Managing Your Load Zones:
Increasing Belt Conveyor Productivity

In today's economy, everyone is looking for ways to cut costs and find more efficient ways to get things done. Operations are going over their books with a fine-toothed comb and even walking the lines of their belt conveyor systems trying to evaluate ways to save time and money without sacrificing quality and production. Oftentimes, when looking over the system, they look past one of the most important parts … the load zone.

Load zones manage the transfer of materials from one belt to another, but the role that these load points can play in the productivity of an operation is often overlooked. If a load zone is managed properly, the materials will transfer safely and efficiently. But when a load zone is not set up properly, poor performance can lead to spillage and even equipment damage. An operation's maintenance team may even think that spillage (and the resulting manpower and equipment used to remedy it) is simply part of running a conveyor system. They may even think that damage to equipment like the pulley and the belt is part of the life cycle of the system.

The fact is spillage and equipment damage at the load zone isn't inevitable. Evaluating and optimizing the belt conveyor at load points can do wonders for a belt conveyor system and its productivity.

Challenges before the load zone

When evaluating the load zone, it is best to start by looking at the belt conveyor receiving the material in the area preceding the load point. For example, one of the primary causes of load-zone spillage is actually a result of poor belt tracking prior to loading.

Mistracking can be a costly and sometimes dangerous problem. If caught early and fixed a mistracked belt does little damage to the conveyor. However, if unrecognized or ignored, other types of damage can occur. A belt that is constantly hitting a structure damages both the structure and frays the edge of the belt. In extreme cases, the width of the belt can be trimmed by several inches, therefore, reducing the amount of material it can carry. If a belt mistracks enough, it will spill material off of the topside onto the area around it, which could result in safety violations. MSHA also considers evidence of a belt rubbing on a structure a fire hazard and can issue citations to underground coal mines under 30 CFR 75.1731(b).

Many times, the load point is near the tail pulley. Since it is critical to center the belt before loading, the question arises of where to place a belt training device. An easy solution is to install a return side belt trainer slightly upstream of the tail pulley. Usually, if the belt is centered as it goes around the tail pulley, it will be centered through the load zone. Another advantage of using a return side trainer near the tail pulley is it allows for overcompensation of the belt position to tolerate a little off-center loading from the transfer chute. If the loading chute pushes the belt with material to the left, a trainer can compensate by presenting the belt to the load zone positioned a little to the right. The net result is a belt that runs true when loading. The downside is it will be off center while empty, but this may be a tolerable tradeoff.

An immediate result of a bad load zone is spilled material landing on the return flight of the belt. This is a significant hazard to the life and well being of your belt. While wing and spiral pulleys are used to allow space for fugitive material to slip by and prevent damage to both the belt and the pulley, they can still capture large lumps of material and become damaged and uneven. In the case of crown and flat pulleys, there is no protection from spilled material that can easily damage the pulley, lagging, and belt. Installing a belt plow before the pulley will clear material from the belt and prevent damage from belt spillage. Both diagonal plows (all materials cleared to one side) and v-shaped plows (material cleared to both sides) are useful in this case.

Transition distance can also have an impact on the load zone. Transition distance is the length of the belt between the pulley and the first full trough. Often transition distances are cheated to save space but this can cause many problems, including premature belt wear, premature lagging wear, roller failure, and belt cupping from carcass damage. Because of this, CEMA (Conveyor Equipment Manufacturers Association) usually recommends transition distances of up to four times the belt width, depending on the troughing angle, belt tension, and carcass construction. A conservative estimate for a 35-degree troughed fabric belt is to have at least 1.6 times its width as a transition distance.

Optimizing the transfer chute

If a transfer chute is being utilized, your operation is already addressing material spillage and dust suppression to a certain extent. But if your material flow isn’t optimal, you could be losing money from chute spillage, damage to chute liners and the belt, and material degradation.

The success of a transfer can be measured by many things, including the chute systems’ ability to transfer the product at the designed rate; loading the receiving

conveyor centrally; loading the receiving conveyor at as close as practical to receiving belt speed; containing spillage within the transfer; and minimising dust generation.

Ensuring that the transfer chute is designed specifically for your operation, with all of these factors in mind, can increase productivity and decrease costs. An optimized transfer chute, combined with an optimized impact area will certainly limit spillage, aid in dust suppression, and discourage belt damage.

“Impacting” the load zone

The belt sees every ounce of every ton of product. It’s amazing they last as long as they do. By the same token, the load support sees every ton too. Be sure to consider abnormal conditions when choosing a support system, because the same belt that runs 6” minus coal could have 300 lb. slabs from a roof fall on it too. Just as one large pothole can wreck a tire, one large rock can wreck the load support and belt if it exceeds the design capacity.

Every load zone needs consideration given to selecting the proper support of the belt. In some cases impact idlers are enough, while others may need a true impact bed to provide the required protection for the belt. Sealing the load zone from escaping dust and spillage will also be a consideration for selecting a belt support solution.

A mine in South Africa found problems at the impact area of its load zone, when its catenary idlers continuously failed. While they provided the “give” needed to absorb impact energy, the connection points between the cans were wearing, and eventually failing. The material was simply too heavy and the drop height too high for catenary idlers to be used. Because of their flexible nature, the catenary idlers were also doing a poor job of centering the load. This off-center loading often led to problems of mistracking after the load point. In this case, impact beds were installed to handle the load and proved to be successful with the application.

Keeping these issues in mind, you want to make sure the belt is continuously supported beyond the load zone. A proper impact bed can be the solution to these challenges, but you’ll need to make sure you have all of your specifications correct. Knowing the material lump weight and drop height are essential to choosing proper impact point protection. Once you have these numbers, make sure that your solution’s ratings are never lower than what is specified.

Sealing the load zone

The rest of the load zone is also important to consider because the transfer area often stretches past the actual impact area. This area needs support for settling material and a sturdy area to create a seal so that the skirting can keep the load on the belt. While idlers are often used, they can allow belt sag, which makes sealing the load quite difficult. And the practice of putting idlers right next to each other to prevent sagging is impractical from a maintenance standpoint. Because of this, the use of slider beds, with rolls in the center and sealing bars on the top trough, is recommended.

The final, often most important, job of the load point is to provide a seal that prevents material spillage and controls dust. The best way to do that is to start with the proper transfer chute. From there, the clamping mechanism should be both durable and provide a strong hold that discourages vibration and drag on the skirt rubber. This equipment should be paired with a belt support system that allows for proper sealing. This total load-point solution is the key to less material spillage, saving money and making the area around the load point less dangerous for workers.

Load zone management is only the beginning

After reviewing all of the elements of load zone management, it is evident that the success of the conveyor in the load zone is dependent upon many parts of the system. It is for this reason that an evaluation of the entire system will benefit your operation. A few simple changes can increase efficiency and productivity and decrease the amount of time spent crunching numbers to cut costs.

Authors: Ryan Grevenstuk, Product Manager – Belt Conveyor Products
Brett DeVries, P.E., Chief Engineer – Belt Conveyor Products