CONVEYOR BELT INSTALL & MAINTENANCE MANUAL

BY:

KREATOR EQUIPMENT & SERVICES INC.

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Installation, Training, and Maintenance of a Conveyor Belt on a Radial Stacker and/or Conveyor

The investment in material handling is tremendous, yet monitoring wear and preventive maintenance on your conveyor belting is frequently overlooked. Trucks, screens and crushers make a lot of noise and get a lot of attention, the conveyor belts on the other hand running smoothly and quietly get little attention. Preventive maintenance is required to get the longest life possible out of your equipment and begins with proper design and installation of the equipment. Daily inspection and correction of any potential or apparent problems should be done. Assigning one man the responsibility for daily inspection of your radial stacker or conveyor's condition will help insure its durability and safety.

BELT INSTALL

Once the roll of belting has been transported to the point of installation, it should be mounted on a suitable shaft for unrolling and threading onto the conveyor. Conveyor belting is normally rolled at the factory with the carrying side out. Consequently, in mounting the roll the belt must lead off the top of the roll if it is being pulled onto the troughing or carrying idlers, but it must lead off the bottom of the roll if it is being pulled onto the return idlers. When pulling the belt onto the conveyor or radial stacker, the roll will turn opposite the direction indicated by the arrows on the crate. The drawing below illustrates a suitable method of mounting as well as leading off the top of the roll for pulling onto the troughing idlers.

In some cases, such as in mines, where head room does not permit maneuvering a roll, the belt may have to be pulled off the roll and re-fed. Extreme care should be exercised to see that the loops have large bends to avoid kinking or placing undue strain on the belt, and no weight should ever be placed on the belt when it is in this position. (Figure 1) Another method of handling belting under such conditions is to lay the roll on a turntable with a vertical spindle.

Handling The Roll

Reels or rolls should never be dropped from a freight car, truck, or other means of conveyance since their weight will break the packaging and may damage the belt. Reels or rolls should always be rolled or provisions should be made for hoisting them. For hoisting, a bar is passed through the hole in the center of the roll. Chains or cables looped around the bar ends should be provided with a spreader above the roll to avoid damage to the belt edges.

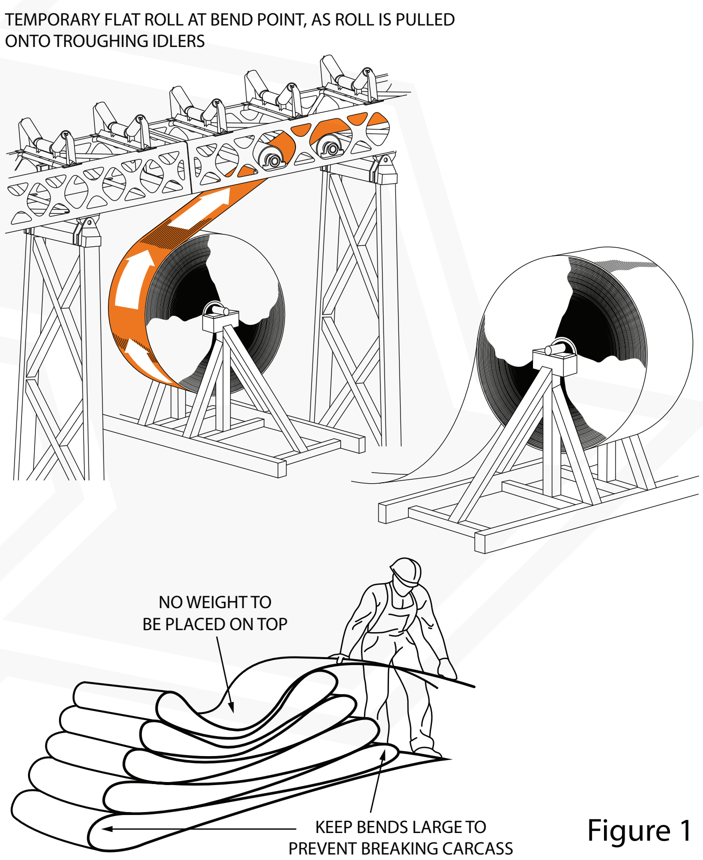

Figure 1

STORAGE

Belts should be stored if at all possible, upright in its factory package until used, in a dry room between 50°F and 70° F, free from sunlight, steam pipes, oil and corrosive fumes. Under no conditions should rolls of belt be laid flat on a concrete floor. Moisture will shrink any exposed fabric which gets damp from such storage and the belt is liable to "bow" on one edge. Upright rolls on a dry wooden floor are recommended. Belts weighing more than 25,000 lbs. should be stored on A-frames and rotated a quarter turn every three months.

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BELT TRACKING AND TRAINING
Tracking/Training the Belt Procedures

Training or tracking the belt on your radial stacker or conveyor system is a process of adjusting idlers, pulleys and loading conditions in a manner which will correct any tendency of the belt to run other than centrally. The basic rule which must be kept in mind when tracking a conveyor belt is simple, **"THE BELT MOVES TOWARD THAT END OF THE ROLL/IDLER IT CONTACTS FIRST."** You can demonstrate this for yourself by laying a small dowel rod or a round pencil on a flat surface in a skewed orientation. Then lay a book across the dowel rod and gently push push/roll it in a line directly away from you. The book will tend to shift to the left or right depending upon which end of that dowel rod the moving book contacts first.

When all portions of a belt run off through a part of the conveyor length, the cause is probably in the alignment or leveling of the radial stacker or conveyor structures, idlers or pulleys in that area.

If one or more portions of the belt run off at all points along the conveyor, the cause is more likely in the belt itself, in the splices or in the loading of the belt. When the belt is loaded off-center, the center of gravity of the load tends to find the center of the troughing idlers, thus leading the belt off on its lightly loaded edge. (Figure 2)

These are the basic rules for diagnosis of belt running troubles. Combinations of these things sometimes produce cases that do not appear clear-cut as to cause, but if a sufficient number of belt revolutions are observed, the running pattern will become clear and the cause disclosed. The usual cases when a pattern does not emerge are those of erratic running, which may be found on an unloaded belt that does not trough well, or a loaded belt which is not receiving its load uniformly centered.

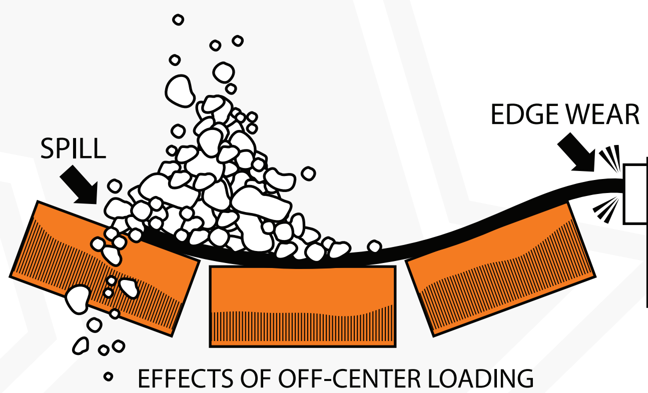


Figure 2

Factors Affecting the Training of a Conveyor Belt

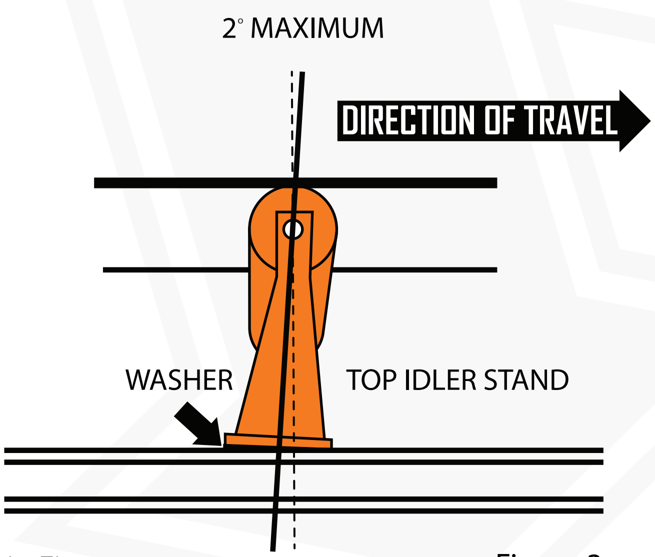
Reels Pulleys and Snubs
Relatively little steering effect is obtained from the crown of conveyor pulleys. Crown is most effective when there is a long unsupported span of belting, (approximately four times belt width) approaching the pulley. As this is not possible on the conveyor carrying side, head pulley crowning is relatively ineffective and is not worth the lateral mal-distribution of tension it produces in the belt.

Tail pulleys may have such an unsupported span of belt approaching them and crowning may help except when they are at points of high belt tension. The greatest advantage here is that the crown, to some degree, assists in centering the belt as it passes beneath the loading point, which is necessary for good loading. Take-up pulleys are sometimes crowned to take care of any slight misalignment which occurs in the take-up carriage as it shifts position.

All pulleys should be level with their axis at 900 to the intended path of the belt. They should be kept that way and not shifted as a means of training, with the exception that snub pulleys may have their axis shifted when other means of training have provided insufficient correction. Pulleys with their axes at other than 900 to the belt path will lead the belt in the direction of the edge of the belt which first contacts the misaligned pulley. When pulleys are not level the belt tends to run to the low side. This is contrary to the old "rule of thumb" statement that a belt runs to the "high" side of the pulley. When combinations of these two occur, the one having the stronger influence will become evident in the belt performance.

Carrying Idler

Training the belt with the troughing idlers is accomplished in two ways. Shifting the idler axis with respect to the path of the belt, commonly known as "knocking idlers," is effective where the entire belt runs to one side along some portion of the conveyor or radial stacker. The belt can be centered by "knocking" ahead (in the direction of belt travel) the end of the idler to which the belt runs. Shifting idlers in this way should be spread over some length of the conveyor, or radial stacker, preceding the region of the trouble. It will be recognized that a belt might be made to run straight with half the idlers "knocked" one way and half the other, but this would be at the expense of increased rolling friction between belt and idlers. For this reason all idlers should initially be squared with the path of the belt and only the minimum shifting of idlers used as a training means. If the belt is over-corrected by shifting idlers, it should be restored by moving back the same idlers, not by shifting additional idlers in the other direction.



in Figure 3

Figure 3

Obviously such idler shifting is effective for only one direction of belt travel. If the belt is reversed, ashifted idler, corrective in one direction, will misdirect in the other. Hence reversing belts should have all idlers squared up and left that way. Any correction required can be provided with self-aligning idlers designed for reversing operation. Not all self-aligners are of this type, as some work in one direction only.

Tilting the troughing idler forward (not over 2°) in the direction of belt travel produces a self-aligning effect. The idlers may be tilted in this manner by shimming the rear leg of the idler stand. Here again this method is not satisfactory where belts may be reversing, as illustrated.

This method has an advantage over "knocking idlers" in that it will correct for movement of the belt to either side of the idler, hence it is useful for training erratic belts. It has the disadvantage of encouraging accelerated pulley cover wear due to increased friction on the troughing rolls. It should therefore be used as sparingly as possible - especially on the higher angle troughing idlers.

Special, self-aligning troughing idlers like the one to the right are available to assist in training the belt. (Figure 4)

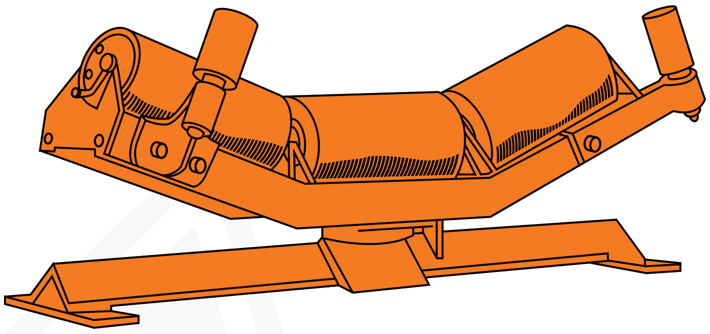


Figure 4

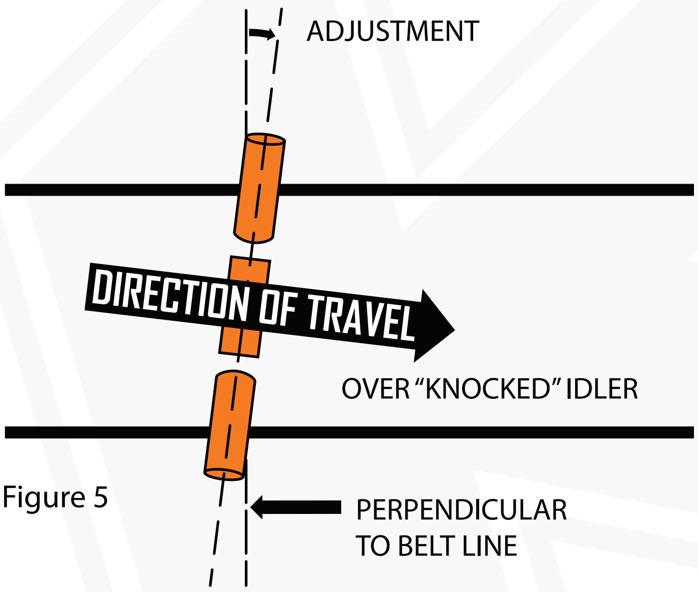


Figure 5

Return Idlers
Return idlers, being flat, provide no self-aligning influence as in the case of tilted troughing idlers. However, by shifting their axis (knocking) with respect to the path of the belt, the return roll can be used to provide a constant corrective effect in one direction. As in the case of troughing rolls, the end of the roll toward which the belt is shifting should be moved longitudinally in the direction of return belt travel to provide correction. (Figure 5)

Self-aligning return rolls should also be used. These are pivoted about a central pin. Pivoting of the roll about this pin results from an off-center belt and the idler roll axis becomes shifted with respect to the path of the belt in a self-correcting action.

(Figure 6) Some return idlers are made with two rolls forming a 10° to 20° V-trough, which is effective in helping to train the return run.

A further aid to centering the belt as it approaches the tail pulley may be had by slightly advancing and raising the alternate ends of the return rolls nearest the tail pulley. (Figure 7)

Assuring Effectiveness of Training Rolls
Normally, extra pressure is desired on self-aligning idlers and, in some cases, on standard idlers where strong training influence is required. One way to accomplish this is to raise such idlers above the line of adjacent idlers. Idlers or bend pulleys on convex (hump) curves along the return side have extra pressure due to component of the belt tension and are therefore effective training locations. Carrying side self aligners should not be located on a convex curve since their elevated positions can promote idler juncture failure of the carcass.

Side Guide Rollers

Guides of this type are not recommended for use in making belts run straight. (Figure 8) They may be used to assist in training the belt initially to prevent it from running off the pulleys and damaging itself against the structure of the conveyor system. They may also be used to afford the same sort of protection to the belt as an emergency measure, provided that they do not touch the belt edge when it is running normally. If they bear on the belt continually, even though free to roll, they tend to wear off the belt edge and eventually cause ply separation along the edge. Side guide rollers should not be located so as to bear against the belt edge once the belt is actually on the pulley. At this point no edge pressure can move the belt laterally.

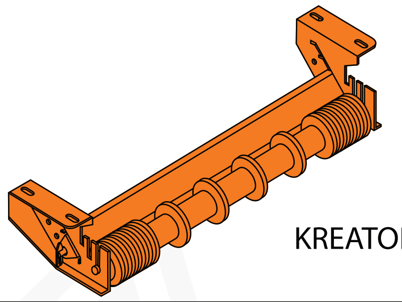


Figure 6
KREATOR RETURN ROLLER
WITH BRACKETS

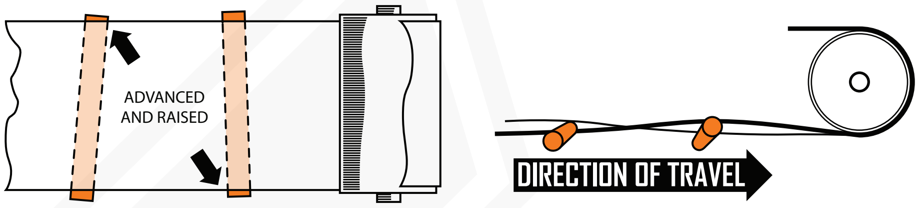


Figure 7

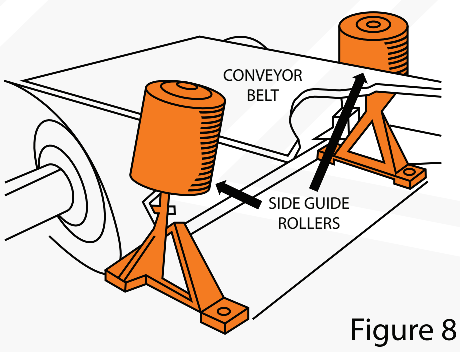
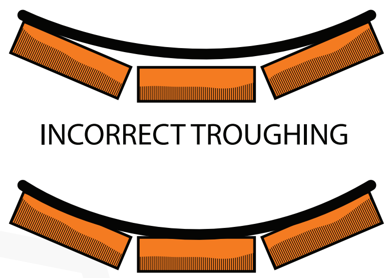


Figure 8



CORRECT TROUGHING
Figure 9

The Belt Itself

A belt having extreme lateral stiffness, relative to its width, will be more difficult to train due to its lack of contact with the center roll of the carrying idler. Recognition of this fact enables the user to take extra precaution and, if necessary, load the belt during training to improve its steer ability. Observation of troughability design limitations will normally avoid this trouble. (Figure 9)

Some new belts may tend to run off to one side, in a certain portion or portions of their length, because of temporary lateral mal-distributions of tension. Operation of the belt under tension corrects this condition in practically all cases. Use of self-aligning idlers will aid in making the correction.

BELT SEQUENCE OF TRAINING OPERATIONS

Initial installation of conveyor equipment or the set-up of a radial stacker should ensure good alignment of all pulleys, troughing and return idlers, i.e. they should be placed at right angles to the direction of belt travel, leveled and centered on a straight line. First movement of the belt should be slow and intermittent so that any tendency of the belt to run off may be quickly observed and the belt stopped before damage occurs. When the conveyor is a long center installation, men should be stationed at frequent intervals to observe the action of the belt. They should be provided with an effective method of communication so as to report their observations and, if necessary, cause the belt to be stopped.

Initial movement of the belt will provide indication of where corrections of the types described are required. The first corrections must be those at points where the belt is in danger of being damaged. Once the belt is clear of all danger points, a sequence of training operations can be followed.

The best procedure to use in starting the training sequence is probably to start with the return run and work toward the tail pulley. This assures early centering of the belt on the tail pulley so that it can be centrally loaded.

If the empty belt troughs readily, so that its running tendencies are not erratic, the training can and should be completed. Should the belt tend toward stiffness and erratic running, getting some load onto the belt as soon as the return run has been straightened up and the belt centered on the tail pulley will help hold the top run. Normally, the belt can be trained properly onto the tail pulley by manipulation of return idlers and with the assistance of self-aligning return rolls. Seldom is any adjustment of snub or tail pulley necessary but the snub can be used as a supplementary training means.

Training of the top run, with the belt empty, is usually no problem if the belt troughs readily. In this case self-aligners on top are not required except as insurance against damage in the region approaching the head pulley. There, two self-aligners placed approximately 40’ and 80’ preceding the pulley, will help re-center the belt if it is ever forced off due to some temporary disturbance.

It should not be necessary to use the head pulley for training purposes if it has been aligned properly. Likewise, the snub following the head pulley should not be required as a training means. It is relatively ineffective as a training device due to the strong influence of the head pulley.

The take-up carriage has a strong influence on the running of the belt at that point and, due to its movement as belt length changes, is subject to misalignment. A vertical take-up carriage, hanging in a festoon of belt, must be guided in its travel so that the pulley shaft remains horizontal. The belt cannot be depended upon to center itself on the pulley and, once it moves off center, the pulley will tip out of horizontal if not guided closely on its posts.

A horizontal take-up carriage is subject to misalignment due to loose track gauge, fouled rails or even jumping off the track. V-shaped rails will hold the gauge tight and, with the apex upward, are self-cleaning. Hold-down rails above the wheels with sufficient clearance so that they do not touch under normal operation will help prevent jumping off the track. (Figure 10)

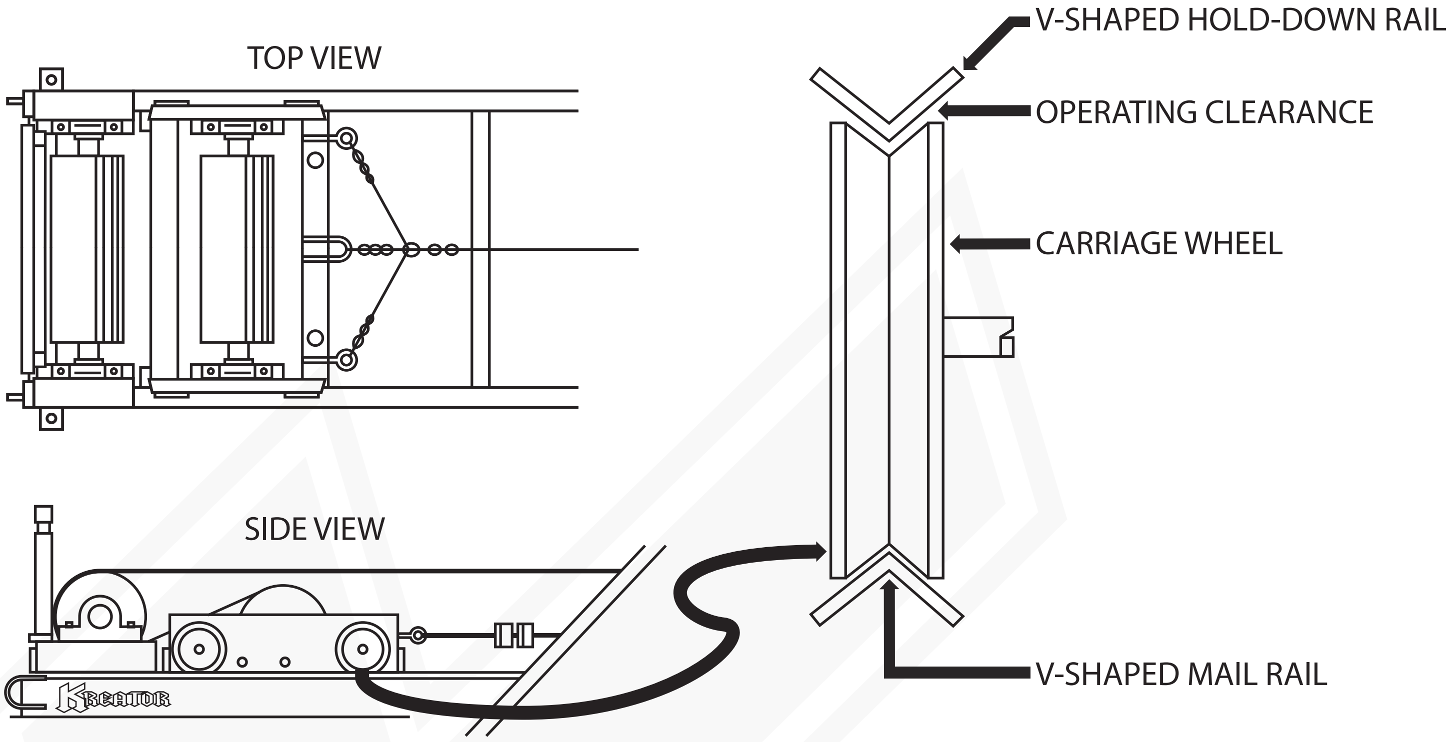


Figure 10
SAMPLE OF HORIZONTAL TAKE-UP CARRIAGE

With the empty belt trained satisfactorily, good operation with load is usually assured. Disturbances which appear with load are usually due to off-center loading or, to accumulation of material from the load on snub pulleys and return idlers.

When equipment is known to be properly aligned, training action should be taken slowly and in small steps because the belt requires some time to respond to corrective measures. It should begin at some point preceding that where run-off occurs and then gradually proceed forward, in the direction of belt travel, until the run-off condition has been corrected.

Under some conditions of operation where the conveyor is not level, is extremely short or too wide to be affected by permissible crowning, belts with a special guide strip have been used. This V-guide strip runs loosely in grooved pulley and idler rolls. Guide strips are not recommended or necessary for the long conveyors normally encountered in industrial use.

MAINTENANCE
CLEANING

Special care must be exercised to keep the return rolls and snub pulleys clean. Buildup of material on this equipment has a destructive effect upon training with the result that the belt may run against the structure and damage itself. It is advisable wherever possible that return idlers be suspended far enough below the structure so that any misalignment or dirty idlers can be easily seen. Caution must be used to insure that cleaning devices are used before the materials are allowed to accumulate to the point that the belt is running in it, and it creates more damage than if cleaning it had not been done at all.

Keeping the return rolls and snubs clean requires that the belt be clean when it enters the return run. Scraping is the most common method of doing this.

Rubber scrapers can be made by clamping rubber slabs ½" to 1" thick (not old belting) between two metal or wooden bars. Extend the rubber about twice its thickness beyond the bars and suspend the mechanism with a counter-weight to provide the pressure against the belt. Replace the rubber when it wears down near the bars. Two or three such scrapers can be used in succession.

The most common steel scraper is a series of diagonally set blades mounted on the end of a leaf spring to maintain pressure against the belt. These will scrape sticky materials which rubber scrapers may ride over. Washing the belt with a water spray before wiping with a rubber scraper will do a good cleaning job on almost any material, including iron ores and mixed concrete.

Dry materials can be cleaned off the belt with rotating bristle or rubber vane brushes, driven at fairly high surface speed, usually three to five times the belt speed. They wear rapidly, require considerable maintenance and are likely to fill up solid if used with wet and sticky materials.

It is preferable to clean just after the head pulley and before the snub. An exception to this is that sticky material often requires scraping on the head pulley. This is because a large part of the fine material sticks to the belt and must be scraped into the chute.

In some cases the best possible cleaning is insufficient and steps must be taken to compensate for the effect of a dirty belt. Snub pulleys can be kept from building up by the use of soft rubber lagging or by scraping directly against the pulley. Diagonal grooving will distort and discharge accumulations on these pulleys. Rubber disc or spiral type return rolls prevent build-up on themselves and thus save a training problem.

The only cleaning required on the pulley side is removal of material, principally lumps, which may fall or bounce onto the return run, and be carried between the belt and tail pulley if not removed. Rubber faced plows immediately in front of the tail pulley are used for this purpose. They are usually held against the belt by gravity and set at an angle to the direction of belt travel.

Another point on a conveyor which is often overlooked is the discharge end. Occasionally at the point of discharge to a pile or bin, material overfills and the belt runs in the material and the belt is worn or torn off and rendered unusable. If there is a possibility of this happening, care must be taken to monitor the operations or possibly install a level control switch to prevent damage.

LOADING

Generally most wear and tear in a conveyor belt occurs at the loading point because of the material impact on the belt. The loading point of any conveyor or radial stacker is nearly always the critical point, the life determining point of the belt. Here the conveyor receives its major abrasion, and practically all of its impact. The "ideal condition" is to have the material pass from chute to belt at the same speed and direction of travel as the belt with a minimum amount of impact, and strike the belt between and just forward of the idlers.

Receiving material off-center will cause the belt to move sideways after loading as the center of the load seeks the lowest point in the troughing idlers. This can be corrected by proper chute arrangement provided, of course, that the belt is centered as it enters the loading point.

The subject of chute design and arrangement is too broad to be discussed in detail, the following suggestions are offered:

The width of the receiving end of the loading chute should be great enough to accept material lying on the extreme edge of the preceding belt or feeder, and its position determined by the trajectory of the material coming into it. At no place should the chute be less than twice the size of the largest lumps, if fines are present, and 3 1/2 times the size of lumps, if uniform. The discharge width of the chute thus determined should not exceed about 2/3 of the receiving belts' width.

The slope of the chute is determined by the nature of the material, its entering velocity and length of the chute. This value varies with each particular installation, but about 35° has been found satisfactory for most dry industrial materials such as coal and rock.

An attempt to approach the above "ideal condition" should be made continually by adjusting the chute arrangement. Optimum loading and transferring through chutes still requires considerable experimental adjustment in the field.

Skirt boards should be used to further center and settle the load as it leaves the loading point. The steel structure of the chute and skirts never should be placed closer to the surface of the belt than 1", this distance to be made increasing in the direction of belt travel to free any material trapped between the belt surface and the skirt. Skirt boards are usually 4 or 5 times the belt width in length, but may vary considerably due to belt speed, type of material and lump size.

Impact of material being loaded on the belt is often the cause of severe cuts and gouges. The degree of impact can be lessened to some extent by providing a cushion in the form of rubber covered disc type or semi-pneumatic idlers, which also tend to prevent material from crowding under the skirt boards at the instant of impact.

The use of a “Grizzly,” a slightly fanned row of bars, at the bottom of the chute reduces wear on the belt. It distributes the impact of large lumps by allowing the fines to fall onto the belt first to act as a cushion. The fan shape of the “Grizzly” in the direction of travel prevents jamming of the lumps.

A “V-slot” cut in the bottom of the chute is another very satisfactory method of allowing fines to fall on the belt before the lumps and thereby reduce belt wear at this point.