale.

Fall fatalities demonstrate a worst-case scenario in the workplace and have a severe impact on employee morale, and high indirect costs that are conservative at one million dollars. Most commonly, falls, trips, and slips result in back injury or some other musculoskeletal disorder (MSD); however, statistically MSDs from those hazards are calculated separately. MSDs include any injury, damage, or disorder of the joints or other tissues in the upper/lower limbs or the back.

Check out Pneumatic Conveying Systems Health & Safety: Exploring ROI, ***Part 2****,* here *[3].*

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