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SKIRTING AROUND THE ISSUE

Are your skirts rubbing you the wrong way?
By Todd Swinderman

Any discussion around the best practices of "skirtboards as a system" must include elements of the entire loading zone as each element impacts the effectiveness of the skirtboards to perform well as a system. The term skirtboard is derived from the early practice of using wooden boards to confine the load on conveyors.

Due to the punishing environment and modern production demands, a skirtboard sealing system today consists of equipment – some permanent, some wear parts – that work in tandem to seal the conveyor loading area from dust emissions and fugitive fines. These innovative designs are engineered to improve workplace safety, reduce labour for cleanup and ensure efficient production.

DESIGN APPROACH

Conveyor design is an iterative process where initial selections are made for the belt width and speed based on the desired capacity and the path of the conveyor. The design approach depends upon the purchasing philosophy, lowest purchase price versus lowest cost of operation.

It is unusual to find a conveyor purchased on price alone meeting the specified throughput. Almost every conveyor is "upgraded" at some point, so provisions for the eventual increase in throughput and to address potential operating issues such as dust and spillage should be built into the design. Note that, one of the most common design shortcomings is lack of access for cleaning and maintenance.

Skirtboard structure can be unique to the operation and the application and should be determined by an experienced engineer

SKIRTBOARD SYSTEM

The system includes the belt, tail pulley, loading chute, skirtboards, skirtboard covers, dust curtains belt support, sealing system and wear liners. It is recommended that the belt be in reasonably good condition without existing skirtboard grooves, otherwise, the system may not seal the belt effectively. If dust is an issue, consider replacing enclosure covers after maintenance.

The material should be centre-loaded and the skirtboards aligned parallel to the centreline of the conveyor. Idlers that are not closely spaced under the skirtboard enclosure will make a bumpy belt path that leaves gaps between the skirt and the belt for dust and fines to escape. To produce a fully sealed environment, the belt should be supported with closely spaced idlers or an impact slide bar system. The inflection point created at the first fully troughed idler creates an entrapment point for abrasive particles. Therefore, loading must only start after the belt is fully troughed to control fugitive material release and belt damage.

SKIRTBOARD WIDTH

There are various historical ratios for the spacing of skirtboards. They are usually based on belt width such as the Conveyor Equipment Manufacturers Association (CEMA) standard is two/three times or ½ times belt width for very free flowing material or multiple loading points. Another approach states three times the size of the largest average lump.

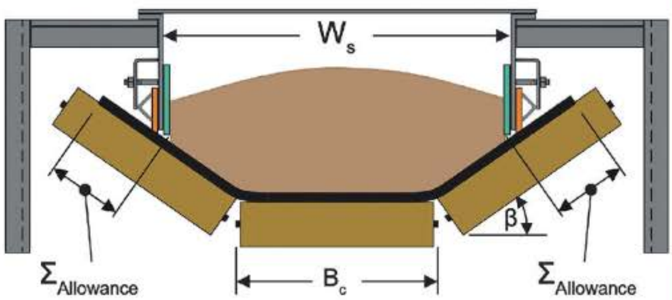
The standard edge distance is an allowance to prevent material from falling from the belt as the edges sag between carrying idlers after the load zone. The mistracking allowance is the expected deviation of the belt path from the central axis of the conveyor. CEMA Misalignment Guide is based on the dimensions of standard CEMA idlers and pulleys and considers three categories of mistracking: allowable, actionable and critical. The International Organization for Standardization (ISO) misalignment allowance is +/-40mm for belts up to and including 800mm or +/-5% (+/-75mm max.) of the belt width for widths over 800mm.

The free belt edge should be based on the thickness of the sealing system, skirtboards and wear liners added together and measured along the troughed belt surface. This distance will determine the maximum skirtboard spacing. With a BW of 1,200mm, Bc of 452mm, trough angle of 35°, standard edge distance of 60mm, a mistracking allowance of 100mm and a sealing system 50mm thick the skirtboard width inside the wear liners would be 757mm. Note that this is the distance between skirtboards, not the distance between the wear liners, but wear liner thickness should be included.

SKIRTBOARD HEIGHT

The minimum skirtboard height is based on the maximum expected cross-sectional area contained between the skirtboards, so the belt's full edge-to-edge area should be used to determine the height of material rubbing on wear liners and to make sure the skirtboards are tall enough for a completely full belt. . Use the loose bulk density – material before it settles on the conveyor – to represent the bulk density. The reason for this is the loose bulk density can be up to 40% less than the settled (vibrated) bulk density, requiring the material cross-sectional area to be 40% greater at the point of impact before settling.

When a conveyor is purchased on price the skirtboards will typically be 300mm tall to accommodate a basic vertical slab



Note: CEMA 3-Equal Roll Idler Std.: B_c = 0.371 x BW + 6.35 mm

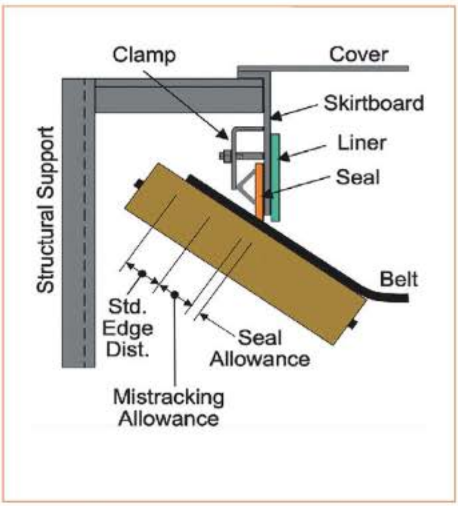
Skirtboard width: actual requirements versus a generic rule

The longer the enclosure, the more time dust has to settle, making for a cleaner work environment

seal and clamping arrangement. With an engineered approach the height of the skirtboards is based on keeping the air speed in the enclosure below 1.0m/s. At this air speed, most nuisance dust will settle in the enclosure. When taking this approach, the quantity of air flowing through the enclosure is estimated by considering the displaced air from the initial loading, the induced air created by the separation of the material discharge stream and any generated air from prevailing winds or process equipment such as crushers or screens.

For existing enclosures simply measure the average air speed at the exit. If the average speed is 3.0m/s then the cross-sectional area of the enclosure needs to be three times the existing area (i.e. three times the height) to reduce the exit air speed to 1.0m/s.

Skirtboard sealing system components



LENGTH OF SKIRTBOARDS

As with the width of the skirtboards there are various generic rules for the extended length of the skirtboards. The extension serves two purposes, first, it prevents spillage as the load settles into a stable profile after loading. Generic rules for containing turbulent flow range from 1.8m extension past the dump point or 1.5m plus 1.2m for every 1.0m/s of belt speed. Secondly, the extension helps settle nuisance dust without extraction, so, 1.2m per 1.0m/s for minor airflow and 1.8m per 1.0m/s for major airflow is one recommendation for dust control.

The ACGIH Industrial Ventilation manual provides guidance when collection is needed for respirable or hazardous dust. In general, it is good practice to make the extension generous in length and height, keeping in mind there is added friction from seals and material rubbing on the liners. This can be a major additional load on the drive for long lengths of skirting.

IN SUMMARY

Designing an effective skirtboard system requires an iterative approach. Starting with basic capacity calculations ensures the belt is wide enough to accommodate the free belt edge, the sealing system, wear liners and expected mistracking allowance. Old design rules and fabricated solutions only work for the short term and often result in more maintenance. Installing a well-designed skirtboard sealing system for safety, ease of maintenance and less downtime is part of a cost-effective production plan with the greatest return on investment. ●

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