

WORLD CEMENT[®]

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The raw, semi-finished and finished materials and processing steps involved in Portland cement manufacture, material temperature and moisture content, and the variations in the manufacturing process, mean that the challenges to eliminate fugitive material are many and varied.

Fugitive material and its causes

Spillage

Spillage at load zones can be attributed to many factors. Overloading the belts can be due to load zone spillage as well as off-centre loading. Poor load zone design, such as loading the belt too close to the tail pulley, not enough clearance, or free board between the skirting walls and the belt edge, all contribute to load zone spillage. Load zones that are too short, poor maintenance and housekeeping practices, changing material characteristics and weather conditions are also contributing factors.

Off-centre loading

Off-centre loading is often the result of partially plugged chutes, poorly designed chutes or partially dislodged wear plates. Besides being a major contributor to load zone spillage, off-centre loading has many other destructive results further

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PLANTS.**

ABOVE THE BELT

down the belt line. For example, more tension is placed on the bearing on one side of the troughing idlers, resulting in premature failure of those components. Belt mistracking and belt edge damage can also occur.

Improper skirting or poorly adjusted skirting

Proper selection and installation of an easy to maintain skirt board rubber or urethane system is critical to reducing spillage at load zones. Skirt board rubber or urethane systems should not be jammed onto the surface of the belt – causing unnecessary additional friction and belt top cover wear – but gently touching the surface of the belt. Over-tensioned skirt board media may also cause additional horsepower requirements on the conveyor’s drive system.



Figure 1. Material spillage at the load zone.

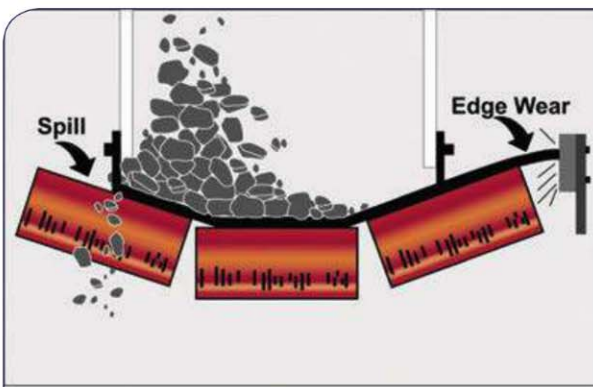


Figure 2. Results of off-centre loading.



Figure 3. Before and after pictures of a complete Transfer Point rebuild.

Under no circumstances should old or scrap conveyor belting be used as skirting media.

Figure 3 is an example of an improperly and a properly installed and maintained Clamp-Mount® and rubber skirting system.

Belt sag between idlers

CEMA recommends that conveyor belt sag between idlers be limited to 2% for 35° idlers and 3% for 20°. Any more will result in spillage. There are several ways to reduce belt sag between troughing idlers. One way is to place the idlers as close together as possible. This method will, however, be limited by how close the feet or bases of the idlers can be placed and may not achieve the reduced belt sag desired. Other solutions to eliminate belt sag are to install impact cradles or slider beds with a combination of UHMW bars and centre rolls to support the belt. Specialty purpose built roller cassettes are also a good solution for higher speed conveyor belts.

Solution

Other solutions to eliminate belt sag are to install impact cradles or slider beds with a combination of UHMW bars and centre rolls to support the belt. Purpose-built roller cassettes are a good solution for higher speed conveyor belts. Modular all-in-one systems, such as the Pro-Zone™, are a one-stop solution. These systems easily mount to existing conveyor stringers and provide belt support and dust sealing in an easy to install and maintain package.

Inner skirt board liners

Inner skirt board liners, either straight or angled, are the most important and the most overlooked piece of the load zone puzzle. All too often, this component is either not installed or is installed too high off the belt to properly help in the reduction of spillage. The inner skirt board’s function is to protect the rubber or urethane sealing system. The sealing system is not designed to be a material dam but to be a dust seal. Installing these types of wear liners will not only make the entire load zone perform better, but it will also significantly reduce the frequency with which worn sealing systems media need changing. The inner skirt board liners should slightly taper outward from the entry to the exit, providing relief for any material entrapment that could cause belt top cover damage.

An example of a load zone with proper belt support, inner wear liner, and easy to maintain rubber skirting system, is provided in Figure 4.

Belts mistracking through the load zone

When conveyor belts mistrack through the load zone, the belt will move inside the skirting system and spillage will occur. Belt edge damage will occur when it wears into chute support structures. The conveyor now will surely have an off-centred load and will stay mistracked, causing additional component and belt damage further up the belt line.

Solution

Keeping carryback from building up on return rolls is key to solving tracking issues on the return side of the belt.

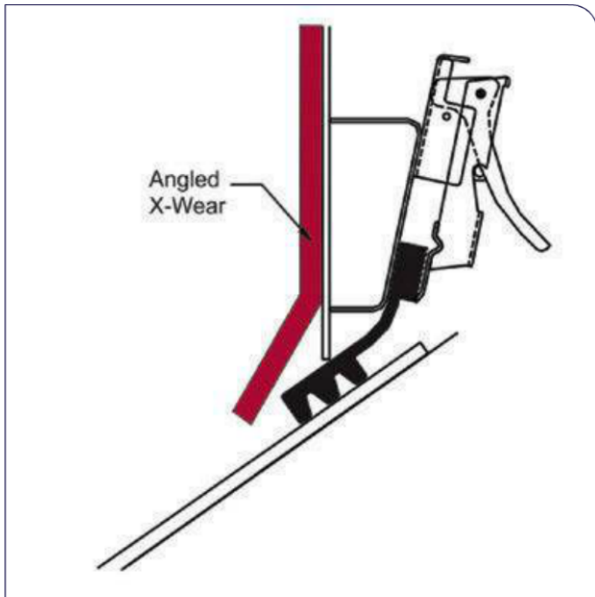


Figure 4. Correct wear liner and skirting combination.

Installing a well-engineered, quick-reacting tracking device 30 ft before the tail pulley will ensure the belt tracks correctly through the load zone. If the conveyor has a gravity take up, placement of a quick reacting tracking device 30 ft before the first bend pulley is also recommended.

Carryback

Carryback is used to describe the fugitive material remaining on the return side of the belt after the head or discharge pulley. This material is then knocked off the surface of the belt by vibration and/or the return rolls and is deposited on the ground underneath the conveyor on catwalks and other components of the conveyor. The health and safety of plant personnel is put at risk due to the dangers that carryback can have on a conveyance system. Maintenance and operational budgets go up as premature belt and component failures unnecessarily and, too often, occur.

Material build-up on conveyor rollers, primarily on the return rollers that contact the dirty carrying side of the conveyor belt, account for an ever-changing tracking problem.

Belt cleaner terminology

The primary cleaner is the belt cleaner, which is the first cleaner located in a system that comprises multiple cleaners.

Primary belt cleaners come in a variety of sizes and urethane compounds. For instance, conveyor belts in the quarrying area of a cement plant will generally see wider belt widths, higher tonnages, and larger diameter head pulleys, so larger, more robust primary cleaners should be used in order to maximise cleaning and durability.

On conveyors handling clinker, an Ultra High Temperature (UHT) urethane formulation works the best.

Coil stainless steel spring tensioning devices provide consistent blade pressure and reduce the need to retension the belt cleaner through the lifecycle of the blade.



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Secondary belt cleaners

These cleaners are easier and safer to maintain when the blades are mounted on a cartridge system. Blade material is usually tungsten carbide for belts with vulcanised splices; tool steel or urethane is best suited for belts with mechanical splices.

Wash box belt cleaning systems

Water is a wonderful aid to cleaning conveyor belts. Of course the further along in the cement manufacturing process the less water is utilised, but from the quarry to the

blending and mixing stage of the process, water greatly enhances the cleaning efficiency of secondary belt cleaners.

A washbox is used in the secondary belt cleaner position. They are generally mounted outside the head chute on the return side of the belt. Typically washboxes have two spray bars that wet the surface of the belt to allow the two sets of secondary belt cleaners to remove the carryback. Coal and petcoke are 89% of the primary fuels used by the cement sector worldwide. Washboxes have proven themselves in cleaning carryback from belts conveying these materials.



Figure 5. Example of proper belt support, wear liners and skirting.

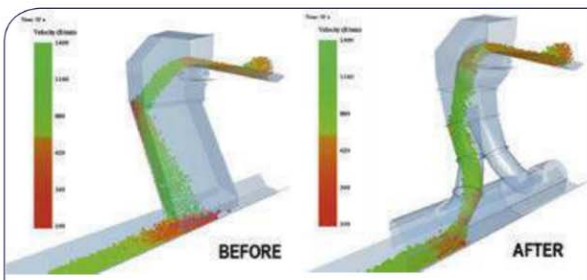


Figure 6. 3-DEM modelling to show improved flow.



Figure 7. Hood and Spoon Flo-Control chute installation.

Dust reduction utilising flo-control chutes

Chute Analysis Program 3-DEM® is a revolutionary way to handle granular and particulate material problems through computer simulation by accurately predicting material trajectories, moisture content, coefficients of friction and designing solutions that will accommodate fluctuations in loading conveyor belts.

Some of the advantages of using this technology in cement plants are:

- Increased production capabilities.
- Stop chute plugging, spillage, beltwear, chute wear and dust.
- Optimise life of conveyor belt and components.
- Minimise impact and top cover wear on the conveyor belt by using a curved chute or soft loading design.
- Minimise material spillage.
- Centre load the material at a uniform rate and speed in the same direction of travel as the receiving conveyor after the belt is fully troughed.
- Decrease the need for dust control and suppression.
- Minimise impact of materials against surfaces.
- Minimise air movement and dust through a soft loading design.

Conclusion

Left unchecked, fugitive material in cement plants creates an unsafe and unproductive work environment. The application – and most importantly the proper care and preventative maintenance – of equipment designed to reduce fugitive material is the key factor in a safe, productive and profitable facility.

The management of cement manufacturing facilities that promote good housekeeping policies and fugitive material reduction will see:

- Improved plant safety.
- Better moral and work habits from employees.
- Overall improvement in product quality.
- Greater operating efficiency.
- Reduced maintenance costs.
- Less scrutiny from outside groups. 🌐

Bibliography

- PCA Americas Cement Manufacturers.
- *Belt Conveyors for Bulk Materials*, CEMA Conveyor Equipment Manufacturers Association.