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Cement: controlling material at transfer points

Conveyor belts form a critical part of the network that moves bulk materials through any process. Yet every time there's a transfer from one piece of equipment to the next there's also a risk of materials escaping. The root causes are not always obvious, but with the right expertise solutions can always be found, according to the team at Martin Engineering.

Fugitive material — whether spilling on the deck, clogging the process or pumping into the air — presents multiple health and safety risks. For a start, spillage increases the risk of localized slips, trips and falls whilst exposure to airborne dust can pose long-term health risks.

But if spillage is left to accumulate, it will start interfering with production, from conveyor belt mistracking and seized components to structural issues and total process failure. That introduces a whole new level of safety risk, because discharge and transfer points often seem to be in difficult-to-access places, and sending in workers to clean up manually is unfortunately still the norm.

That can mean exposing people to confined spaces or working at height, not to mention the risks of stored energy, entrapment, falling materials, manual handling and so on. Worse still, despite what we know about the importance of energy isolation through LOTOTO (Lock Out, Tag Out, Try Out) production pressures can mean clean-ups are allowed to take place whilst equipment is still running — and experience shows that can have catastrophic consequences and cause life-changing injuries.

To address these challenges, conveyor

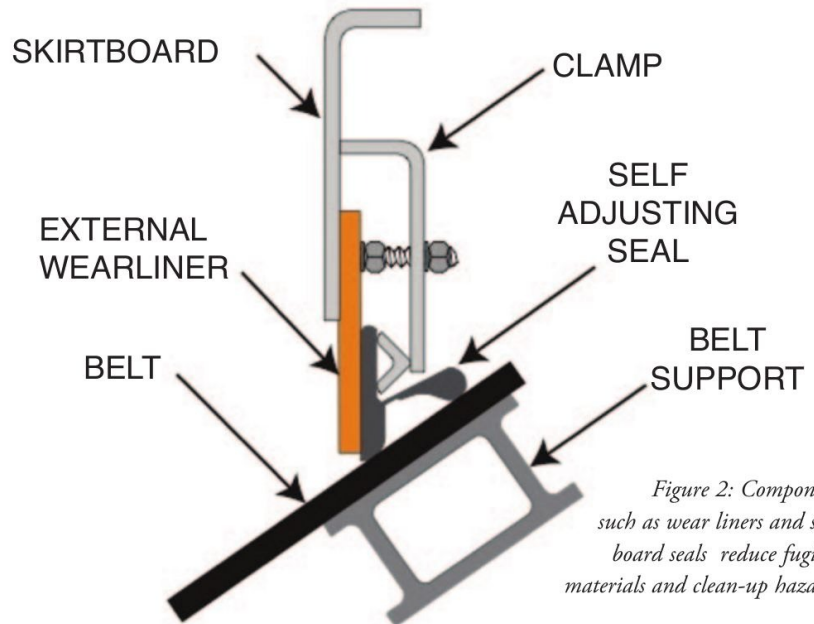


Figure 2: Components such as wear liners and skirt board seals reduce fugitive materials and clean-up hazards.

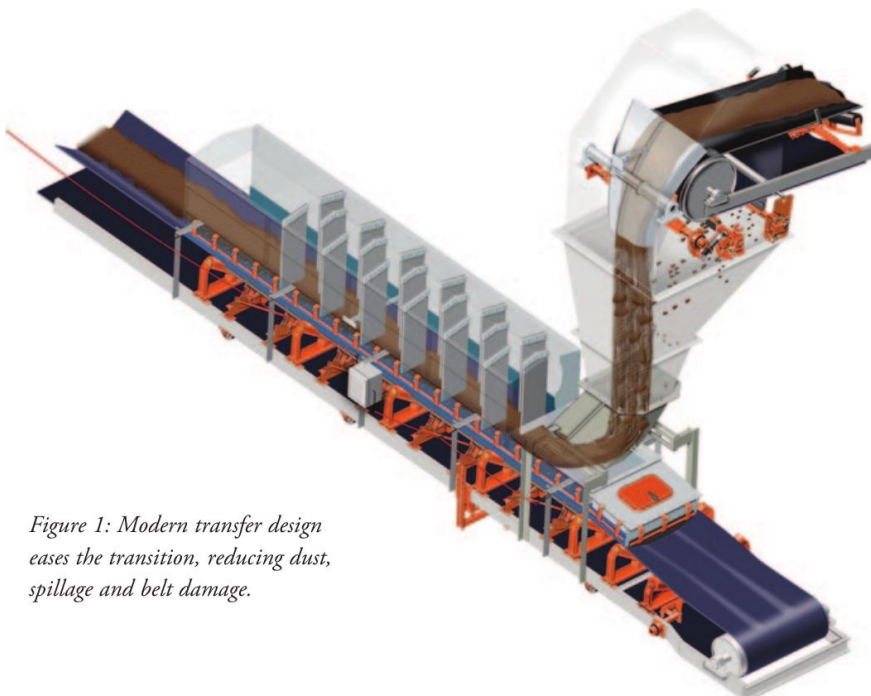


Figure 1: Modern transfer design eases the transition, reducing dust, spillage and belt damage.

equipment manufacturers have sought to design innovative components and solutions that can prevent fugitive dust and spillage from conveyors and transfer points.

TRANSFER POINTS: KEEPING MATERIAL IN ITS PLACE

Daniel Marshall, Product Engineer at Martin Engineering says: “When tonnes of bulk material hit a moving conveyor belt, three things happen: fines scatter in random directions, cargo shifts and dust becomes airborne. The impact creates turbulent air pressure inside the chute that seeks to escape from any gap it can find, carrying dust and fines with it.

“A properly designed enclosure will manage bulk solids, allow cargo to settle in the centre of the belt and contain most of

the dust inside a settling zone enclosure. If left uncontained, fugitive material in the form of dust and fine particle spillage will increase labor costs for clean-up, foul equipment, potentially encapsulate the belt and pose a serious safety hazard.

“Problems such as improper belt support, badly sealed chutes, damaged idlers and uneven cargo distribution all result in spillage and belt mistracking, contributing to increased costs for maintenance and clean-up, and high potential for injury.”

But it doesn't have to be this way.

Well-designed conveyor loading zones are crucial in keeping walkways clear from spillage and dust emissions under control, allowing for hazard-free manual inspections and maintenance.

“Reduced workplace injuries and fatalities is a positive trend, but there are still predictable and preventable injuries happening,” said Marshall. “The goal of our philosophy is to help bulk handlers achieve the greatest amount of production at the lowest cost of operation and, most important of all, keeping workers safe and healthy while they go about their everyday tasks.

“We aim to accomplish that with a holistic, whole-process approach which involves raising awareness of the root causes through extensive training for production and maintenance teams, combined with innovative, safety-conscious equipment design based on decades of experience solving issues.”

TRANSFER POINTS: SEALED CHUTE COMPOSITION

A well-designed loading zone typically consists of a combination of components:



Polyurethane belt cleaner blades are essential to prevent carryback, spillage and build-up beneath conveyors.

(Fig.1)

- ❖ An enclosed transfer chute long enough to give dust and fines time to settle.
- ❖ A heavy-duty belt support system to absorb impact, protect the belt and handle rapidly shifting heavy material.
- ❖ Closely spaced idlers to reduce sag in the belt that allows gaps where fines can escape and to ease material disruption from bouncing.
- ❖ Externally adjustable or self-adjusting skirting that's able to contain fine particles and adapts to fluctuations in the belt plane. [Fig.2]
- ❖ Easily serviced external wear liners that can be inspected and changed from outside the chute without confined space entry.
- ❖ Dust curtains set strategically throughout the enclosure to control airflow and help settle dust.
- ❖ Dust bags or mounted air cleaners to collect tiny, highly active particles.
- ❖ A sealed tail box to protect the tail

pulley from the backflow of fines, dust and spillage.

- ❖ Exit curtains to prevent fugitive dust from escaping from the end of the chute.

CONVEYOR DISCHARGE: KEEPING THE BELT CLEAN

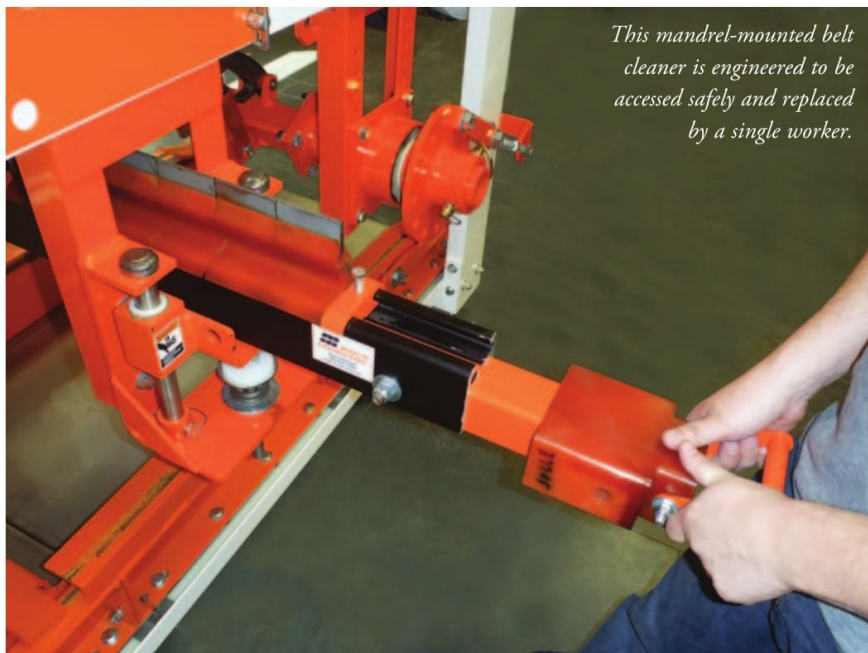
Conveyors are among the most dynamic and hazardous machinery in any processing plant. Manually inspecting and maintaining each component of a conveyor belt system across a wide area can be time-consuming, labour-intensive and, crucially, involves significant exposure to risk.

Primary and secondary conveyor belt cleaners play a critical role in ensuring belts are kept clean and in preventing material carryback, spillage and build-up after the point of discharge. But to be effective, belt cleaner blades must be in constant contact with the belt at the right tension. And it's the inspection, servicing, retensioning and replacement of belt cleaners that can give rise to transfer point health and safety risks.

To meet the demands for greater safety and improved production, manufacturers like Martin Engineering have introduced belt cleaner designs that are not only engineered for safer operation and servicing, but also reduce maintenance time and resource. Here we cover three examples of systems that reduce exposure to risk and improve maintenance safety.

SLIDE-IN, SLIDE-OUT BELT CLEANERS

Martin Engineering has designed a family of heavy-duty conveyor belt cleaners that allow the blade cartridge to be slid away from the belt for safe access. The system enables all servicing to take place outside of the chute, reducing the risk of injuries associated with moving machinery — manual handling, confined spaces and difficult access — and keeps workers away



This mandrel-mounted belt cleaner is engineered to be accessed safely and replaced by a single worker.

CleanScrape is a unique belt cleaner that forms a 3-D curve beneath the discharge that conforms to the pulley's shape.



from harm while servicing belt cleaners. The design also enables blades to be serviced and replaced by a single worker in a fraction of the time of a typical blade replacement task.

The same slide-out technology has been applied to impact cradle designs. The systems are engineered so operators can work on the equipment safely, without breaking the plane of motion. External servicing reduces confined space entry and eliminates reach-in maintenance, while facilitating faster replacement. The result is greater safety and efficiency, with less downtime.

REVOLUTIONARY BELT CLEANER DESIGN

One way to reduce exposure to risk during maintenance, and ensure exceptional belt cleaning performance at the same time, is a revolutionary belt cleaner design that doesn't use a urethane blade at all. CleanScrape is equipped with tungsten carbide tips that delivers extended service life, low belt wear, significantly reduced maintenance and improved safety.

Unlike conventional belt cleaners that are mounted horizontally across the belt plane, this unique cleaner is installed diagonally across the discharge pulley, forming a three-dimensional curve beneath the discharge area that moulds to the

pulley's shape. This novel approach has been so effective that, in many operations, it has rendered some crucial secondary belt cleaners redundant, saving further on belt cleaning costs and service time.

REMOTE MONITORING IS THE NEXT GENERATION

Until recently the only way for maintenance contractors and in-house teams to identify what servicing was needed was to physically go to each belt cleaner location, taking all the necessary steps to address the hazards involved in inspection. Because of the level of exposure — even to simply inspect belt cleaners — there's been a growing need to find a way to make this common, but time consuming, task safer and more efficient.

"The number of inspection visits — and therefore the exposure to risk — can be significantly reduced by allowing service technicians to monitor the condition of each belt cleaner remotely, rather than having to physically visit each one," says Dave Harasym, Martin Engineering UK Branch Manager.

"The smart thing about this kind of innovation is that it goes straight in at the top of the health and safety 'hierarchy of controls' eliminating needless inspection visits and significantly reducing the interaction between people and conveyors. (Fig. 3) Technicians only need to visit conveyors when the system shows that a belt cleaner

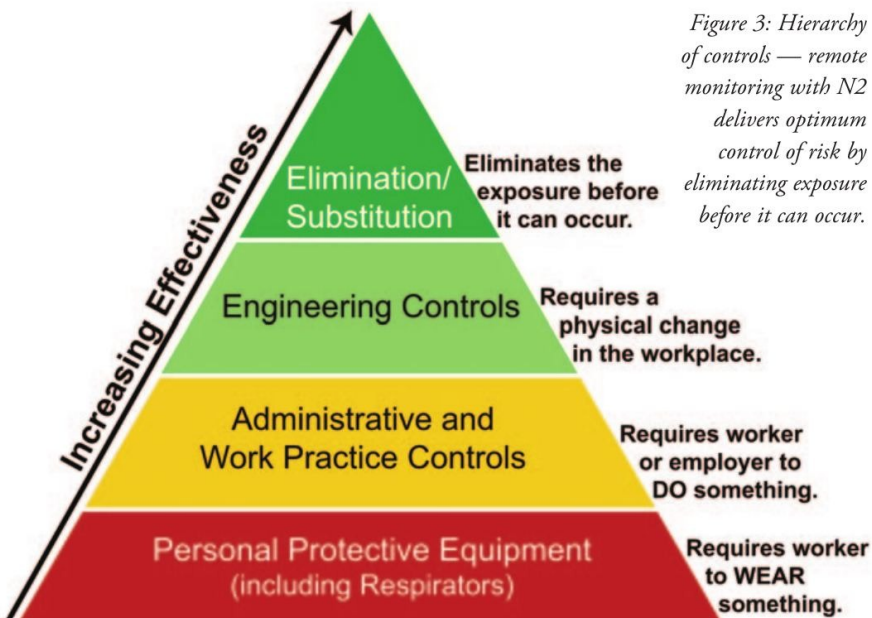


Figure 3: Hierarchy of controls — remote monitoring with N2 delivers optimum control of risk by eliminating exposure before it can occur.

needs attention, often this can be planned for an already scheduled shutdown.”

The result is a remote monitoring system that tracks the condition of each blade. It features a position indicator — a polyurethane collar embedded with a wireless sensor unit — fitted to each primary belt cleaner. The sensor unit transmits data on blade wear life to a central on-site ‘gateway’ device which sends the information to the cloud. From there users can access belt cleaner condition data in one place on an easy-to-use mobile app or desktop dashboard which predicts the retensioning cycle for each belt cleaner and indicates when servicing should be scheduled or performed immediately.

“It’s the ideal solution, especially for large-scale cement plants which have numerous difficult-to-access belt conveyors distributed over a large production site. The next generation of innovation to make bulk materials processing safer and more efficient is here.”

END-TO-END KNOWLEDGE IS KEY

There are innovative products and solutions capable of addressing virtually every incidence of spillage, build-up and dust in bulk material handling. But

overhauling a single problematic conveyor discharge or transfer point can sometimes exacerbate fugitive material problems elsewhere in the system. When safety has been sacrificed in the design for a lower price, it is difficult to go back and redesign a system for to achieve optimum health and safety standards.

There is a huge return on spending a little extra at the outset to design a clean, safe system, especially if the investment has been signed off with the expectation of the ability to increase production volumes! That’s why Martin Engineering advocates a holistic approach, working alongside cement production and maintenance teams around the world to conduct comprehensive end-to-end assessments of entire cement plants and their constituent phases.

A total process review with all parties is the best way to reveal the true causes of spillages, build-ups and blockages to ensure that the right solutions can be devised and implemented. It also helps plant teams to gain knowledge and expertise to continuously improve and maintain their plants to the highest standards – not just in terms of health and safety, but also productivity and profitability.

The second part of this feature will take

a look at the risks and the remedies of materials sticking to refractory walls and the inside of hoppers, bins and silos.

ABOUT MARTIN ENGINEERING

Martin Engineering has been a global innovator in the bulk material handling industry for more than 75 years, developing new solutions to common problems and participating in industry organizations to improve safety and productivity. The company’s series of *Foundations* books is an internationally recognized resource for safety, maintenance and operations training — with more than 22,000 print copies in circulation around the world. The 500+ page reference books are available in several languages and have been downloaded thousands of times as free PDFs from the Martin website. Martin Engineering products, sales, service and training are available from 16 factory-owned facilities worldwide, with wholly-owned business units in Australia, Brazil, China, Colombia, France, Germany, India, Indonesia, Italy, Mexico, Peru, Spain, South Africa, Turkey, the USA and UK. The firm employs more than 1,000 people, approximately 400 of whom hold advanced degrees.



The N2® Position Indicator is a polyurethane collar embedded with a sensor unit that fits onto the end of the belt cleaner mainframe.