CONVEYING

Conveyor Startup: Tips of the Trade

A Superior Industries White Paper

Successful conveyor installation and startup requires planning, preventive measures, and practice. There are no mere tricks to getting it right the first time. Instead it's best to consider some basic step-by-step tips–ones that can ensure high capacity, reliable operation and maximum wear life for your belt and conveyor components.

First and foremost, proper planning is essential. Choose the correct conveyor components for the given application. Don't be penny-wise and pound-foolish. Cutting corners could lead to a host of costly operational, maintenance and safety issues. Consult with your conveyor manufacturer's application engineers, making sure that you can provide them with the most accurate information regarding the conveyed material–its size, shape, weight, roughness, smoothness, moisture content, and proportion of fines and lumps. For example, correctly identifying the absolute maximum material lump size means that transfer points can be engineered to reduce the impact of material falling on the belt. Once you have selected the right system, consider the addition of belt scrapers, impact beds, skirtboards, and other components, which can minimize overall maintenance while maximizing the intervals between maintenance tasks.

Next, install belts that have been properly stored. Stretching occurs when a belt rests with its weight on one edge, making it difficult to square at assembly and train during initial operation. Also, the molded edges on new belts are not always straight and parallel, so it's recommended to square the ends of the belt with the belt centerline. Then during belt installation, check the side take-up bearings to make sure they are adjusted all the way to the retracted position. This will give you maximum take-up ability after installation.

As to belt training (adjusting idlers and loading conditions so that the belt runs on center), practice makes perfect. Importantly, never try to train a belt by unequal adjustment of take-ups, which are only to be used for keeping the tail pulley square with the conveyor frame and to maintain belt tension. There are five steps to proper belt training:

- Level all frames crosswise.
- Square the tail pulley.
- Square all troughing and return idlers.
- Make sure the belt splice is square.
- Adjust individual troughing or return idlers as needed.

After completing the above steps, test the belt at a slow running speed. Then load the belt with material and continue testing until normal operating speed and conditions cause no deviation from central running. Start with a light load and gradually work up to the load that the conveyor was designed to handle. Adjustments to the loading chute may be required to ensure that the load is being centered on the belt. Skirtboards should be installed to keep material from dropping off the side of the belt.

Any conveyor expert will tell you that the first week after startup is a critical time. Belts and components should be inspected daily for any abnormal conditions. Remember, that just one frozen idler can cause serious damage and costly downtime.

Lastly, a well-designed conveyor is key, but no amount of quality engineering will eliminate the need for ongoing maintenance and training programs. Certainly one of the most important startup steps is making sure that each operator understands all vital safety and maintenance procedures before operation begins.

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Proper Belt Installation: The Back-to-Basic Steps

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Even the most veteran plant operator may encounter the need to troubleshoot when installing a new conveyor belt. After all, there are a number of precise procedures in the process – each as important as the next. Cutting corners along the way will undoubtedly result in costly, unexpected downtime. Don't take any shortcuts. Proper belt installation always requires a back-to-basics approach. So, take it one step at a time.

1. PROTECT YOUR INVESTMENT WITH PROPER STORAGE

First, belts should always be stored in a cool, dry building and in an area free from sunlight. Store the belt roll suspended on a tube, bar or support stand. Storing the belt flat on the ground where moisture can penetrate exposed fabric, or storing the belt roll with weight on one edge may stretch the belt, causing belt camber or a bowing in the belt that results in serious belt mistracking.

2. LIFT AND PLACE THE BELT, ALIGNING IT WITH THE CONVEYOR FRAME

Belt rolls are usually marked with an arrow showing the direction in which they should be rolled. Typically, the load carrying side is facing up. Lift the belt roll with chain or cable attached to the ends of a center bar that passes through the core of the roll. A spreader bar above the roll prevents the chains from damaging belt edges. Place the belt on a cradle or support stand behind the conveyor, or if space is lacking, suspend the roll above the conveyor frame for threading. Make sure that side take-up bearings are set in the retracted position to ensure maximum take-up ability after installation.

3. SQUARE THE ENDS OF THE BELT

Most belting is shipped from the factory with additional allowance for squaring ends for the splice. Remember that installing an unsquared belt is a common mistake, one that prevents any splice from running correctly. As molded edges on new belts are rarely straight and parallel, one must determine an accurate cut line on the belt by finding the true center point (as shown to the right). Also, when cutting the belt, operators will often use a hand knife, but note that an inexpensive belt cutter is safer to use and will ensure a straight, accurate cut. Once squared, holes should be punched into the end of the belt (based on the fastener manufacturer's template) to prepare it for the splice.

4. THREAD THE BELT ONTO THE CONVEYOR

A belt is pulled onto the conveyor by threading a cable over the idlers and pulleys. Attach the cable to the belt with a clamping plate, which distributes the pulling force across the belt and prevents damage to the belt end. Place the clamping plate on the bottom side so it will pass more easily over the troughing idlers. Slowly pull the belt into position using a block and tackle or similar equipment.

5. SPLICE THE BELT ENDS

Pull the unsquared end of the belt over the top of the squared end until the correct belt tension is obtained. Then square the remaining belt end, make the cut, and punch in the fastener holes. Placing a wooden plank under the splice point facilitates this process. Follow fastener manufacturer instructions but note that the use of belt tape under the fasteners is often recommended to help reinforce the splice area.

6. PRACTICE THOROUGH, ONGOING INSPECTIONS

After installation and during initial operation, check for any abnormal conditions such as frozen idlers, excessive slippage, sideways movement, or off-center loading. Also, during its wear-in period a belt will stretch and belt re-tensioning is often required. Remember, thorough inspections are critical particularly during the first week of operation. After that, your daily and/or weekly scheduled maintenance will ensure efficient, economical conveyor operation.

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Conveyor Belt Mistracking: Basic Causes & Cures

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Any effective cure requires a proper diagnosis followed by the correct remedy. Such is the case in conveyor belt mistracking – find the cause before you grab for the cure. There's no need for a complete system overhaul if a simple tweak will truly solve the problem. Uncover the locations of the mistracking, determine the cause, and then choose the appropriate solution. Sounds obvious, but consider that belt misalignment (and the resulting material spillage and wear costs) can often be a significant factor behind dwindling profit margins.

The most common causes of belt misalignment are:

- Conveyor structure and/or component problems
- A warped or improperly spliced belt
- Off-center material loading

Determining between the above causes involves some basic rules say leading belt manufacturers. For example, when all portions of a belt run off-center through only a part of the conveyor length, the cause is probably in the alignment or leveling of the conveyor and its components. If one or more portions of the belt run off-center at all points along the conveyor, the problem may be the belt itself. Lastly, if a belt is loaded off-center, the center of gravity of the load tends to find the center of the troughing idlers, which leads the belt off-center on its lightly loaded edge.

If a belt is free from any warping and curvature, and if proper material feeding systems are in place, then that belt can be trained to travel over the center area of troughing idlers, pulleys and return idlers. This is vitally important to trouble-free operation and minimized maintenance costs. Belt training involves adjusting idlers and loading conditions in a manner that will correct any off-center operation. The following basic steps in belt training are commonly known as "squaring the system."

1. Level the frame crosswire. Gravity will force the belt off-center if one side of the conveyor frame is lower than the other
2. Square the tail pulley with the frame. Be certain that all major pulleys–head, tail, drive, snub, bends and take-up are parallel and square. All idlers and pulleys should be clean and functioning.
3. Square all troughing and return idlers with the frame. Measure from the straight edge on both sides of the conveyor and tighten the attachment bolts.
4. Square the belt splice. If there is a side creep at the splice area only, and this progresses along the conveyor instead of remaining at one point on the frame, the splice may have to be redone.
5. Adjust individual troughing or return idlers is commonly known as "knocking the idlers." Loosen the bolts and pivot the idler just as one would steer a car into the center lane. Mark the spot where the belt goes off to one side and locate the idler that precedes it by 15- to 25-feet. Turn that idler slightly in the direction in which the belt is mistracking. If the belt continues to wander, follow the same process with the next idler closest to your mark.
6. Never attempt to train the belt by unequal adjustment of take-ups
7. Specifically, take-ups are used to maintain belt tension while keeping the tail pulley square with the conveyor frame.

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A Simple, Yet Solid Approach to Belt Tension

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Ensuring proper belt tension is a vital issue in conveyor operation – one that affects belt tracking, overall belt performance efficiency, and the life of the belt itself. All conveyors use some form of take-up device to adjust belt tension to the optimal level – one that not only prevents slippage between the belt and the drive pulley, but also guards against possible material spillage caused by too much belt sag between idlers Take-ups also compensate for belt shrinkage or stretch, and allow for extra belt length storage for making belt replacement splices. While take-ups can be either manual (mechanical-style) or automatic, manual take-ups are found in a majority of conveyor units, particularly those that are less than 80-feet in length.

Although manual take-ups are practical and cost-effective in shorter, lighter conveyors, they present challenges. There are many different types and styles of manual take-ups, and many different means used to tighten them. But what they all have in common is this: Even if you know how much tension you need (measured by PIW or pounds per inch of width), with a mechanical-style take-up, it's difficult to determine just how to get there. For example, with an automatic counterweighted take-up, you throw so much weight on it and you're right on tension requirements. But how do you judge if belt tension is too tight or too lax when using a manual take-up? For most operators it's often a matter of time-consuming trial and error. So why not consider this simple, yet solid rule of thumb: You should have no less than 1-inch and no more than 3-inches of belt sag between return idlers that are typically mounted at 10-foot intervals – no matter what the belt size.

Next, try this simple trick to ensure that you are within the above requirements:

Take a piece of tape, cut to 6-inches in length. Mark the center at zero and indicate one, two- and three-inch marks to the right and left of zero. Center the tape and place it on your return idler roll. Now it is easy to measure the belt sag, and adjust the tension until the belt sag is no greater than 3-inches (1 ½ inches on each side of the zero); and is no less than 1-inch (½-in on each side of the zero).

Remember, proper belt tension is critical to efficient conveyor operation. Consult with your equipment dealer or manufacturer to choose the most effective, easy-to-operate take-up systems. Certainly with the stretching and wearing-in process involved in installing a new belt, tensioning can become an everyday task, so specifying the right take-up system is important. But after initial stretching, belt re-tensioning becomes just another facet of your scheduled routine maintenance program. The simple tips we've shared can make the chore quick and easy.

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Conveyor Safety: It's Never Just an Option

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While today's economic climate leads to rampant budget slashing, it is never advisable to cut costs where conveyor safety is concerned. Safety features and safety training programs should never be eliminated by a need to achieve lower prices or costs. As to the equipment alone, consider that producers may obtain conveyors from a variety of sources–from small fabrication operations, or from used equipment sales, to those purchased from leading conveyor manufacturers. When examining all these sources, it is never just apples to apples as far as standard features are concerned. MSHA advises that upon purchasing a new conveyor system, a unit should be evaluated as to its standard safety features. Elements such as pull cords, stop buttons, backstops, start-up warning systems, lockout devices and guards are an imperative when protecting workers from accidents due to inadvertent contact with conveyor belts, says MSHA. Furthermore, safe operation guidelines, such as those outlined in a conveyor manufacturer's operations manual, should be the subject matter of ongoing personnel training. It's not just the rookies who are at risk. Often, it's the seasoned veteran who may take safety precautions for granted.

Case in point: never service, clean, or adjust a conveyor or its components while the system is running. This may seem so obvious, but note that an industry newsletter recently told the story of an experienced operator who found it so much faster to clean the take-up pulley while it was turning. Tragically, this operator was killed when his tool (an ordinary garden hoe) and then his arm was pulled into the conveyor structure. The newsletter points out that even a belt, moving at five miles an hour, travels 7 feet and 4 inches per second. At that speed, one's hand would travel 5.5 feet before letting go of the tool, it reports.

Next, emergency stop switches and guarding are among the most important safety features. Stop switches consist of pull-cables located at every 100-feet of conveyor length. Also, there should be an audible start-up alarm that sounds prior to the conveyor beginning to move. Conveyors should be fitted with guards which prevent access to hazard points such as the head and tail pulleys, and v-belt and shaft drives, to name a few.

Additionally, return roll guards are used to guard return idlers that are less than 7 feet from the ground. Side guards are used on transfer points to prevent access to pinch points and rotating components. The best situation is that greasing and belt alignment can be accomplished without the need to remove guarding. It's common to see conveyor systems in operation without key guarding components. More often than not, it's because guarding was removed to allow maintenance and then was never reattached. These kinds of loose operating procedures are accidents waiting to happen.

The face of conveyor technology has changed. Unlike simple fabricated units, modern conveyors are often PLC-controlled, automated systems that can significantly streamline material handling functions. Leading conveyor manufacturers are designing these systems with key safety features at the forefront, while leading aggregate producers are operating their plants with award-winning safety initiatives in place. Today, safety is never just an option.