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INDUSTRY INSIGHTS

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EXPLORATION

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AN ESSENTIAL GUIDE TO SKIRTBOARDS

MARTIN ENGINEERING EXPLAINS HOW A CONVEYOR TRANSFER POINT WITHOUT SKIRTING IS A MAJOR COST – AND A HAZARD.

When bulk material hits a moving conveyor belt, the landing can cause aggregate, dust and fines to splash and pelt the sides of the enclosure before settling onto the belt.

Without skirting, that material escapes and piles under the structure, spills into walkways, fouls equipment, and chokes the area with dust, creating an expensive headache for operators.

When tonnes of bulk material hit a moving belt, three things happen: fines scatter in a random direction; cargo shifts as it settles to the centre of the belt; and dust becomes airborne.

According to Martin Engineering, a properly designed enclosure should manage bulk solids and contain all of the dust. Inside a settling zone enclosure, the impact can create turbulent air that seeks the easiest escape from any gap it can find, carrying dust and fines with it. These gaps generally appear on the sides of the enclosure between the chute wall and the belt. Skirting systems address the challenge of containing fugitive dust.

Cluttered walkways and blocked access to systems is an implication of spillage. Since slip and fall injuries are some of the most common, Safe Work Australia guidelines recommend regular clean-up of all debris on the walkway and providing clear access to machinery.

In addition to safety hazards, material piling in the loading area can quickly encapsulate the belt and tail pulley. Spillage of just 4g per hour will result in an accumulation of 680g by the end of a week. With spillage of just one shovelful per hour, the total could reach 227kg of material every day. That kind of volume can cause equipment breakdowns, foul the pulley face and promote belt alignment issues.

Installation and service of skirtboard systems can also be hazardous, with some designs welded to the inside of the chute structure, involving confined space entry with a grinder or blow torch to perform maintenance, repair or replacement.

Properly sealing the chute using modern skirting designs can help avoid equipment breakdowns, improve workplace safety and prevent excessive downtime due to dust and spillage.

Anatomy of a sealed chute

The components of a well-designed and sealed loading zone will likely consist of a combination of components, including an enclosed loading chute, a heavy-duty belt support system, closely spaced idlers to avoid belt sag, adjustable skirting to contain fine particles, easily serviced wear liners, dust curtains to control air flow, a sealed tail box to protect the tail pulley, and exit curtains to prevent release of fugitive dust.

The trough angle will change throughout the settling zone, so proper skirt design for adequate sealing is important.

Usually made from natural or styrene-butadiene rubber (SBR) rubber, the skirting extends the length of the transition enclosure and is generally tapered at the bottom to match the trough angle of the belt. It is intended to ride the inside edges of the belt to maintain a seal on the enclosure and help trap any fine particles and dust that is not contained by the wear liners and chute wall.

Without a wear liner to protect the skirt and chute wall from serious damage by bouncing and shifting cargo, both will degrade and fail quickly.

As the skirt edge loses its seal due to wear or belt sag, gaps are created that can allow material to become trapped in a 'pinch point', causing abrasion that gouges or chafes the surface of the belt down its entire length.

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Often blamed on pressure from the skirt, pinch points occur most often when there is inadequate belt support or loading is done before the belt is fully troughed.

Major issues that result from entrapment include scalloping, which occurs when trapped material forms a high-pressure area between the roller and the skirt; and grooves being created by trapped debris under the skirt causing friction damage.

Regardless of the belt tension provided by the take-up pulley, small amounts of belt sag will occur between the skirt and belt, creating a space for fugitive dust to escape or material to become entrapped.

This is avoided by using impact cradles or edge support rather than rollers in the loading zone for a more consistent belt plane through the settling zone.

Skirting types

The main skirt sealing configurations are vertical sealing systems, internal wear liner and skirting, internal wear liner with external skirting, and external wear liner and skirting.

Segmented vertical sealing systems use a series of interlocking sealing blocks installed outside the skirtboard on special mounting plates.

The interlocking blocks can be manually moved downward but resist upward movement. However, since some wear disproportionately to others, they are difficult to adjust accurately (leading

SCALLOPING OF THE SKIRTBOARD.

GROOVES IN THE BELT.

OLD BELTING USED AS A LAY-IN SEAL TRAPS MATERIAL BETWEEN THE SEAL AND BELT.

to scalloping) and are easily over-adjusted (causing premature wear to the seals and belt). Gaps caused by material being forced between the blocks make them prone to material entrapment and leakage of dust and fines.

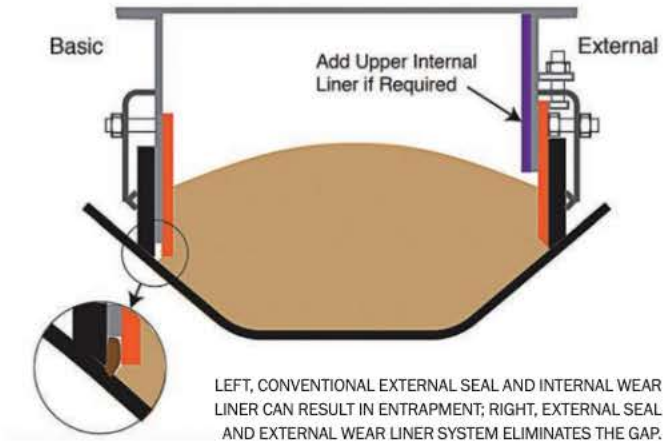
Internal wear liner and skirt configurations are not usually adjustable and require significant downtime to repair, maintain and replace.

A self-adjusting interior skirt features an L-shaped system with an outside assembly – similar to the self-adjusting skirt – with an inward 38mm extension under the wear liner that rides on the belt closer to the cargo to increase the range of tolerance for belt mis-tracking.

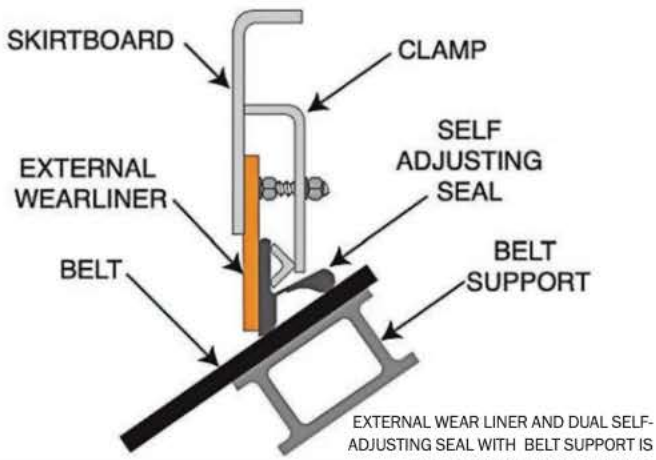
Old belting should never be used for sealing, as the fabric will trap abrasive fines and wear grooves in the belt. Even with a deflector-style wear liner, cargo will get between the seal and belt, and the pressure of the load will create wear unless the bulk material is totally non-abrasive.

The internal wear liner and external skirt configuration has been industry standard for decades. It offers a safer and more adjustable solution, as it is typically held tightly against the skirtboard using an adjustable clamp system that can be accessed from outside the chute. However, the internal design can allow some material build-up in the gap between the wear liner and the skirtboard.

Martin Engineering's external wear liner and skirting configurations place both pieces of equipment outside the chute wall. If not originally supplied, this may require some restructuring of the chute.



LEFT, CONVENTIONAL EXTERNAL SEAL AND INTERNAL WEAR LINER CAN RESULT IN ENTRAPMENT; RIGHT, EXTERNAL SEAL AND EXTERNAL WEAR LINER SYSTEM ELIMINATES THE GAP.



EXTERNAL WEAR LINER AND DUAL SELF-ADJUSTING SEAL WITH BELT SUPPORT IS CONSIDERED STATE OF THE ART.

Placing the skirt seal and wear liner outside of the chute makes it easier for workers to perform adjustments safely and more frequently, resulting in a better seal on the belt and less material entrapment, while eliminating the need for confined space entry.

The low profile of the skirt seal assembly needs only a few inches of clearance, allowing installation and maintenance in space-restricted areas. The design of the components drastically reduces scheduled downtime and the potential workplace hazards.

Sealing by the numbers

Innovative skirt designs apply practical engineering for safer and more effective sealing for trough angles up to 45°. They are often made from improved materials to deliver chemical resistance and low-abrasion index characteristics for reduced friction on the belt and splice.

Many dusty applications may need skirts featuring a secondary 'dual seal' that rides further up on the belt angle behind the primary seal to offer an added layer of protection.

Once the edge is worn, some designs allow the strip to be flipped over, effectively doubling the service life.

Self-adjusting skirting maintains a seal automatically, as the belt path fluctuates due to its design, without the need for adjustment and only periodic inspection. Self-adjusting skirting is also good for tight spaces where maintenance may be difficult. A low-profile skirting assembly should need only 152mm of clearance for installation and maintenance in small spaces.

Skirting best practice

The skirt should be considered a safety device first and foremost, protecting the work environment from fugitive dust and spillage and therefore reducing the time exposed to hazards while cleaning, with the added benefit of increased efficiency.

With this in mind, any manager contemplating a capital investment in a skirting and wear liner system should consider:

- hiring an external engineer to design the best system for the application
- installing equipment that features external maintenance
- utilising a skirting strip that extends the length of the chute to avoid seams
- choosing skirting material that is free of fabrics, with a lower abrasion resistance than the belt
- installing a self-adjusting system
- choosing the option with the least worker exposure to equipment hazards.

Since skirts are wear parts, it is important that they are easily installed, adjusted, maintained and replaced to avoid dust and spillage, mitigate downtime, improve workplace safety and reduce the cost of operation.