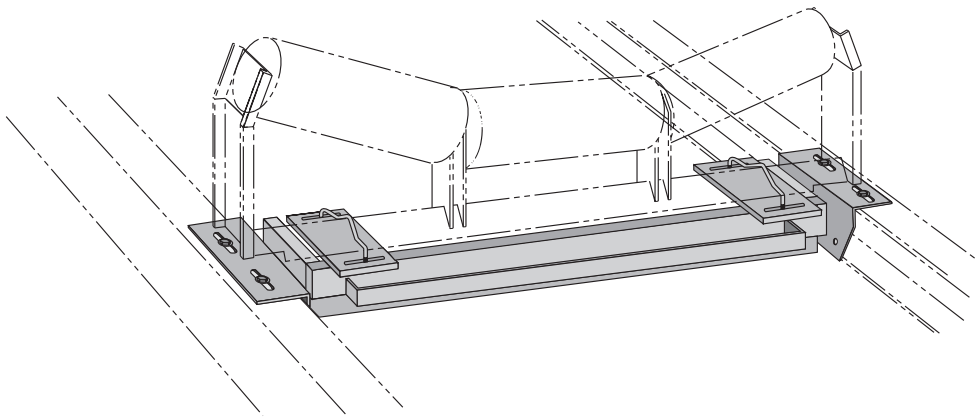
MILLTRONICS

MSI BELT SCALE
APPLICATION GUIDELINES

Instruction Manual PL-264 January 2001



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Rev. 1.2

MSI BELT SCALE

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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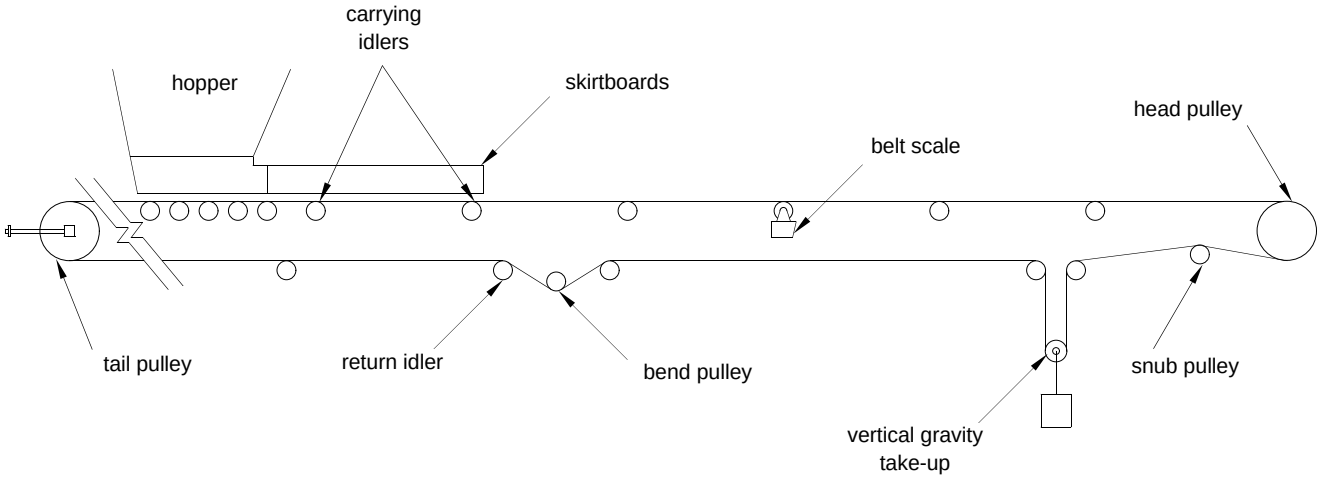
PREFACE

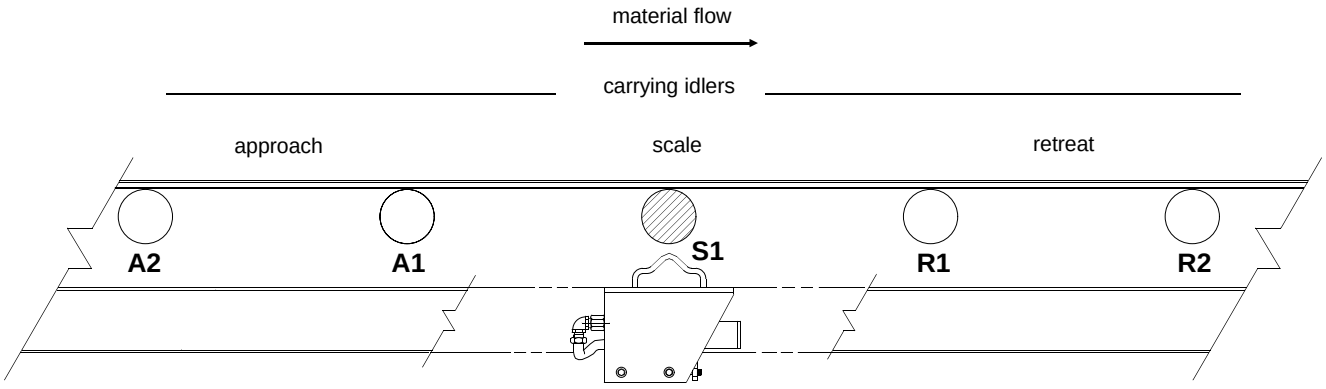
The MSI belt Scale design and manufacture allow for accuracies in the order of 0.5% or better to be achieved when installed according to the guidelines. It is customary to factory test each MSI belt scale. We are therefore concerned that each belt scale be installed in a conveyor system where it can 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



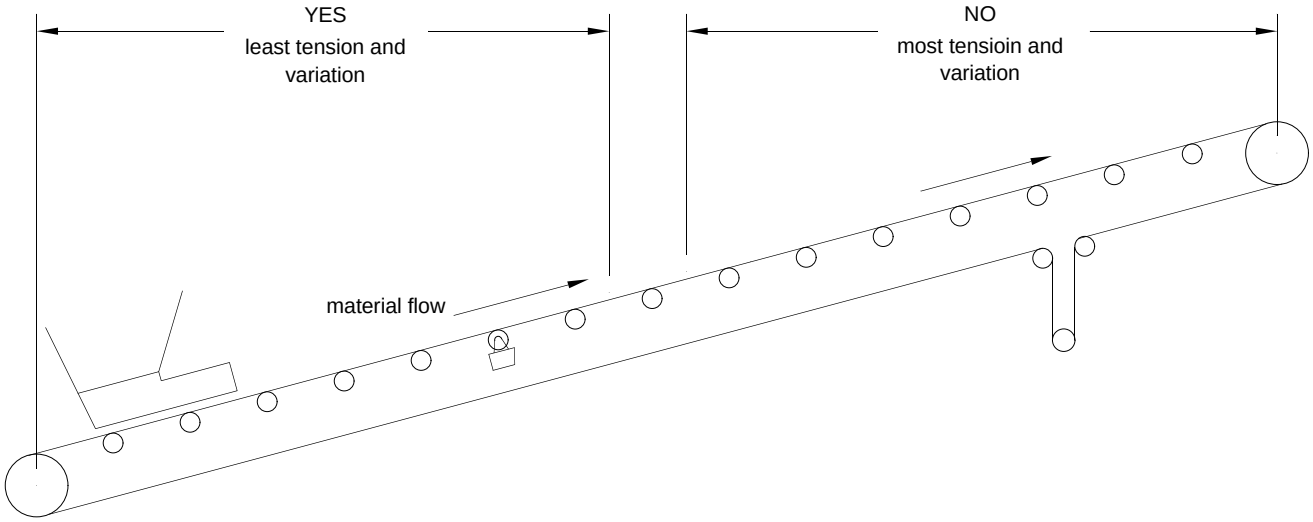
IDLER DETAIL



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.

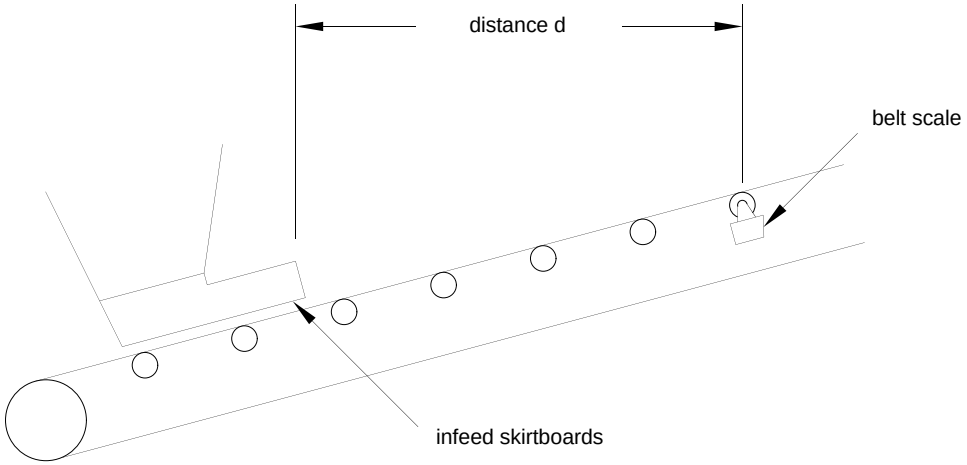


RECOMMENDATION

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 skirtboards, 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

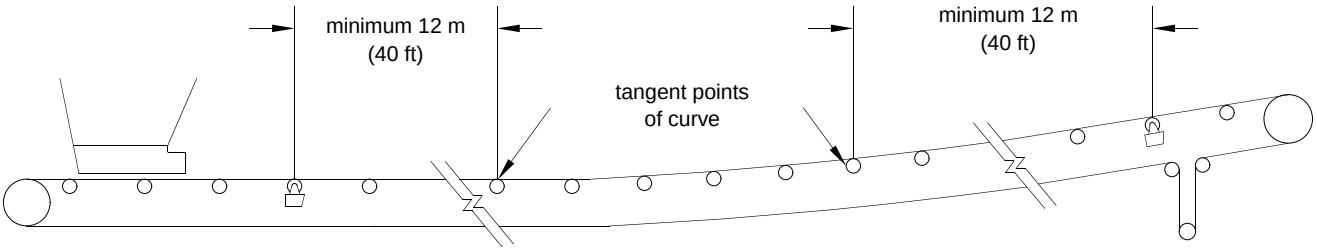
Locate the scale not less than one idler space beyond the point where turbulence stops. If that cannot be determined, then refer to the following chart:

belt speeds	*d*
up to 1.5 m/sec (300 fpm)	2 m (6 ft)
up to 2.5 m/sec (500 fpm)	3 m (10 ft)
over 2.5 m/sec (500 fpm)	5 m (15 ft)

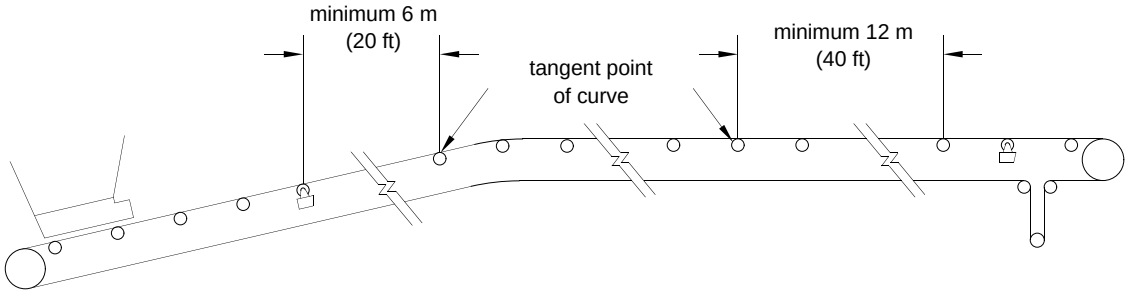
CURVED CONVEYORS

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 or convex, would disturb the 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 balance for the scale.

Concave



Convex



BELT PLOUGHS

The use of belt ploughs or any conveyor or material control device that changes the profile of the carrying belt in or near the scale area is not recommended. These devices have a detrimental effect on the belt scale idler alignment and may create drag on the belt which the scale senses as a material force or load.

RECOMMENDATION

Do not install the MSI within 9 m (30 ft) of belt ploughs or similar devices that come in contact 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

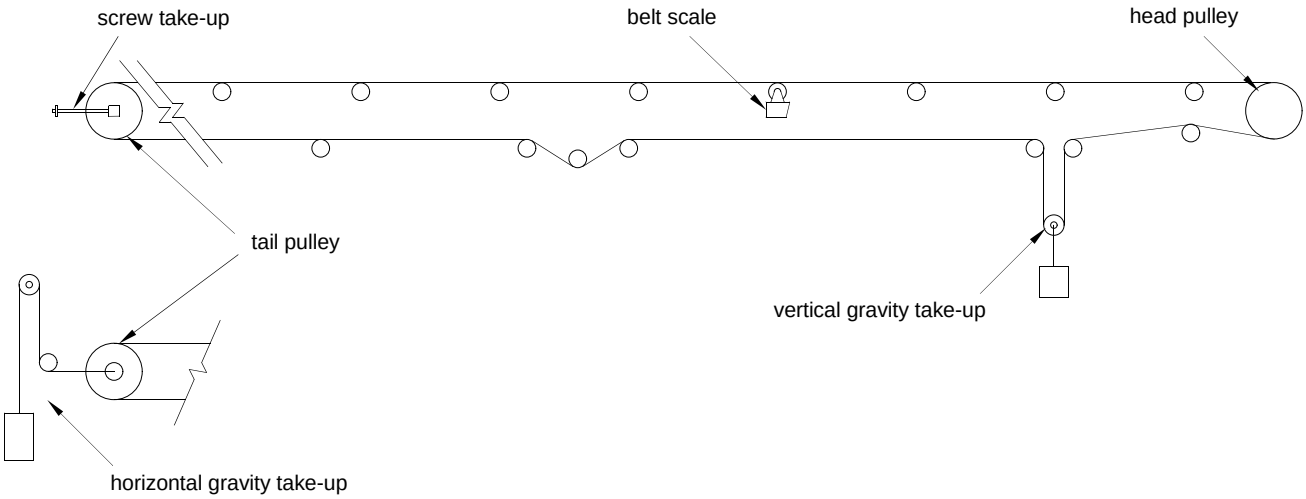
Not as common as a conveyor with fixed curvature, but it can be as troublesome to scales.

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

Belt scale take up device. 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 the best accuracy, use a 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 feeds points in use at any given time.

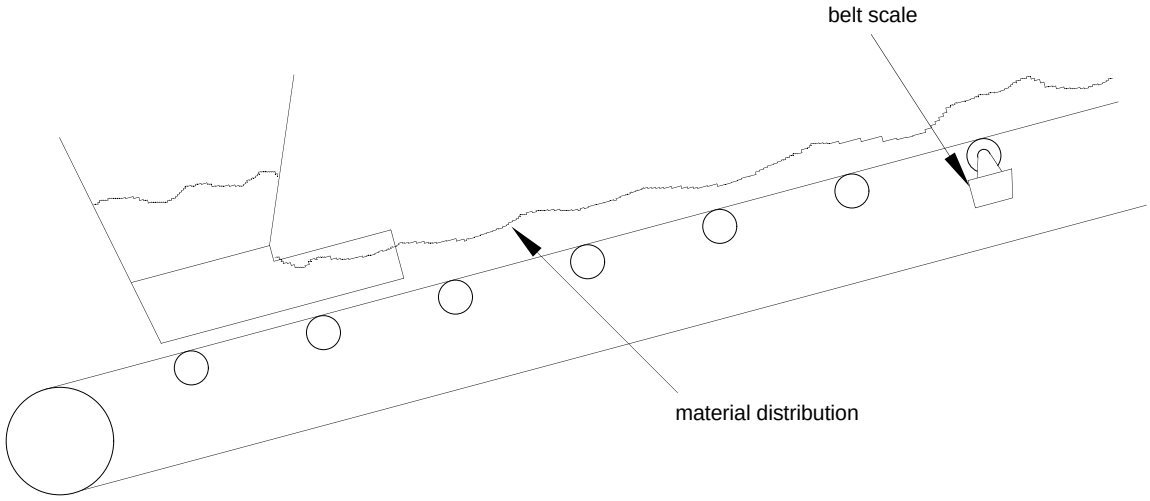
RECOMMENDATION

Whenever possible, install the scale on a conveyor that has only one feed point.

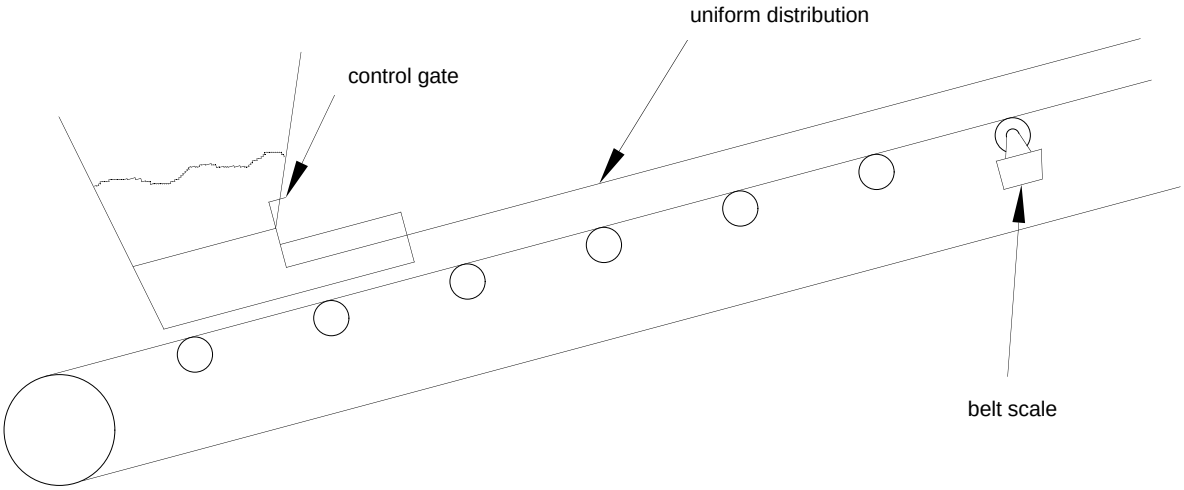
MATERIAL LOADING

Various methods are used to feed material to the belt. A good deal of time the flow of material from the pre-feeder to the belt is not uniform and at speeds different from the conveyor belt speed. These influences make the scale's job much harder and in some instances, may decrease desired accuracy.

Without Control Gate



With Control Gate



RECOMMENDATION:

An attempt should be made to insure steady and uniform material loading to the belt at or near the same speed as the conveyor belt. The installation of a material feed control gate or similar device will greatly enhance the uniform flow of material.

MATERIAL ROLL BACK

(Sometimes referred to as material slip). 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. This phenomenon can also be the result of an inequality between material feed velocity and belt speed. It can also be caused by poorly selected or installed rubber or chain curtains at the infeed, where the curtain momentarily holds back the material on the top of the pile causing it to slow down in comparison with the rest of the pile.

RECOMMENDATION:

Make a close inspection of the installation to determine if the proper speed to feed relationship as well as proper incline versus material roll back relationships are in use.

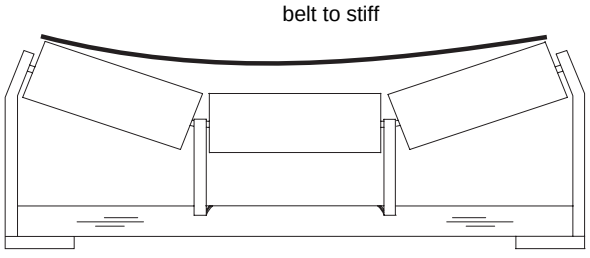
CONVEYOR BELTING

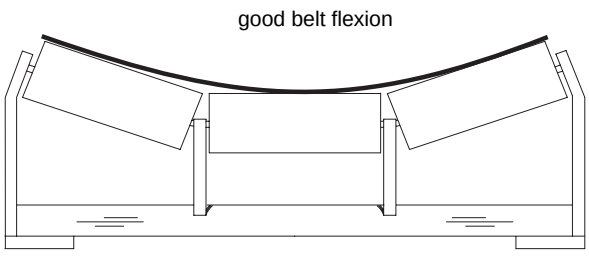
Belt weight in many installations, it has been found that the variations in the number of belt plies, the cover thickness and the type and quantity of splices in a given conveyor belt does cause considerable variation in the weight per length of that belt. During the course of zero balancing, most belt scales average the weight of the belt over one complete circuit of the 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 that it cannot flex enough to properly trough in 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.



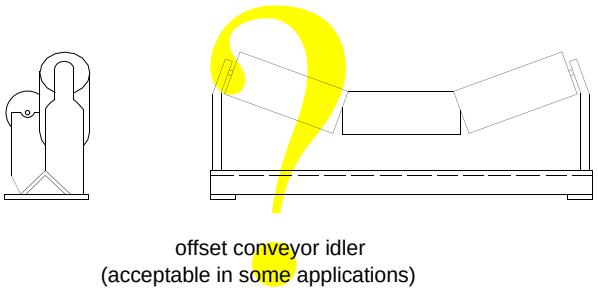


RECOMMENDATIONS

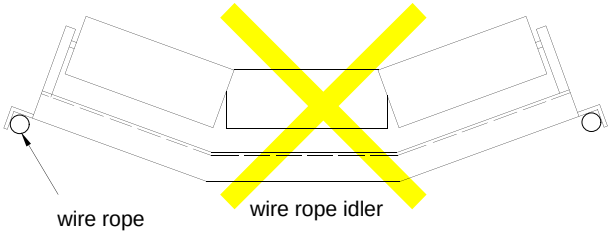
Be careful when selecting and replacing worn sections of belting. Insure that it is the same as the existing belting. Also be careful when choosing a new belt to select one that suits the application, not necessarily an oversized and over-rated belt that hopefully will last a lot longer. Even though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

IDLERS

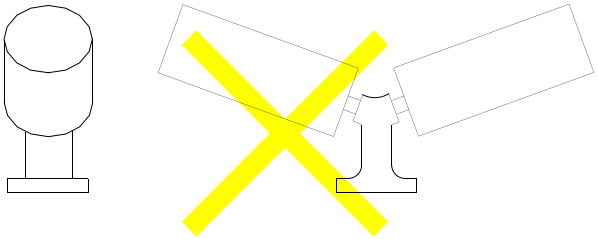
There is quite a variety of idlers available on the market today. The types permitted for use with a belt scale are more limited. Due to the fact that idler alignment in and around the scale area is such a critical requirement, it is of great importance that the proper idlers be used.



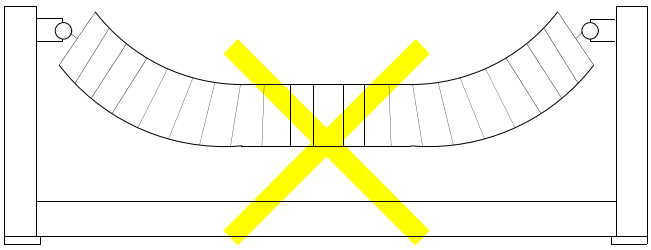
offset conveyor idler
(acceptable in some applications)



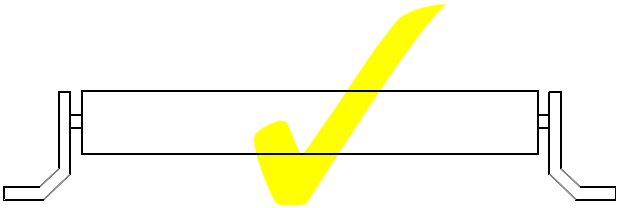
wire rope idler

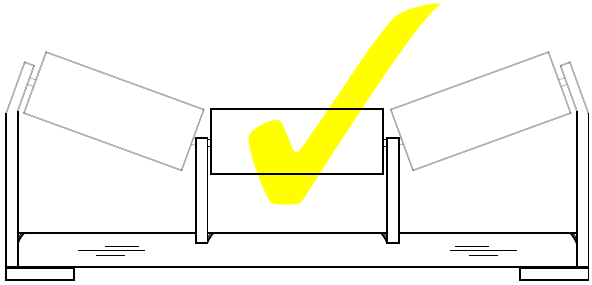


V - Roll (2 Roll) conveyor idler



catenary idler





RECOMMENDATION

a. Do not use wire rope type, 2 roll "V" type, or catenary type idlers on or near scale. Offset type may be acceptable in some installations. Consult the factory on the use of the same. The only truly acceptable types are the troughed 3 roll in-line type or single roll flat type idlers.

b. The most common troughed idlers are 20° and 35°, however 45° troughed idlers may be used but experience has shown that accuracy does suffer. The deeper trough angle tends to magnify the effect that belt tension and belt stiffness have upon the scale. The need for good idler alignment becomes even more critical.

c. Select idlers that are dimensionally the same, have rolls that are concentric within 0.5 mm (.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).

d. 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

This phrase has been mentioned frequently throughout the belt scale industry and in this manual. Its importance cannot be overstated. The proper and accurate alignment of idlers throughout the scale area is the one critical conveyor related element that can make a belt scale function accurately or not. Though the procedure involved to accomplish proper alignment can at a time be cumbersome, the end results will justify the time taken. Refers to PL-319 MSI manual Installation Procedure.

RECOMMENDATION

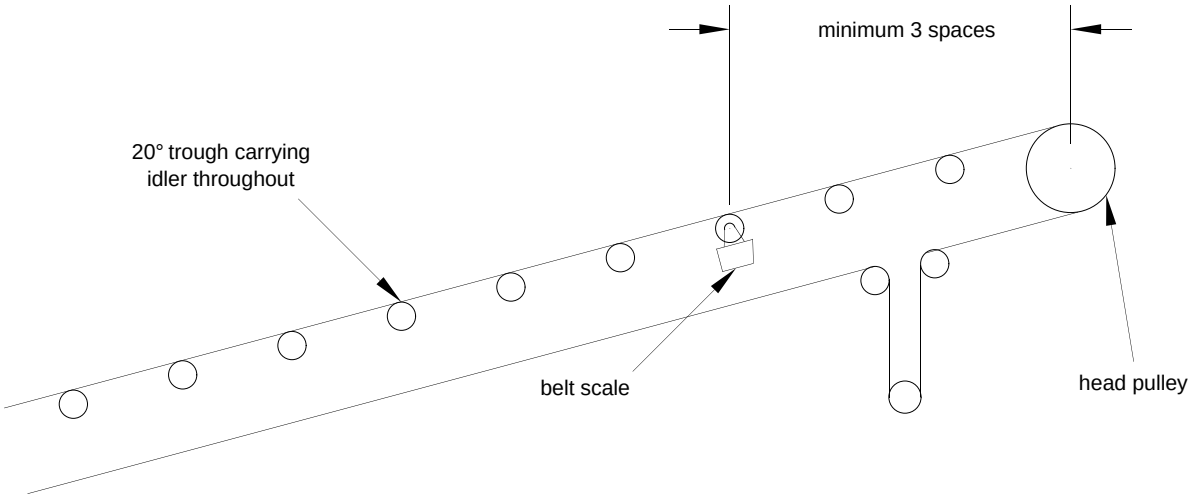
Do not pass over this requirement lightly no matter what the reason. It only involves the scale idlers and at least two but preferably three idlers on each side of the scale.

HEAD PULLEY

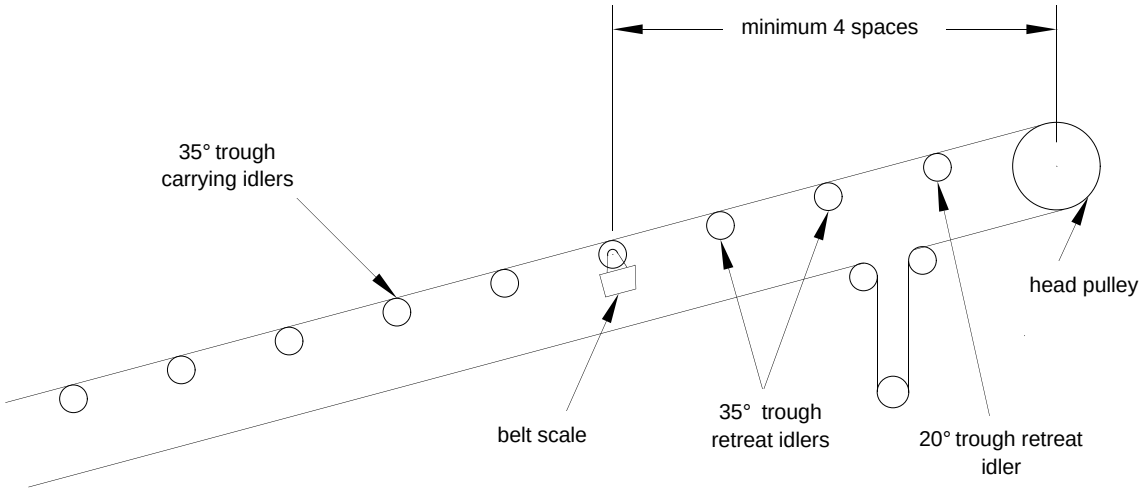
When installing a scale in a short conveyor or when there is virtually no other place to locate the scale except in the area near the head pulley, it is advisable to apply some caution. Since head pulleys are essentially flat faced with a slight crown and the idlers being troughed, a situation is created whereby the belt profile must change from the 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 he belt edges and the idlers adjacent to the head pulley and, ultimately, these undesired forces are applied to the scale.

RECOMMENDATION

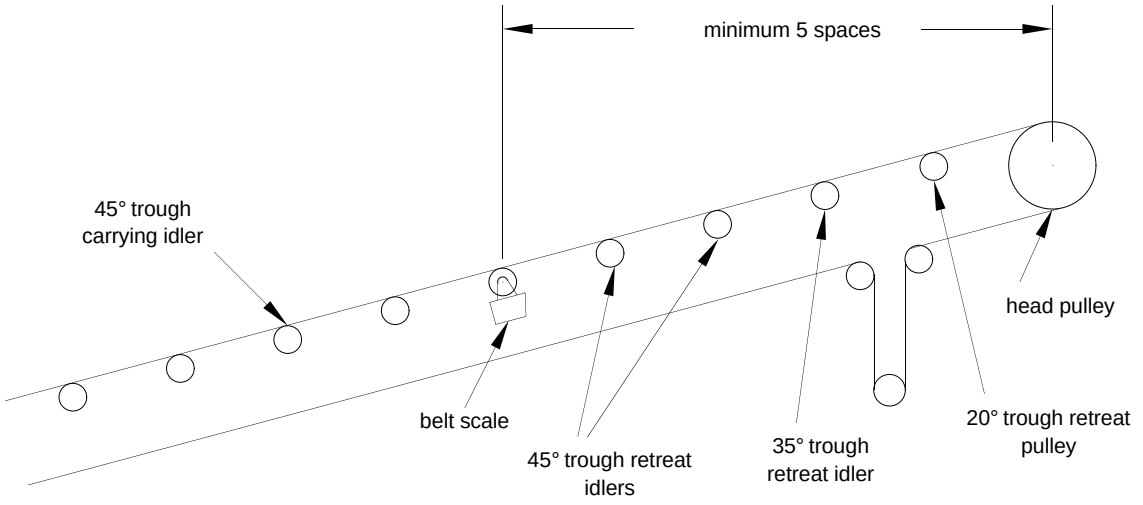
a. On conveyors with 20° trough idlers throughout, a minimum of two fixed 20° idlers must be located between the scale idlers and the head pulley.



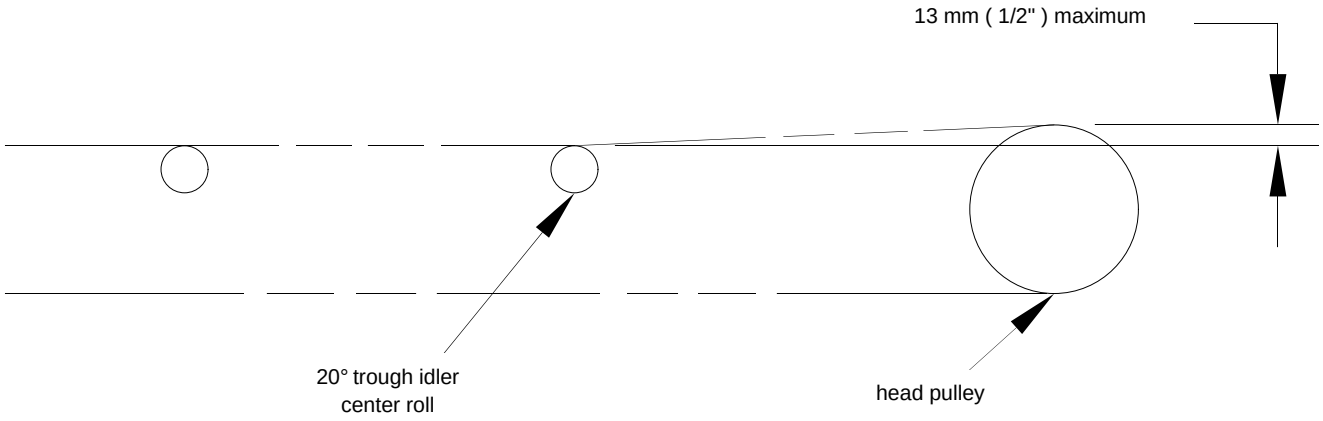
b. On conveyor with 35° trough idlers throughout, a minimum of two 35° and one 20° retreat idlers must be located between the scale and the head pulley.



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. It is suggested that:



When locating a scale close to the head pulley maintain a maximum of 13 mm (1/2") vertical displacement between the top of the head pulley and the top of the center roll of the adjacent roll.

1. 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

2. 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. There is one condition where a problem could exist and that comes about if the tail pulley is the self-cleaning type with slats or beater paddles, often called wing pulley. The thumping, beating or slapping action of this pulley may develop sufficient oscillations which under certain circumstances 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 1.6 mm (1/16") or less with supports 2.4 m (8 ft) apart throughout the range of conveyor loading. Stringers should also be straight without twist so that the belt has a better chance of tracking 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 insure 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 particularly) it is necessary that additional shielding be installed. Depending upon the geographical area, more or less may be required, but typical dimension 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:

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

Secondly, insure 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:

- insure the idlers are square to the conveyor and located centrally on the frame
- insure 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

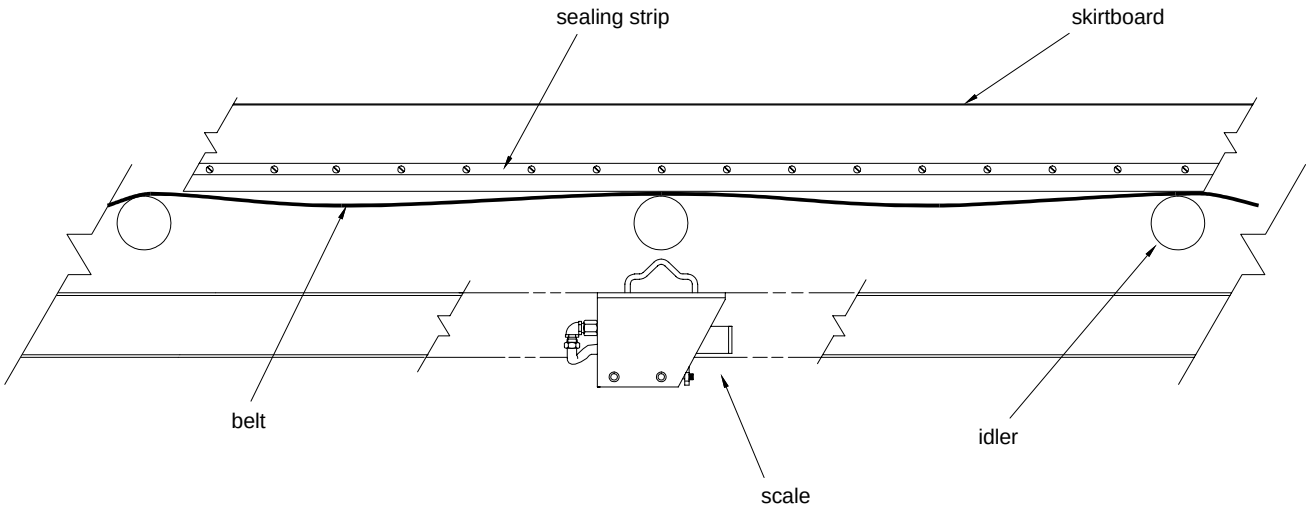
The conveyor belt is one of the most expensive items on the conveyor and can wear prematurely or be damaged if proper consideration is not given.

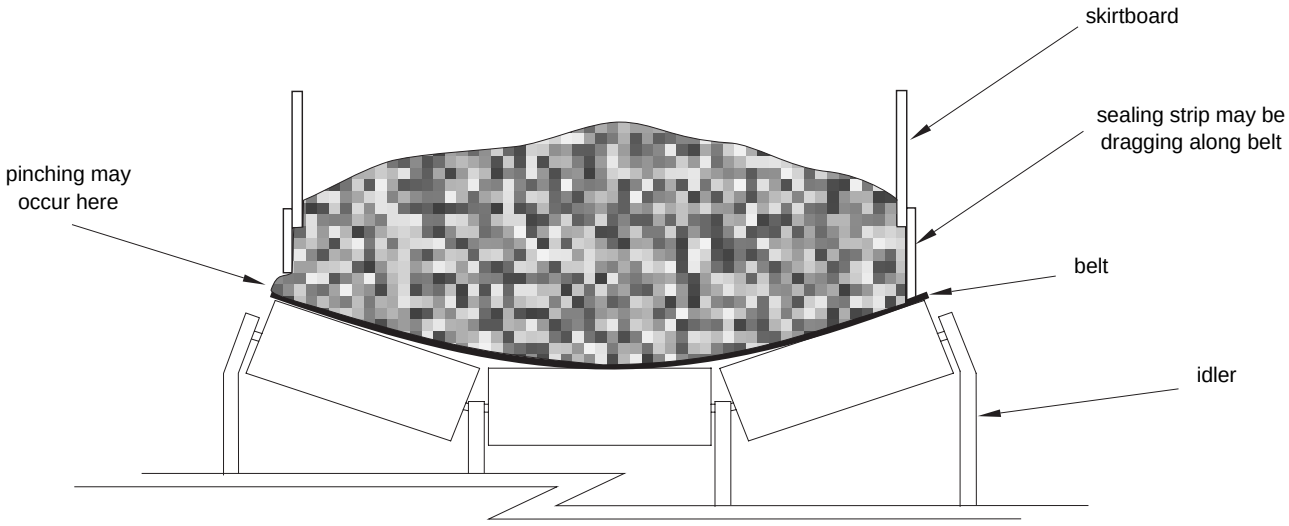
RECOMMENDATION

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

SKIRTBOARDS AND SEALING STRIPS

In some applications it is necessary to extend the infeed skirtboards and sealing strips the full length of the conveyor. This can create problems in weighing accuracy to the effects that the sealing strips exert when contacting the belt and indirectly upon the idlers, especially where pinching occurs. Attempts to obtain a good zero balance 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 an 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 should be equally important to take good care of the scale and the surrounding area. Therefore, periodic conveyor maintenance is important to proper scale operation which include:

» lubrication of all pulleys and idlers

» proper belt tracking and training

» proper belt cleaning and scraping

» proper belt take-up operation

» proper material and spillage control

Maintenance Precautions:

» when are welding near the scale, do not allow current to pass through the belt scale

» reset 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. Keep in mind that it is possible that those changes could have a profound effect upon the operation and resulting accuracy of the belt scale.

RECOMMENDATIONS

Consult Milltronics for advice regarding belt scale installation.

MATERIAL BUILDUP

Some materials stick quite readily to the belt and conveyor equipment. To rectify this common problem, belt scrapers, rotary brushes, vibrating cleaners, shakers, ploughs 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 balance of the scale.

RECOMMENDATION

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

MILLTRONICS

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