WORLD CEMENT®

January 2017

WORLD CEMENT January 2017 www.worldcement.com

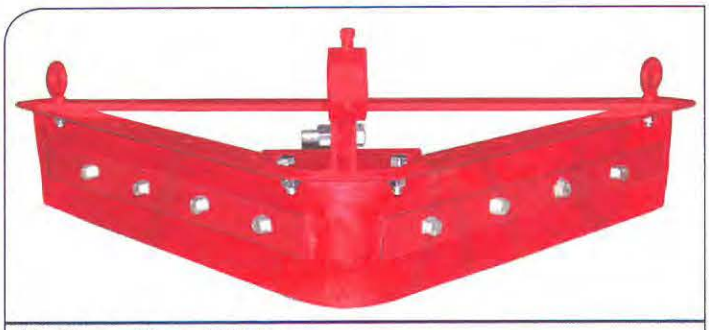
A DUSTY AFFAIR

PHIL WOWAK, ASGCO, USA, EXAMINES WAYS OF SOLVING SOME OF THE ISSUES INVOLVING BULK CONVEYING SYSTEMS.

Portland cement mills have operated in basically the same manner for over 100 years. The process involves the mining and crushing of limestone and clay, after which the material is calcined in a kiln under very high temperatures. The resulting product, clinker, is mixed with gypsum and several other additives which are then finely milled, bagged and transported as finished Portland cement. In addition to the limestone and other necessary additives, coal and other waste fuels are used as the combustion source to heat the kiln. From the beginning of this process, which starts at the limestone quarry, to the packaging and loading of the finished product, bulk material conveyor systems of one type or another are almost exclusively used to transport the product. The generation of fine particulates and dust are inherent in this process and some can be recovered and recycled through

Dust and material spillage is expensive to clean up and remove.

Dust curtains and full belt support to contain dusting.



Urethane Hinged V-Plow.

various dust collection methods incorporating baghouse or other types of filters. Belt conveyors can often result in major spillage and fugitive dust emissions that are, to say the least, difficult to control, collect and recycle. Let us start at the beginning, or should I say the tail, and explore how to solve some of the issues involving bulk conveying systems.

The tail: the beginning of the problem

The mined and crushed limestone is loaded onto the primary conveyor belt at rates of up to 1000 tph. The material needs to be contained within a skirted area for an acceptable distance in order for the load to settle down, as well as for any dusting entrained or induced into the flow to slow down and fall out onto the belt and not escape as fugitive dust. It is important that the product does not spill off of the belt in the load zone.

Many plants struggle to keep these areas clean and dust free due to not having enough time or man power to properly adjust the load zone skirt seals or fix holes worn in the transfer chutes. When you walk around many load zone areas you usually find material piles in between the troughing idlers and on the floor, as well as excessive amounts of airborne dust.

This material spillage is expensive due to the fact that there is a cost to clean up and remove the material and, if not properly fixed, the problem will continue to reoccur again and again. One thing is for sure, every plant that has a conveyor system has these problems to some degree or another.

Load zone spillage and dusting can be greatly reduced and virtually eliminated with proper belt support and load/dust containment systems. Modular conveyor belt load zone systems should contain the following components.

1. Belt support slider bars fabricated with UHMW for long life and reduced drag friction.
2. Custom low profile support frames to match the existing idler heights and belt width.
3. Covers which completely seal and enclose the entire load zone area.
4. Continuous exterior skirting wall plate.
5. Upper seal plate and skirting seal support.
6. Vibration resistant cover fasteners.
7. Internal rubber soft seal.

A modular conveyor belt load zone system that optimises the seals for air and dust tightness on the receiving conveyor belt is the best method to reduce spillage and dusting. These fully self-contained systems are comprised of slider and roller beds that support the belt. This eliminates the gaps that you would have in a typical load zone with standard troughing idlers. To facilitate maintenance there should be an easy 'slide out' design for quick

removal and replacement of the UHMW support bars. The design should allow for either impact or steel can idlers and allow the customer the choice of any idler company. Centre roll designs with quick changeout features are also a plus for quick replacement.

Hoods and covers for the load zone can be made out of aluminum or steel which completely seals and encloses the entire load zone area. Safety doors can be added to the hoods to allow for inspection of the skirt seals as well as internal wear liners. Inside the modular load zone there should be several replaceable dust curtains. These are a very important component of any properly designed load zone containment area. Multiple curtains throughout the system allow dust to settle by slowing the air velocity down and allowing the airborne dust and particles to fall to the belt.

The internal rubber seal is a low durometer sealing rubber. Its soft seal qualities allow it to self-seal to the conveyor belt thus eliminating any possibility of grooving the belt. This special low durometer sealing rubber system also helps contain the dust.

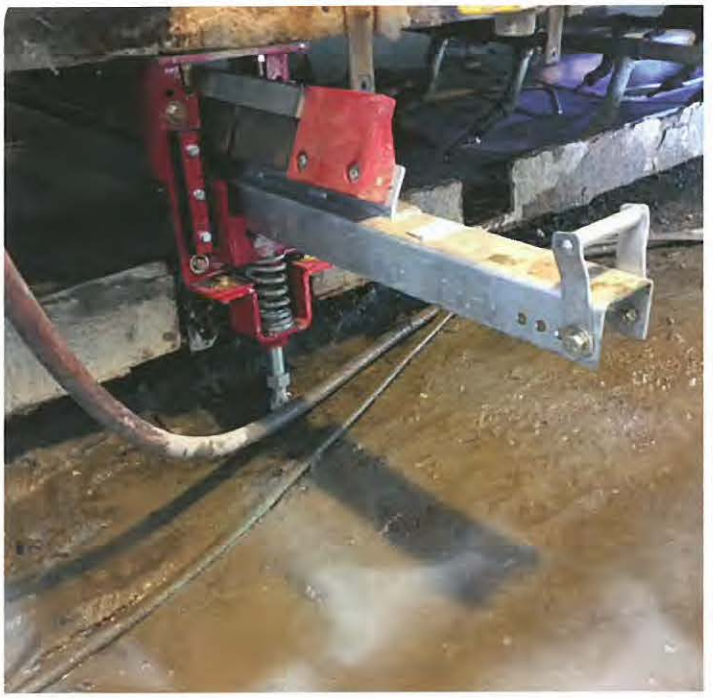
Two components that are usually forgotten about under every load zone would be the return belt run V-Plows and belt trainers. A return run V-Plow is designed to effectively keep bulk material from becoming trapped within the conveyor belt and the tail pulley. A hinge design type of V-Plow allows you to change the amount of angle the plow can have from 30°, 45°, or 60°.

Installation of a return belt self-aligning training idler is recommended with every load zone system. This training idler will keep the conveyor belt centred on the tail pulley, which is very important in any load zone area. The trainer idler should have a stainless steel internal pivot that is perpendicular to the plane of the belt and must incorporate a rubber covered shell with tapered ends to help actuate the trainer immediately as the belt moves off-centre. This type of training idler is always reacting to keep the belt centred. It does not wait, as do conventional trainers, for the conveyor belt to walk over to the 90° sensor rollers and then have the belt react. This internal pivot trainer reacts as the belt moves off centre and contacts the tapered section of the roller on that side of the conveyor belt. The effect of this will be to force the roller to rotate on its internal pivot causing the belt to come back to its original centred position.

Onto the head of the problem: discharge point belt cleaners

Primary belt cleaners or pre-cleaners are an essential part of any conveyor system. Belt cleaners help remove material product carry back. This prevents it from

Primary cleaner.



Secondary cleaners.

falling off at various points of the conveyor along the return side of the belt, which causes fugitive dusting as well as various housekeeping and conveyor belt maintenance problems.

Carry back can lead to one or more of the following problems:

- Excessive buildup and wear on conveyor belt idlers and pulleys.
- Conveyor belt misalignment due to the artificial crown created by the carry back.
- Accumulation of material falling off conveyor belt idlers and structure to the ground or on buildings, vehicles or even people.
- Negative and unsafe work environment.

The guidelines for choosing effective primary belt cleaners should be:

- Design for optimum clean with the least amount of pressure.
- Position the blade out of the main flow of the material.
- If possible, install the belt cleaners in the main chute or an area that will be easily cleaned and maintained.
- Primary blades should be no more than the width of the material being converted.
- The replaceable blade should be a continuous, one piece design.
- Engineered and designed to handle worst case conditions.
- Quick and simple replacement blade change.
- Tensioner to maintain tension throughout the life of the blade.

Secondary cleaners are installed after the point where the belt leaves the head (discharge) pulley and/or anywhere on the return side of the belt where it can be cleaned and maintained effectively. These cleaners remove the very fine particles and moisture that the primary cleaner was unable to remove.

The guidelines for choosing effective secondary belt cleaners should be:

- Long wearing and abrasion resistant blade material like tungsten carbide.
- Installation of the belt cleaners in the main chute or an area that will be easily cleaned and maintained, as is the case with the primary belt cleaner.
- Secondary blades should cover the full width of the belt.
- Each blade should have an impact absorbing, self-tensioning cushion.
- Compact design that require a minimum of clearance for installation.
- A quick change, slide out replacement blade mounting system.

There are many other areas of concern on belt conveyor systems that can cause fugitive dusting, material carry back and spillage. The tail load zone and the head discharge area are two of the most common and, in most cases, the easiest to correct. One of the more difficult areas to address with regards to dusting is the conveyor system transfer point and discharge chute. That subject involves a more detailed analysis in order to identify the problem and engineer a solution.