



STOPPING THE SLIDE

Aaron Gibbs, ASGCO Complete Conveyor Solutions, US, discusses how to eliminate side-travel problems on conveyor belts.

Tracking or training is the procedure required to make the conveyor belt run true when empty or fully loaded. It is a process of adjusting idlers to correct any tendencies of the belt to run other than true.

However, one of the most common reasons for unscheduled downtime on conveyor material handling systems is conveyor belt side travel problems. One of the challenges in tracking conveyor belts is that each belt and system it rides on has its own characteristics.

There is, therefore, no one answer to track every type of conveyor belt.

The structural conveyor components, such as the supporting structure, pulleys, take-ups and idlers, must be properly aligned. These should be the first things looked at when trying to identify belt tracking problems. Conveyor sections should be 'square' and 'horizontal' (side-to-side). All pulleys, snub rollers, troughing and return idlers must be square with the frame (perpendicular to the belt centre line), parallel to each other and level.

Non-structural factors, such as conveyor cleanliness, belt camber, belt tension and squared splices, are also important factors to examine when determining belt tracking concerns.

The conveyor belt tracks off, more commonly, on the return side of the belt, causing a wide array of problems: rubbing and tearing the conveyor belt edges on the conveyor structure; return idler brackets; and spillage throughout the load-zone because the conveyor belt is off to one side or the other.

Selection and placement of belt cleaner systems

Cleanliness is essential to proper conveyor belt tracking. The key to controlling carryback is the installation and maintenance of an effective belt cleaning system.

It is

sound practice to use a multiple cleaner system to provide more than one pass at removing the material. These systems are typically composed of a precleaner/primary cleaner on the face of the head pulley to remove the majority of material, with one or more secondary cleaners installed further along the belt return to remove residual fines. Tertiary or follow-up cleaners can be positioned even further back along the conveyor return to remove any last material.

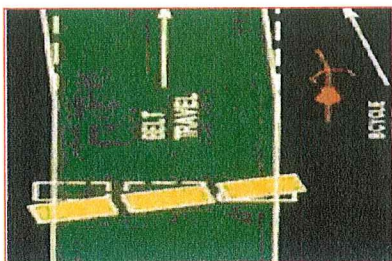


Figure 1. The 'handlebar effect'. Looking at the conveyor belt in the direction of belt travel, steer the idlers in the same way as bicycle handlebars until the conveyor is moved to the desired position. The training effort is caused by the friction force of the scuffing action of the conveyor belt as it passes over the cocked idler.

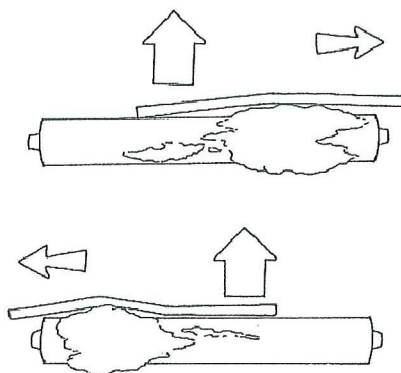


Figure 2. Carryback on idlers can also cause the handlebar effect. The belt will always move and make contact with the side it touches first; therefore, always ensure that proper belt cleaners are installed and maintained to help eliminate this possibility.

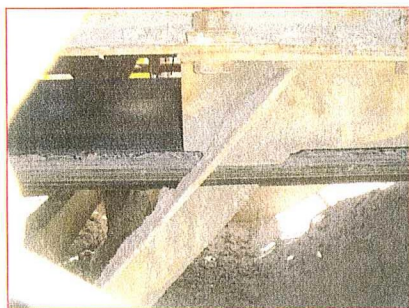


Figure 3. Mis-tracking, causing the conveyor belt to cut into the frame of the conveyor.

Criteria to consider in the selection and placement of a belt cleaning system include the following:

- ◆ Designed and engineered for optimum clean with the least amount of pressure, simple to change replacement blades, and the tensioner to maintain tension throughout the life of the wear blade.
- ◆ Out of the flow: the primary cleaners should be installed below the material trajectory, so they are not barraged by lumps. They should also be no wider than the width of the material being conveyed.
- ◆ Safe for the belt: use systems that minimise or eliminate any risk of damage to the belt, splices or to themselves. They should clean at low pressure and incorporate a method of relief for the passage of splices and other obstructions.

With multiple-cleaner installations, it may be necessary to add systems – an expanded dribble chute or a scavenger conveyor – to return the material removed by follow-up cleaners to the main material flow.

Corrective equipment and tracking techniques

Applying corrective equipment and tracking techniques can optimise conveyor belt and other critical equipment life, making the fuel handling systems of coal-fired power plants and mining companies safer and more productive. However, training idlers should not be the permanent fix: the belt should run true and training idlers are to be installed for adverse and transient conditions.

Laser alignment of the conveyor system is one method of discovering

the the exact problems of an existing conveyor system, or one that is being put in new, to help accurately align all components. It can provide a highly accurate method (0.003 in. at 500 ft) of aligning the conveyor system, as well as aligning framework and conveyor components. It can also be used for non-conveyor applications, such as tripper rails and structural foundation elevations.

The most common piece of conveyor tracking technology equipment is a training or tracking idler. These trackers do work in some applications but have their problems, such as damaging the edge of the belt, damaging the belt carcass and not working on wet applications and centre pivot seizures. Figures 8 - 10 are common examples of failed conveyor belt tracking idlers. Problems occur when the external pivot builds up with carryback and seizes the centre pivot, enabling it to react when the conveyor belt makes contact with the guide idler. These trackers eventually get tied-off in one direction and start to cause more problems, such as edge damage and ply separation to the conveyor belt.

A better tracking solution

After identifying the need in the market for a better tracker, ASGCO (Complete Conveyor Solutions) examined the problems with existing trackers and, combining that with company experience, its engineers set out to design a tracker. It was agreed that a good tracking roller/idler requires the following:

- ◆ Must operate in both dry and wet conditions.
- ◆ Requires a minimum force to activate the tracking mechanism.
- ◆ Does not rely on the edge of the belt to activate the tracking mechanism.
- ◆ Maintains good traction with belt.
- ◆ Must be of durable design.

The ASGCO Tru-Trainer belt tracking idler utilises a unique and highly effective tracking action, which is non-damaging to the belt and kicks in immediately if the belt begins to track off-line. Because it does not rely on contact with the belt edge in order to guide the belt, belt edge damage, which occurs frequently with other

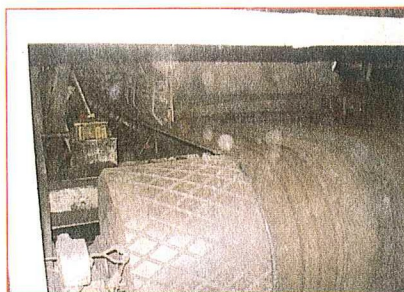


Figure 4. Severe side travel to the right hand side of the tail pulley, causing material spillage and conveyor belt damage.

tracking systems, is avoided. The system has special tapers on opposite sides of the roller, which cause the roller to pivot about an internal, vertical pivot axis. The internal central pivot is perpendicular to the belt, which results in the tracking action always being on the same horizontal plane as the belt. For this reason, it works equally well with reversing/shuttle conveyors.

As the belt starts to move off centre it will contact the taper section of the roller on that side of the belt. The difference between the peripheral rotational speeds of the tapered portion of the drum and the centre causes the drum to pivot about its internal pivot. The extent to which the roller will pivot will depend on the extent to which the belt has moved off its central position. Since the roller is no longer perpendicular to the direction of the belt travel, the skew roller immediately steers the belt back to its central position.

Once the roller has steered the belt back to the centre, the opposite side of the belt will contact the taper on the opposite side of the roller and this will cause the roller to realign itself perpendicularly to the belt.

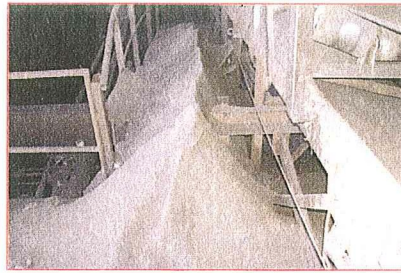


Figure 5. Conveyor belt mis-tracking through the load causes material spillage on the walkways.

As the surface of the belt remains in contact with the roller over the entire width of the belt, the tracking action is far more effective and immediate than those types of trackers that pivot away from contact with the underside of the belt.

The bearings are mounted in the bearing housings in both ends of the drum, to provide support for the roller drum over its full length. This ensures concentric vibration-free rotation. Each Tru-Trainer uses a pair of 3.44 in. ball bearings to facilitate the design (internal movement of the shaft within the inner sleeve) and is therefore well within its rpm and load specifications.

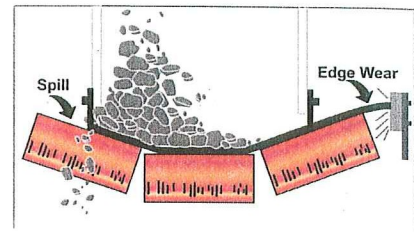


Figure 6. Mis-tracking in the load can cause off-centre loading of the conveyor and the load not to be centred on the trough or carry side of the conveyor belt.



Figure 7. Taking measurements during a laser alignment survey.

BASIC RULES OF CONVEYOR BELT TRACKING

- ◆ The conveyor structure must be true (relative to the centre-line) and level (side-to-side).
- ◆ All pulleys, snub rollers, carrying and return idlers must be square with the frame (perpendicular to the belt centre-line) and parallel to each other.
 - Is the pulley lagging worn?
 - Belt tension must be great enough to prevent slippage between the drive pulley and the belt. Tension must also be enough to cause the belt to conform to the pulley crowns. Slippage will cause excessive wear to both drive pulley lagging and the return side of the belt.
- ◆ Cleanliness is essential to good conveyor belt tracking: there must be no buildup of carryback on the idlers or pulleys.
- ◆ Ensure the belt is stopped when making adjustments, and remember that is better to make several small adjustments and be careful not to over compensate.
- ◆ Start tracking and adjusting idlers on the return run, working towards the tail pulley, followed by adjusting the idlers on the top run in the direction of belt travel.
- ◆ Tracking a conveyor belt should never be done by adjusting pulleys. This can cause uneven conveyor belt stretch and/or pulley and shafting problems.
- ◆ Start with the belt empty and gradually add partial and full load.
 - Tracking adjustments should be spread over some length of the conveyor preceding the area of trouble
- ◆ Load the material in the centre of the conveyor belt.
- ◆ Conveyor belt must be straight (less than 0.5% camber), in good working condition (not cupping or damaged) and the ends must be squared and laced properly.
- ◆ Accurate squaring of the belt ends before splicing is essential.
- ◆ If the belt runs to one side at a particular point or points along the conveyor structure, the cause will probably be due to the alignment or levelling of the structure, to the idlers and pulleys immediately preceding that particular area, or to a combination of these factors.
- ◆ Finally, remember that the belt moves towards the end of the roll/idler that it contacts first.

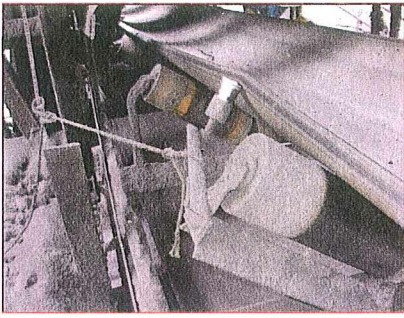


Figure 8. Standard troughing trainer tied off; the bottom of the conveyor belt is being damaged from the guide roller.



Figure 10. Conventional training idler tied off in one position, which is not solving the problem.

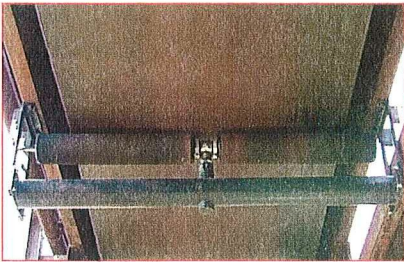


Figure 12. Coal handling conveyor, 60 in. belt width, 700 ft/min dual-return Tru-Trainer idler.



Figure 13. PRB coal ship loading conveyor, 96 in. belt width, 750 ft/min dual-return urethane Tru-Trainer idler.

This allows conveyor belts with speeds exceeding 1100 ft/min to be tracked effectively.

The centre pivot is unique and simple, consisting of a stainless steel pin within a solid mild steel centre shaft. This combination of the dissimilar materials overcomes any possibility of seizure. As an added precaution, graphite anti-seize compound is added



Figure 9. Seized trough trainer, causing ply separation and edge damage to the conveyor belt.

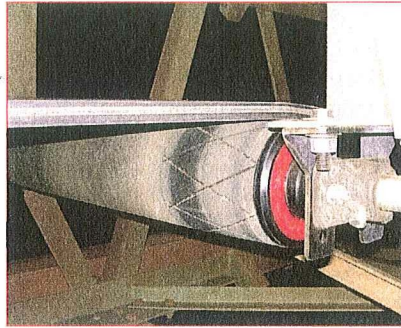


Figure 11. Coal handling conveyor, 48 in. belt width, 600 ft/min return Tru-Trainer idler.

and the whole unit is seal welded for life.

The drum of the roller is 0.5 in. of hot vulcanised 65 durometer abrasion resistant natural rubber. The bearing housing, front and back seal have been specifically developed for the entire Tru-Trainer product range, to ensure effective sealing in adverse conditions.

For the load-carrying side, the Tru-Trainer Trough tracking idler/roller was developed. Due to the fact that the load carrying side is in a trough formation, a different tracking configuration was needed. Applying Tru-Trainer flat return principles of tracking in the horizontal plane, wing rollers were incorporated into the design to activate its standard central pivot system, appreciating the potential damage caused by wing rolls intercepting the belt at 90°. The activating wing rolls are set to have a maximum effective contact between the belt edge and the wing roller of 25 – 55° and are compatible with all troughed belts from 15 – 45°.

As the belt moves off-centre, it slides up the wing roll and thus causes the Tru-Trainer to pivot on its internal pivot and steer the belt back to centre with minimum force. The unique aspect of the system's Trough tracker is that the centre roll does all the steering and not the wing rolls, as this is where the most effective steering forces are exerted.

For extreme applications, as seen in underground and open-pit mining applications of wide, high tension conveyor belts, the Tru-Trainer Dual Return tracking roller was developed to accommodate the excessive forces encountered in these applications. An external central pivot mechanism was designed instead of using a single cumbersome large drum, enabling a concentric and balanced rotation to be achieved. This results in an extended bearing life. Two separate tapered rolls are mounted onto the pivot mechanism, which can be individually replaced as wear occurs. The operating principle is identical to the Tru-Trainer Flat Return tracking roller, the advantage of the split configuration has resulted in a highly sensitive tracking action.

As it does not rely on contact with the belt edge in order to guide the belt, belt edge damage is avoided. The centre pivot is unique and simple, consisting of a stainless steel pin within a solid steel centre shaft.

This mine duty tracking idler is also available in 0.75 in. abrasive resistant urethane covers.

Tru-Trainer advantages include the following:

- ◆ Increases conveyor efficiency and belt life.
- ◆ Reduces spillage and increases tonnages.
- ◆ Improves safety and reliability.

Conclusion

The most critical areas to install training idlers are 30 ft before the tail pulley to ensure proper tracking over the tail pulley and through the load zone. Other important areas are just after the belt leaves the head pulley, before and after the gravity take-up, if present, and lastly a troughing tainer 10 ft before the head pulley to ensure the conveyor belt is centred on over the head pulley. Self-training return and troughing idlers should be installed on 100 ft to 200 ft centres, unless the conveyor structure is out of square and then it may be required to install them on 50 ft centres.

In the end, belt tracking is essential to a well-running conveyor system. It is far less expensive to fix the problem than to let it drag on year after year, causing additional problems to the conveyor material handling system. 