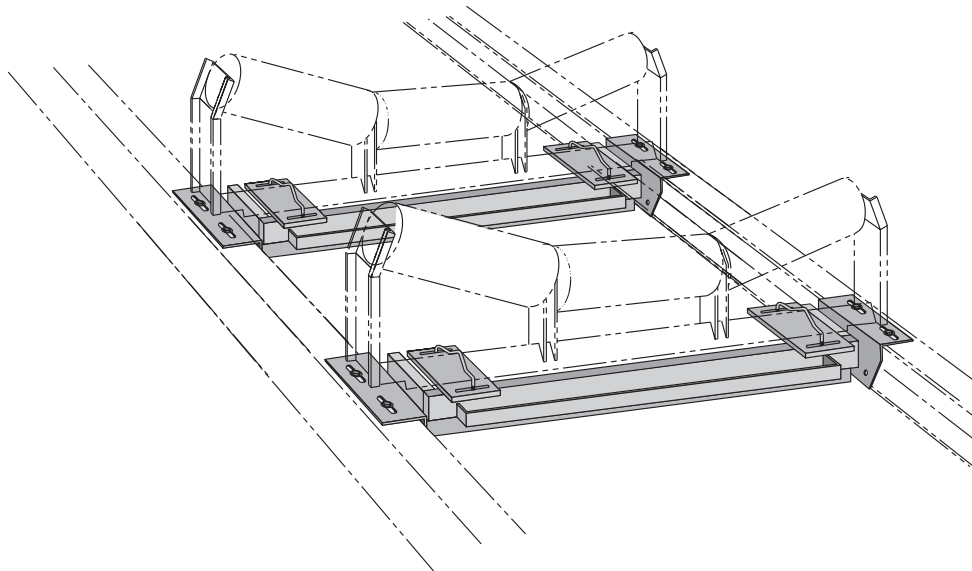


MMI-2 BELT SCALE APPLICATION GUIDELINES

Instruction Manual PL-328

January 2001



Safety Guidelines

Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

Qualified Personnel

This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

Warning: This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

Note: Always use product in accordance with specifications.

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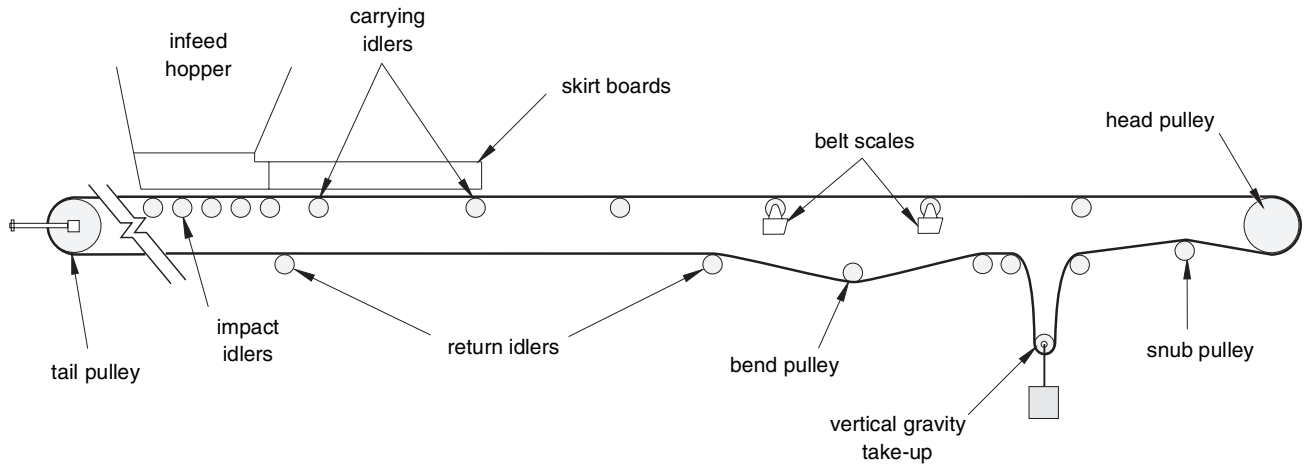
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PREFACE

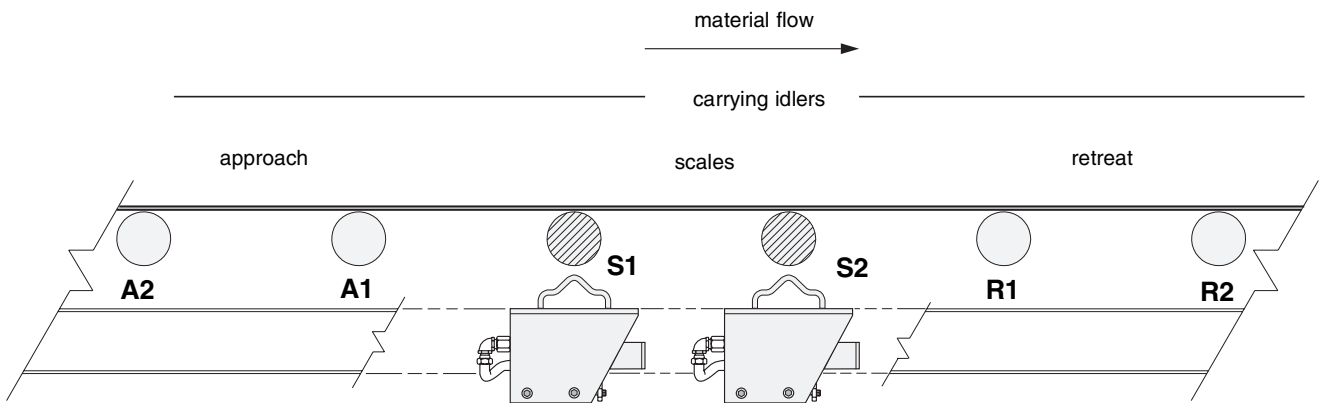
The MMI belt scale design and manufacture allow for accuracy in the order of 0.25% or better to be achieved when installed according to these guidelines. It is customary to factory test each MMI belt scale. We are therefore concerned that each belt scale be installed in a conveyor system where it can be used to its fullest advantage. In keeping with this intent, Milltronics offers the following in the hope that the application of this scale will provide years of good service and uninterrupted usage.

The proper application of a belt scale is possibly the single most critical consideration if accurate results are to be obtained. Other factors must not be overlooked, though they may be of lesser significance. A number of specific conveyor and environmental influences will be considered, preferences stated and recommendations made. The accuracy that can be anticipated from the application will be directly related to the degree to which the detrimental influences can be avoided and preferred practices can be maintained.

BELT CONVEYOR TERMINOLOGY



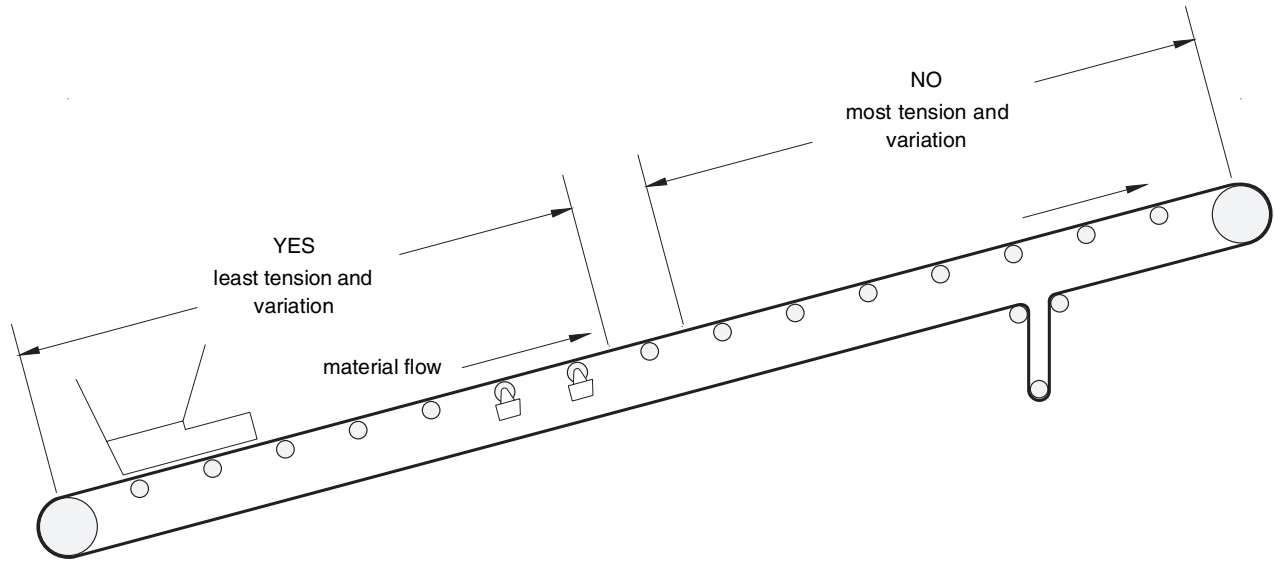
IDLER ARRANGEMENT



LOCATING THE SCALE

BELT TENSION

Belt tension is a function of material tonnage, belt speed, conveyor length and the height that the material must be raised. Obviously, the larger these values become, the greater the tension and the greater the resulting effect on the scale.

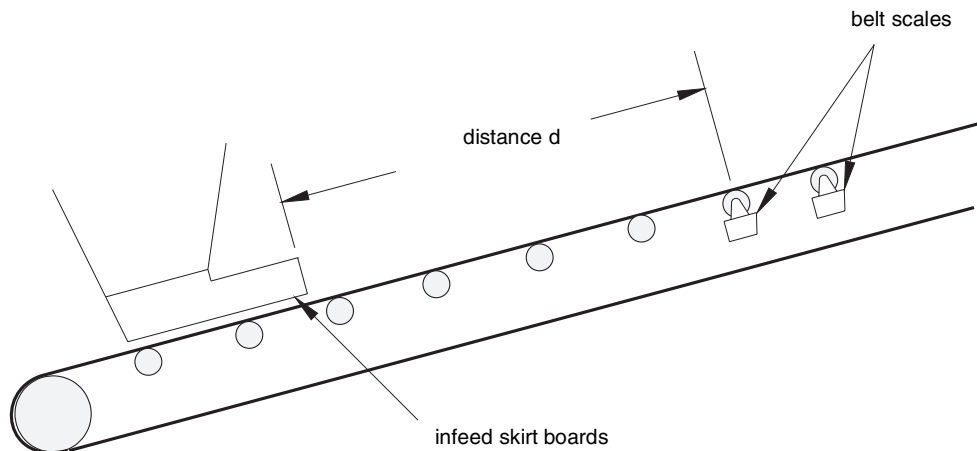


RECOMMENDATION

Locate the scale fairly close to the tail section where tension and its variations from no load to full load are minimal.

MATERIAL TURBULENCE

As the material leaves the confines of the feed point and associated skirt boards, the cross sectional shape is changing until it settles down to a fairly stable section. Attempting to weigh the material before it completely settles invites error. The proper location of the scale beyond this point depends upon the conveyor belt speed and the characteristics of the material.



RECOMMENDATION

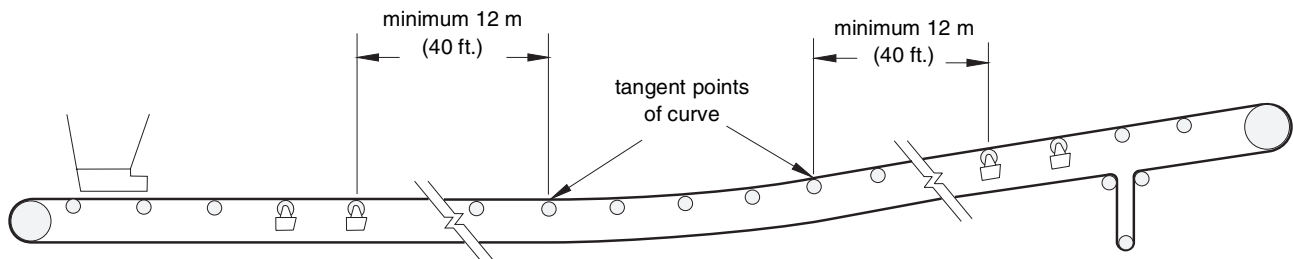
Locate the scale not less than one idler space beyond the point where turbulence stops. If that cannot be determined, then refer to the following chart:

<i>belt speeds</i>	<i>d</i>
up to 1.5 m/s (300 fpm)	2 m (6 ft.)
up to 2.5 m/s (500 fpm)	3 m (10 ft.)
over 2.5 m/s (500 fpm)	5 m (15 ft.)

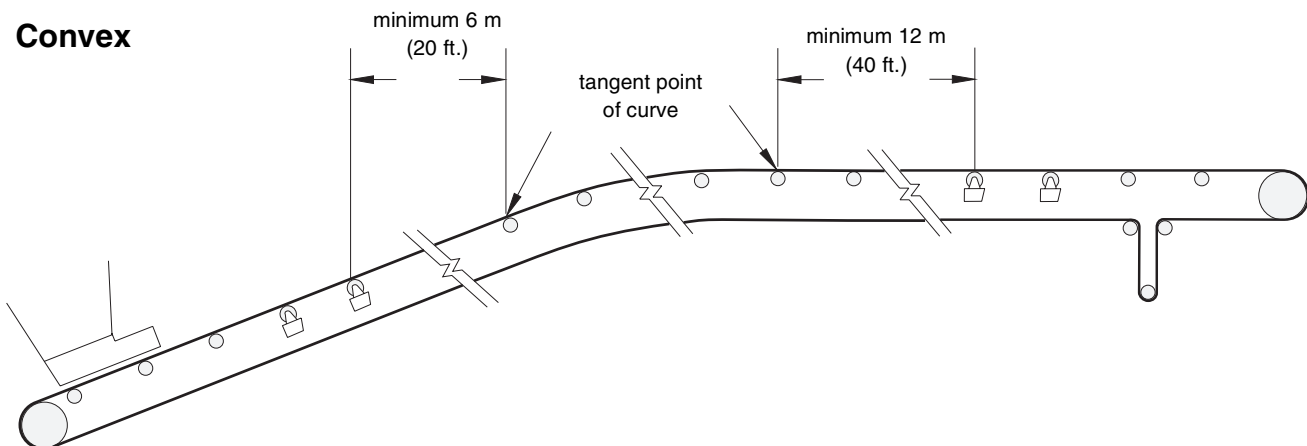
CURVED CONVEYORS

Vertical curvature is common in conveyor design, but one which can create difficulties with belt scales if not dealt with correctly. The curvature whether concave (internal) or convex (external), would prohibit proper idler alignment if the belt scale was installed in that area. The more difficult of the two curves is the concave curvature, since it tends to lift the belt off of the idlers in and near the curve when the belt is empty. This prevents the possibility of obtaining a good empty belt zero calibration for the scale.

Concave



Convex



BELT PLOWS

The use of belt plows or any other device that changes the material or belt profile in or near the scale area is not recommended. These devices may create drag on the belt which the scale senses as a material force or load, and may prohibit proper idler alignment.

RECOMMENDATION

Do not install the MMI within 9 m (30 ft.) of belt plows or similar devices that come in contact with the material or belt.

STACKER CONVEYORS

Any conveyor that is not a permanent structure, that varies in its incline, elevation or profile is not considered a good installation for an accurate belt scale. There are instances where a belt scale can be used effectively in a conveyor of this type, but this requires special consideration. Please consult Milltronics.

CONVEYOR TRIPPERS

Not as common as a conveyor with fixed curvature, but it can be as troublesome to scales.

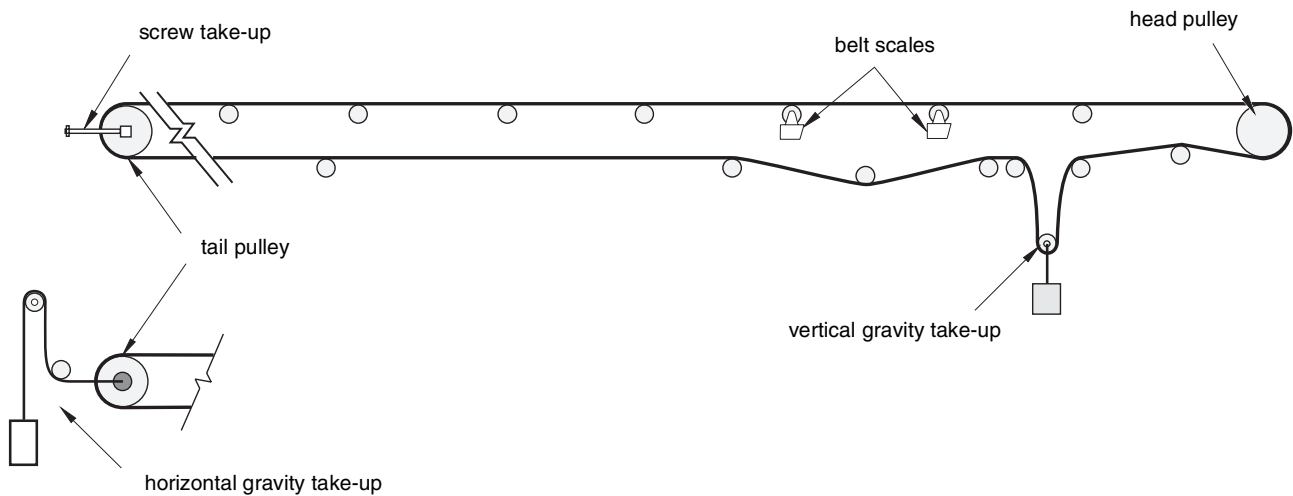
RECOMMENDATION

On a conveyor with a tripper, locate the scale under the recommendations for fixed curves, but with the tripper in its fully retracted position.

CONVEYOR CONSIDERATIONS

TAKE UP

A variety of conveyor belt take-ups are in general use. Since they are intended to control conveyor belt tension within certain constraints, their importance should not be taken lightly. Of the three basic types, (screw, horizontal gravity and vertical gravity), the vertical gravity take-up is the most reliable due to its ability to react to changes in belt tension and at the same time maintain relatively uniform tension. The resulting influence of belt tension upon the scale is greatly reduced and accuracy is improved.



RECOMMENDATION

For best accuracy, use a vertical gravity take-up. If that is not practical or possible, then a horizontal gravity take-up should be used. The use of the screw type take-up should be limited to conveyors with pulley centers of less than 18 m (60 ft.).

MATERIAL FEED POINT

Some conveyor systems require that more than one feed point or a combination of multiple feed points be in use at the same time. Belt tension can vary considerably depending upon the particular combination of feed points in use at any given time.

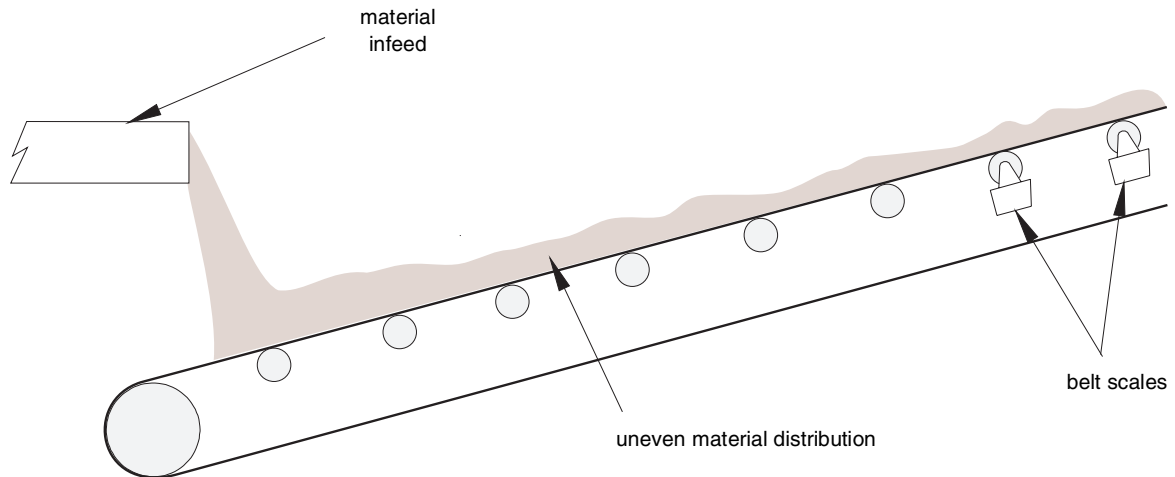
RECOMMENDATION

Ensure sufficient space is provided between the belt scale and the nearest feed point. Refer to Material Turbulence.

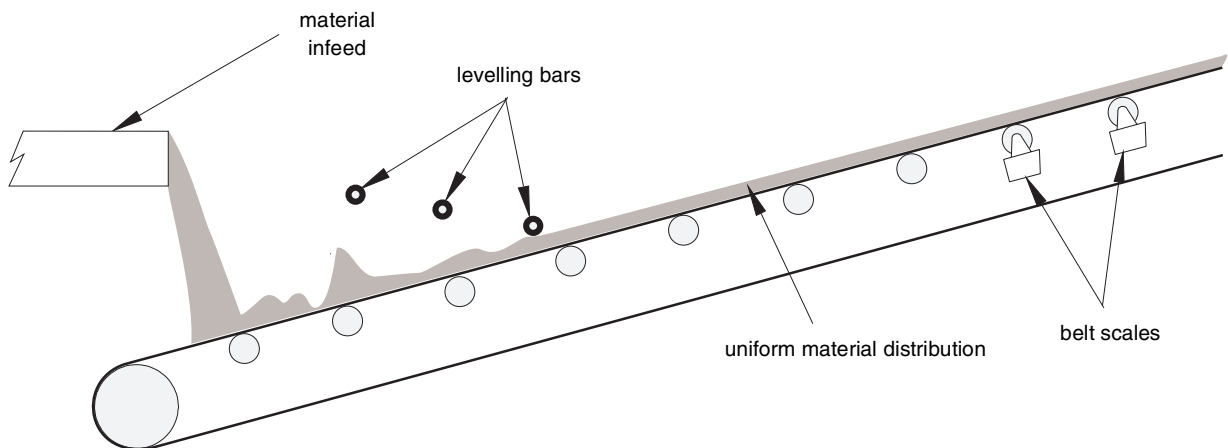
MATERIAL LOADING

Various methods are used to feed material on to the belt. Often the flow of material from the material infeed to the belt is not uniform, causing an uneven material distribution on the belt. This condition may be detrimental to belt scale performance.

Without Load Levelling



With Load Levelling



RECOMMENDATION:

For maximum performance, install chain curtains or load levelling bars (angle iron or pipe across the material path) to establish uniform material distribution on the belt. Ensure the load levelling device used cannot back up material to the point of causing a spill.

MATERIAL ROLL BACK

The design of some conveyors requires that the incline of the conveyor be quite steep. This may serve the purpose of getting the material from infeed to discharge, but on careful inspection it may be seen that the material, due to its size and shape, is tending to roll back on itself even though the general direction is forward.

RECOMMENDATION:

Make a close inspection of the selected belt scale location to verify material roll back is minimal or non-existent in or near the belt scale area.

CONVEYOR BELTING

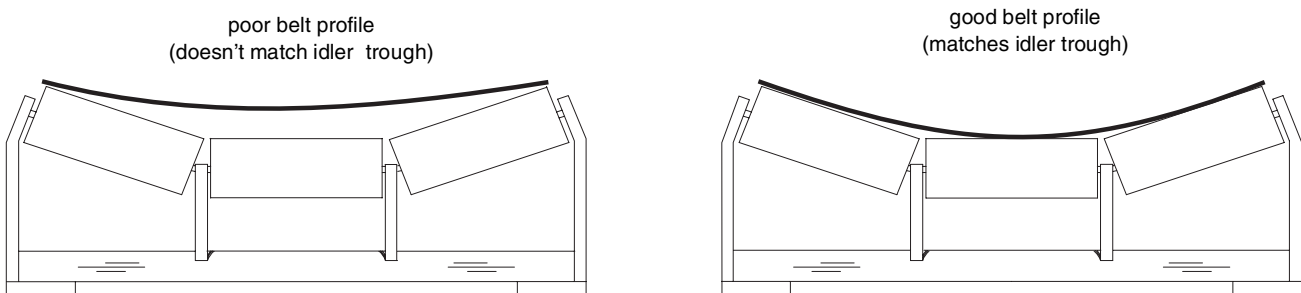
BELT WEIGHT

It has been found that the variations in the number of belt plies, the cover thickness and the type and quantity of splices in a given belt cause considerable variation in the weight per unit length of that belt. During the course of zero calibration, most belt scale integrators average the load applied to the belt scale by the empty running belt.

The amount of the deviation (+ or -) from that average, if great enough, can make it difficult to obtain a good zero reference and subsequent scale accuracy.

BELT STIFFNESS

Many times the belt chosen for a given installation is over-rated for its intended use. The unfortunate end result is a belt that is so stiff the belt profile does not match the trough of the idlers. When this happens (especially in 35° and 45° idlers), the belt arches across the idler and neither a good zero of the belt nor a good span calibration can be obtained.



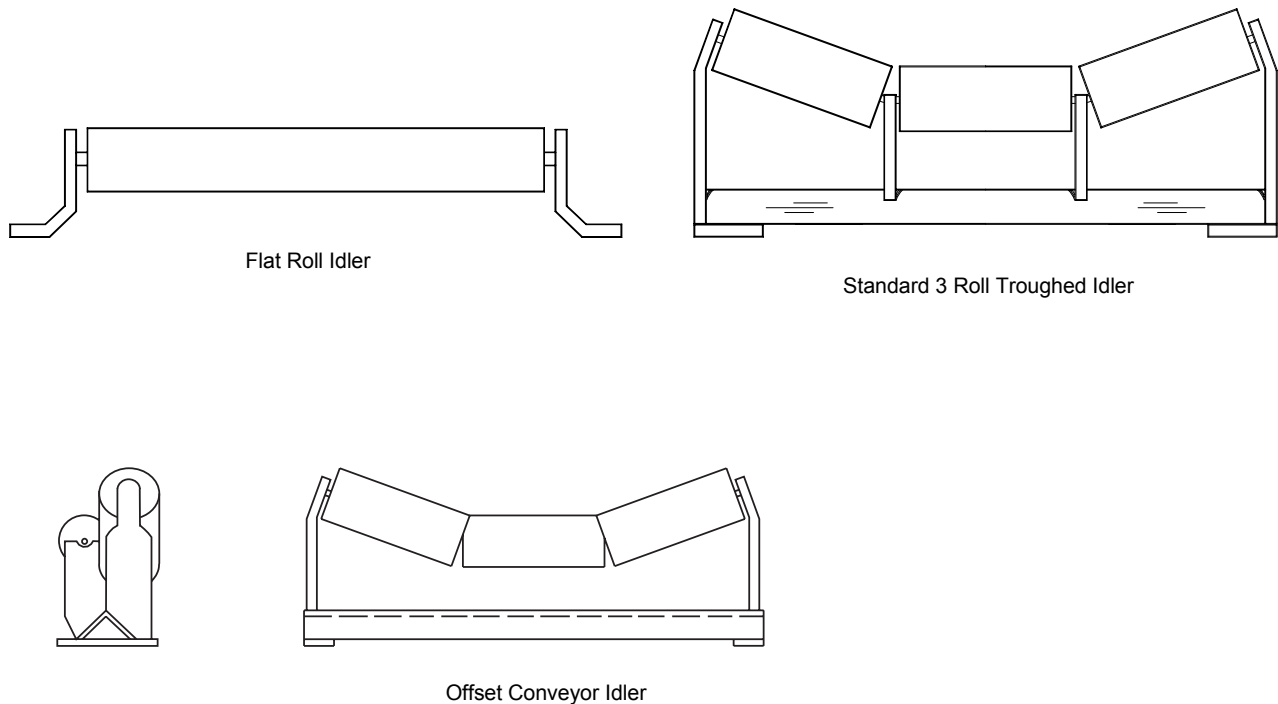
RECOMMENDATIONS

Be careful when selecting and replacing worn sections of belting. Ensure that it is the same as the existing belting. Also be careful when choosing a new belt to select one that suits the application, not necessarily an oversized and over-rated belt that hopefully will last a lot longer. Even though it may never wear out, it also may never allow the scale to work properly.

IDLERS

There is quite a variety of idlers available on the market today. The types compatible with a belt scale are more limited. Due to the fact that idler alignment in and around the scale area is such a critical requirement, it is of great importance that the proper idlers be used.

The following idlers are considered ideal for MMI installations :



RECOMMENDATION

- a. If possible, use single flat roll idlers, or 20° to 35° 3 roll idlers for maximum belt scale performance. For additional instructions, regarding other idler designs, consult Milltronics or your local distributor.
- b. Select idlers that are dimensionally the same, have rolls that are concentric within 0.5 mm (0.020"), and whose troughs match within 3 mm (0.12"), when compared to a template. All idlers chosen for scale installation must be of the same manufacture and properly lubricated (in some instances, idlers having "Lube-for-life" bearings are required).
- c. Keep all idler rolls clean, free from material build up, and free spinning without over- greasing. Neglecting this may result in misalignment and poor belt tracking. Replace all idlers that exhibit stiff, stopped or eccentric rolls.

IDLER ALIGNMENT

Experience dictates that the operational performance of a belt scale is directly related to the care and consideration given to proper conveyor idler alignment.

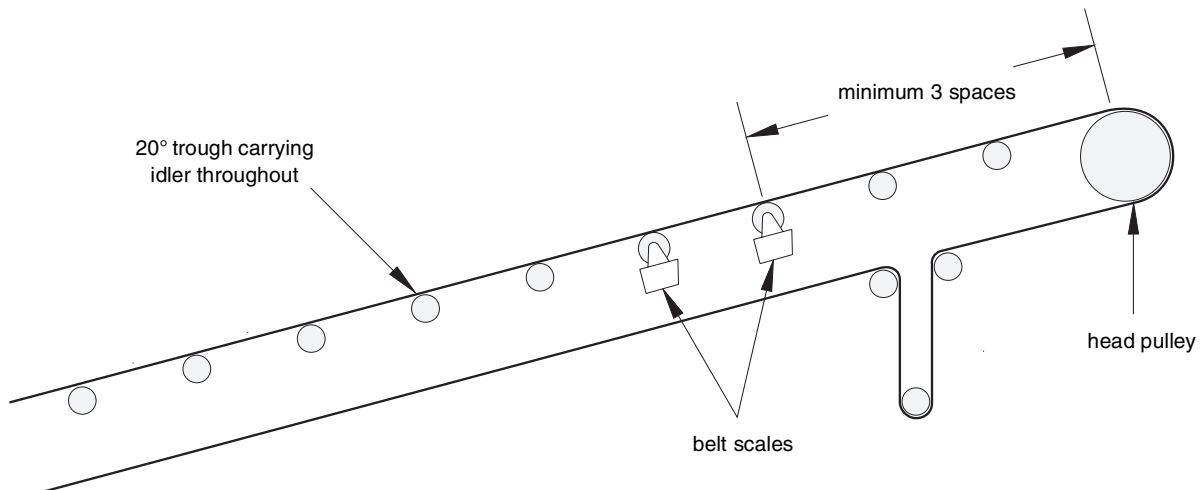
**Ensure the conveyor idlers are aligned within the tolerances specified.
Refer to instruction manual PL-327, "MMI-2, 2 IDLER BELT SCALE".**

HEAD PULLEY

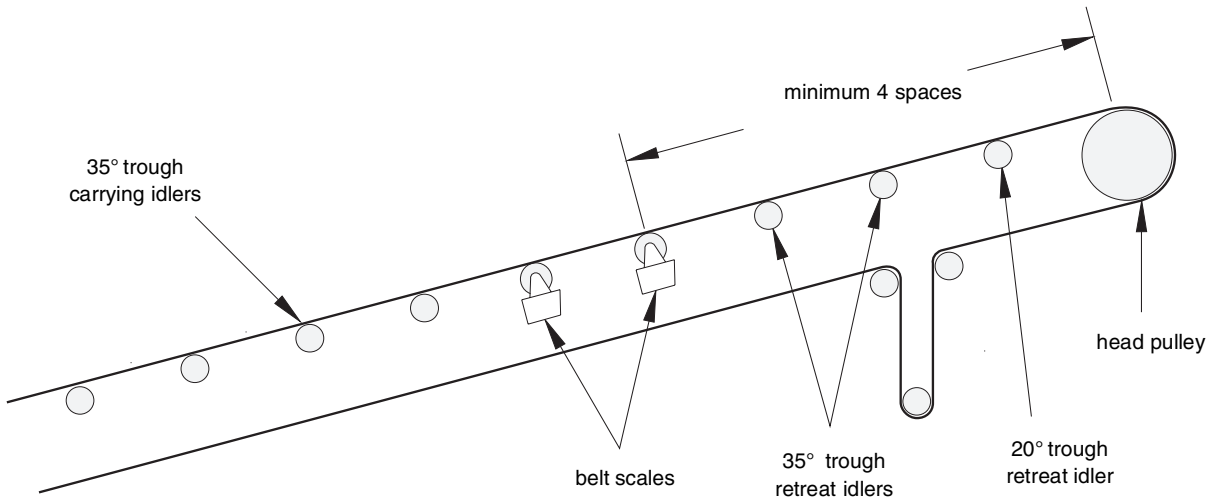
When installing a scale in a short conveyor or where there is virtually no other place to locate the scale except in the area near the head pulley, it is advisable to apply some caution. Since head pulleys are essentially flat faced with a slight crown and the idlers being troughed, a situation is created whereby the belt profile must change from troughed to flat in a short space. To accommodate this the conveyor manufacturer designs a built-in vertical displacement of the head pulley above the top of the center roll of the adjacent idler. To further aid and ease this transition, idlers of decreasing trough angles are inserted between the head pulley and the normal run of idlers. If this is not done, a considerable amount of stress is exerted on the belt edges and the idlers adjacent to the head pulley and ultimately these undesired forces are applied to the scale.

RECOMMENDATION

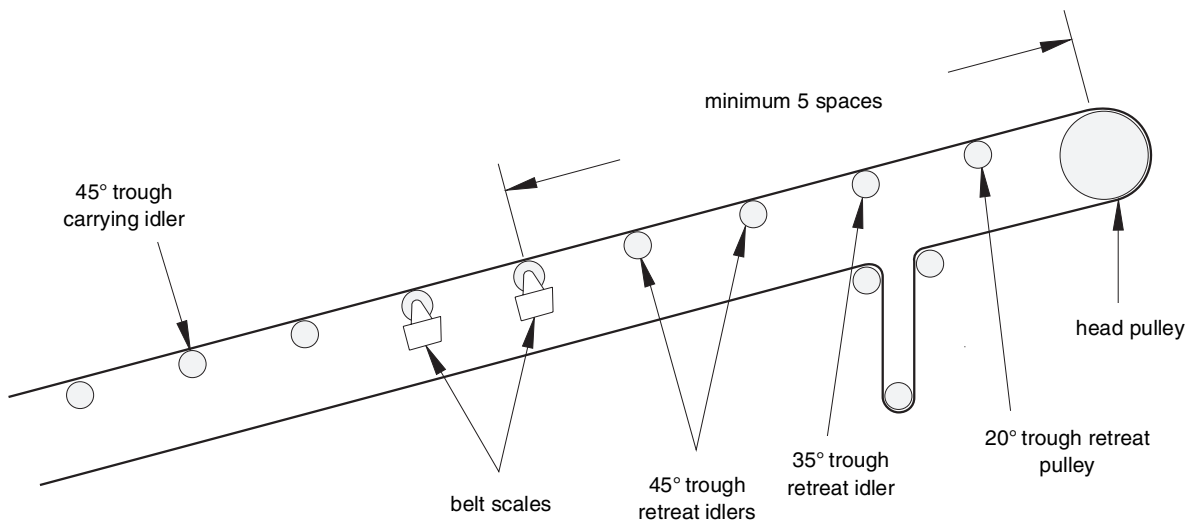
- a. On conveyors with 20° trough idlers throughout, a minimum of two fixed 20° idlers must be located between the scale idlers and the head pulley.



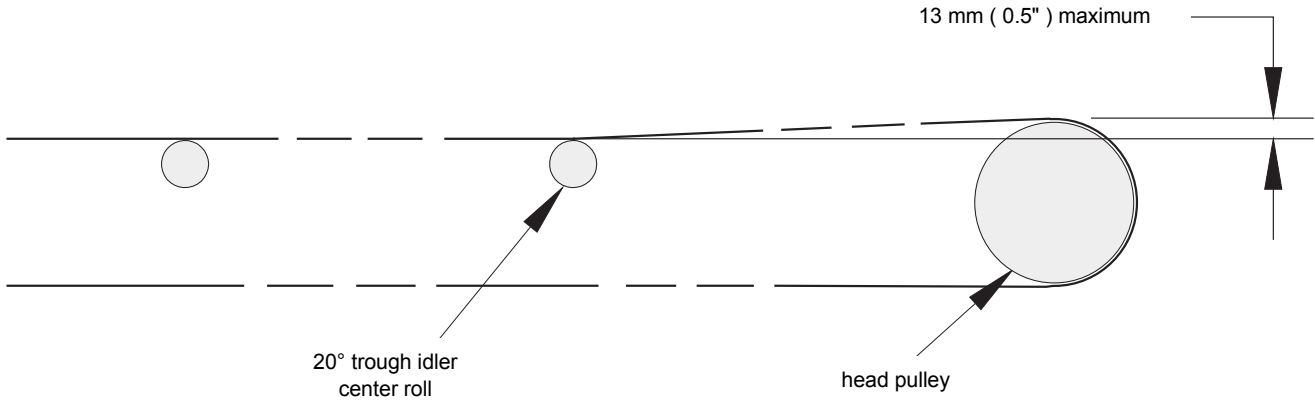
- b. On conveyors with 35° trough idlers throughout, a minimum of two 35° and one 20° retreat idlers must be located between the scale and the head pulley.



- c. On conveyors with 45° trough idlers throughout, a minimum of two 45°, one 35° and one 20° retreat idlers must be located between the scale and the head pulley.



- d. The vertical displacement of the head pulley relative to the adjacent retreat idler is normally in excess of the that which is acceptable for belt scale installations. When locating a scale close to the head pulley maintain a maximum of 13 mm (0.5") vertical displacement between the top of the head pulley and the top of the center roll of the adjacent idler.



RECOMMENDATION

- a. The head pulley be lowered on its mounting until the vertical displacement measured from the top of the head pulley does not exceed 13 mm (0.5") above the top of the center roll of the adjacent idler.

or

- b. All the retreat idlers between the head pulley and the scale, the scale idlers and at least two approach idlers be shimmed to accomplish the same end result as mentioned in first option.

TAIL PULLEY

Scale considerations with respect to the tail pulley are not of great concern. The space reserved for the infeed is usually sufficient to suppress any effect the tail pulley might have upon the scale. However, if the tail pulley is the self-cleaning type with slats or beater paddles, often called a wing pulley, the thumping, beating or slapping action of this pulley may develop belt oscillations, which could be transmitted through the belt to the scale.

RECOMMENDATION

If at all possible, avoid the use of wing type pulleys. Use solid face welded steel pulleys.

CONVEYOR RIGIDITY

The conveyor stringers in the scale area should be strong enough to limit relative deflection to 1mm (0.04") or less, with supports 2.4 m (8 ft.) apart throughout the range of conveyor loading. Stringers should also be straight and without twist so that the belt will track centrally on the conveyor.

VIBRATION

Inherently, a belt scale is a sensitive device and should be isolated from equipment that can induce harmful or disturbing vibration. Equipment such as crusher, vibratory feeding equipment, bins subject to hammering and hammer mills, etc. should be avoided.

CONVEYOR COVERS

Covers are required for outdoor installations involving belt scales.

RECOMMENDATION

Exercise care to ensure that the covers do not in any way physically impinge upon the scale or hamper its freedom of movement. Further, due to the adverse effects that the elements can have upon a scale (wind in particular) it is necessary that additional shielding be installed. Depending upon the geographical area, more or less may be required, but typical dimensions are 9 m (30 ft.) before and after the center of the scale and 1 to 1.2 m (3 to 4 ft.) above and below the carrying belt line.

BELT TRACKING AND TROUGHING

A combination of factors determine whether or not the conveyor belt will properly track (i.e. keep its position on the conveyor and idler centerline) and trough (i.e. lay in the idler trough and make good contact with all three idler rolls as intended).

First and foremost is the belt itself:

- ensure sufficient ply rating to support the load without being overrated for the design load.
- ensure that rubber covers are of the proper thickness
- ensure that splices are properly selected and installed

Secondly, ensure that the conveyor take-up is the right type for the application and that it is properly adjusted and working properly.

Thirdly, the idlers must be considered:

- ensure the idlers are square to the conveyor and located centrally on the frame
- ensure that all idler rolls turn on their axis
- if training idlers or idlers with guide rollers are used, they should not be installed closer than 9 m (30 ft.) from a scale idler

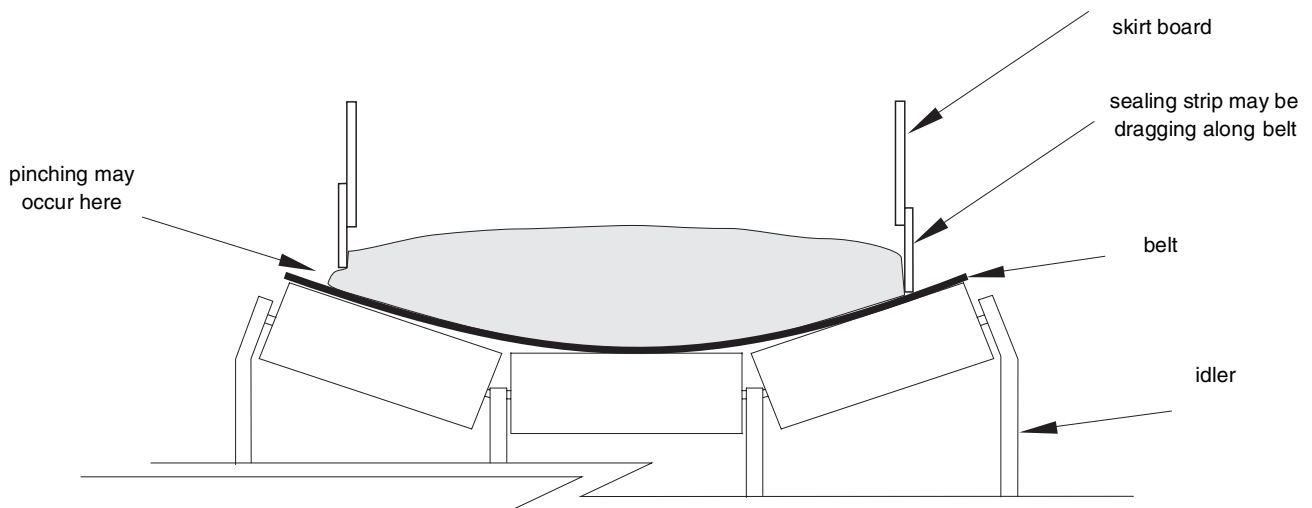
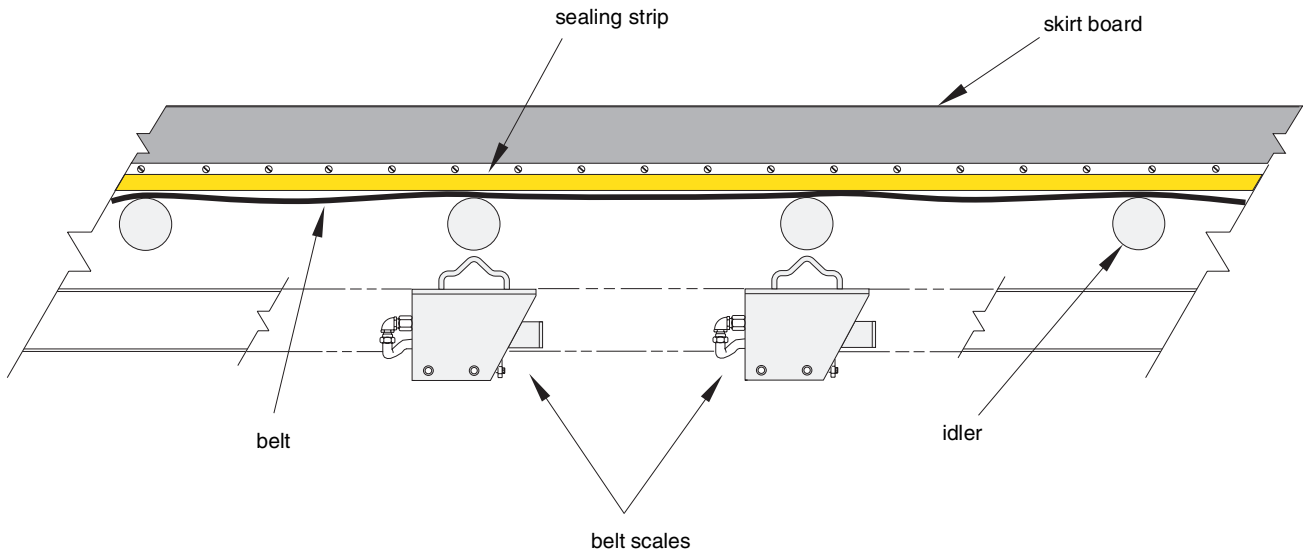
The conveyor belt is one of the most expensive items on the conveyor and can wear prematurely or be damaged if proper consideration is not given.

RECOMMENDATION

Review and check the aforementioned considerations. If any of the conditions are not being met, they must be corrected.

SKIRT BOARDS AND SEALING STRIPS

In some applications, it is necessary to extend the infeed skirt boards and sealing strips the full length of the conveyor. This can create problems in weighing accuracy due to the forces that the sealing strips exert when contacting the belt and indirectly upon the idlers, especially where pinching occurs. Attempts to obtain a good zero calibration and subsequently good span calibrations under these circumstances becomes quite difficult.



RECOMMENDATIONS

Either remove the sealing strips or raise them sufficiently to eliminate their effect upon the belt and idlers.

MAINTENANCE AND MODIFICATIONS

MAINTENANCE

Once the conveyor is fitted with a belt scale, it requires more attention as it is now part of the weighing system. Belt scales tend to be looked upon as simply another piece of industrial equipment. However, when it comes to performance, this is one item from which so much is expected. Since accurate weighing is of prime importance, it is equally important to take good care of the scale and the surrounding area. Therefore, for proper scale operation the following conveyor characteristics should be inspected and adjusted as required.

- » lubrication of all pulley and idler bearings
- » proper belt tracking and training
- » proper belt cleaning and scraping
- » proper belt take-up operation
- » proper material and spillage control

Maintenance Precautions:

- » when arc welding near the scale, do not allow current to pass through the belt scale
- » install the MSI shipping stops to reduce physical shock to the load cells during maintenance

MODIFICATIONS

If it becomes necessary to make changes to the conveyor and/or related equipment, the changes could have a profound effect upon the operation and resulting accuracy of the weighing system.

RECOMMENDATIONS

Consult Milltronics for advice regarding belt scale installation.

MATERIAL BUILD-UP

Some materials stick quite readily to the belt and conveyor equipment. To rectify this common problem, belt scrapers, rotary brushes, vibrating cleaners, shakers, plows and the like are used. It is necessary to keep the conveyor belt and associated equipment as clean as possible, so that the scale measures only the loads intended and not the added load due to material sticking to the belt. Though scales can be frequently and automatically recalibrated at no load (zero), it is not a good practice to allow material build up to remain on the belt.

RECOMMENDATION

Use good quality belt cleaning equipment.

MATERIAL SPILLS

General good housekeeping is always important. Material spillage not only results in lost production but can also adversely affect scale operation when spilled material wedges between dynamic parts preventing proper scale deflection. In addition, the build up affects the zero calibration of the scale.

RECOMMENDATION

Take care not to overload the conveyor. As a precaution, install deflectors to keep spills from reaching the scale.

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