Belt Scale

In-Motion Belt Scale System

Maintenance & Troubleshooting Manual

RICE LAKE®
WEIGHING SYSTEMS

February 28, 2023

PN 130194 Rev A

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www.ricelake.com

Revision History

This section tracks and describes the manual revisions for awareness of major updates.

Revision	Date	Description
A	February 28, 2023	Revision history established; added idler alignment instructions

Table i. Revision Letter History

Contents

1.0 Introduction

Belt conveyor scales are an important part of most bulk material handling facilities. Lack of maintenance can potentially cause a significant reduction in the accuracy of the belt scale instruments.

Most conveyor belts are capable of providing accurate and reliable readings within ±1/2% of their full-scale rating. Regardless of the accuracy capability of the design, it is unlikely that these devices will perform optimally if maintenance procedures are not followed.

Establishment of a routine inspection procedure of the entire material handling system will result in better control of the accuracy that the scale is able to provide. It's important to remember that as the entire conveyor belt is installed it becomes part of the larger "weighing system" and any changes that occur or are performed to this conveyor can affect the performance of the scale.

The information in this manual describes in-motion belt scale maintenance and troubleshooting.

Manuals and additional resources are available from Rice Lake Weighing Systems at www.ricelake.com/manuals

Warranty information is available at www.ricelake.com/warranties

Safety Definitions:

DANGER: Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. Includes hazards that are exposed when guards are removed.

WARNING: Indicates a potentially hazardous situation that, if not avoided, could result in serious injury or death. Includes hazards that are exposed when guards are removed.

CAUTION: Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury.

IMPORTANT: Indicates information about procedures that, if not observed, could result in damage to equipment or corruption to and loss of data.

General Safety

Do not operate or work on this equipment unless this manual has been read and all instructions are understood. Failure to follow the instructions or heed the warnings could result in injury or death. Contact any Rice Lake Weighing Systems dealer for replacement manuals.

WARNING

Failure to heed could result in serious injury or death.

DO NOT perform maintenance on this scale until electrical, air, hydraulic and gravity energy sources have been locked out or blocked.

DO NOT operate, service, inspect or otherwise handle this scale and parts until all operators have read this manual.

Allow only authorized personnel and trained personnel to maintain this equipment.

Ensure everyone is clear of the scale before applying power.

Keep hands, feet and clothing away from moving parts.

Loose or floppy clothing should not be worn by the operator.

2.0 Maintenance Checkpoints

The scale should be checked frequently to determine when calibration is required. Check zero calibration every other day and calibration every week for several months after installation. Observe the results and lengthen the period between calibration checks, depending upon the accuracy desired.

Establish a routine inspection procedure including the belt conveyor scale and entire material handling system. Note changes in the scale function and report them to the individual or department responsible for the scales' performance.

2.1 Housekeeping Tips

The following maintenance issues need attention to maintain the mechanical fitness of the belt scale:

2.1.1 Cleaning

Keep the scale area clean of rocks, dust and material build-up.

2.1.2 Lubrication

The weigh idlers should be greased one to two times yearly. Overloading the weigh idlers with grease can change the tare weight and place the scale out of calibration. A zero calibration is necessary after greasing.

2.1.3 Idler Alignment

The alignment of the scale service idlers to close tolerance is the single most important step in the installation of a belt weighing system. In order to minimize the dynamic effects of the moving belt and to provide a straight belt path through the scale, the weigh area idlers must be aligned to close tolerance.

2.1.4 Belt Training

The belt must be trained to run true to the center line of the idlers in the area of the scale while running empty, as well as under loaded conditions. Where this cannot be accomplished due to off-center loading, the loading should be modified. Where a belt does not train while empty but does train while loaded, it will be necessary to train the belt over the scale area at least during the calibration checks.

Because of lateral forces and changes to belt tension produced within their area of influence will degrade scale accuracy, training idlers should not be located closer than 12 meters from any scale mounted idler.

2.1.5 Belt Tension

It is important that the conveyor conditions remain constant at all times. Therefore, gravity-type take-ups are recommended on all conveyors where belt scales are installed. Conveyors which do not have a constant tension device will require calibration whenever the belt tension changes and the take-up is readjusted.

A gravity take-up weight that is fully supported by accumulated spillage can no longer be effective at maintaining the correct tension of the conveyor belting. The take-up carriage should move freely in its guides when the belt is operating.

2.1.6 Belt Loading

Extreme loading conditions which cause flow rate of material to be above 125% of the instrument range must be avoided. Any load capacity above this amount can't be measured. Belt loading should be adjusted to stay within the instrument range. On the other hand, very low flow rates, with respect to full scale range, can produce low accuracy.

2.1.7 Material Sticking to the Belt

Material can form a film on the belt which is carried continually around the belt and is never discharged. This condition is often true when handling wet, fine material. Belt scrapers may correct this condition. If the film can't be removed, the zero will have to be adjusted. Any change in the build-up of the film adhering to the belt will require further adjustment.

2.1.8 Skirtboards and Covers

Skirtboards should not be placed closer to the weigh idlers than the +3 or -3 idler. If skirts or covers are necessary in the weighing area, they must not place any external forces on the scale. Even though the skirts are clear of the belt under "no load" conditions, material will jam or slide between the boards and the belt when the conveyor is operating. Errors of several percent can be expected where such conditions exist.

Belt Scale Maintenance Checklist						
Item	**Daily**	**Weekly**	**Monthly**	**Quarterly**	**Annually**	**Description**
Scale area - debris	x					Clean scale area. Determine cause of debris and take steps to remedy.
Zero calibration						Perform zero calibration procedure. If change is greater than 0.25%, identify cause and correct. Record results.
Condition of idler rolls		X				Inspect idlers for wear and damage. Replace rolls and bearings as necessary.
Span calibration						Perform auto span simulated load tests. Check repeatabilty and record results.
Belt scraper						Adjust or replace blades if worn.
Belt condition						Visual inspections for cuts, tears or worn edges.
Belt take-up			X			Inspect for free travel (bearings, belts, etc).
Speed pulley						Inspect for wear, material build-up and belt wrap. Check bearings also.
Speed sensor coupling						Inspect for tightness, wobble and corrosion.
Load cell offset				X		No load output must be within 1% of rated maximum.
Load cell balance						Multiple load cell scales must be balanced to within 1 mV.
Static weight condition						Check for corrosion, location and clearances.
Resolution time						Verify time for 1 belt revolution at maximum speed.
Zero reference number						Compare zero number with reference an maximum change is 2%/year.
Audit trail						Review scale history.
Line voltage						Measure hot and neutral. Hot to ground, neutral to ground and correct as needed.
Alignment					X	Complete per manual.
Excitation						Verify value and stability.
Belt length						Measure and verify. Perform acquire test duration if changes noted.
Check rods						Inspect check rods. Rods must be straight, spherical washers without corrosion.
I/O						Check and verify performance of all I/O being used.
Dead band						Confirm settings and adjust if necessary.
Auto zero track limit						Record data.
Auto zero track correction						Record data.
Passwords						Confirm and revise if required.
Wire terminations						Inspect for tightness and corrosion.
Cable integrity						Visual and ohm check (corrosion, moisture, deterioration).
Spherical washers						Inspect for corrosion, pitting, etc. Replace if necessary.
Material factors						Verify with weighed load test.

Table 2-1. Maintenance Checklist

2.2 Idler Alignment

Use the following string test to align the idlers:

IMPORTANT: Include at least three idlers before and after the belt scale in this alignment procedure zone. Ensure scale and each idler are square with the ramp. Ensure that the belt scale and idlers are equidistant from each other.

1. Secure the end of one string to the conveyor structure under the idler at one end of the alignment zone.
2. Run the string along the center of one row of idler cans.
3. Secure the loose end of the string to the conveyor structure under the idler at the other end of the alignment zone.
4. Repeat this process on each row of idler cans.

IMPORTANT: String should be a taught line from one end of the alignment zone to the other. The string should touch each of the cans without gaps or deflection (see Figure 2-2). If there are gaps or deflection, adjust the idlers to align as in Figure 2-1. The difference in height between idlers cannot be greater that 1/16 inch.

5. Adjust the height of the idlers by placing shims under the mounting feet as needed to align with the plane of the string without gaps or deflection.

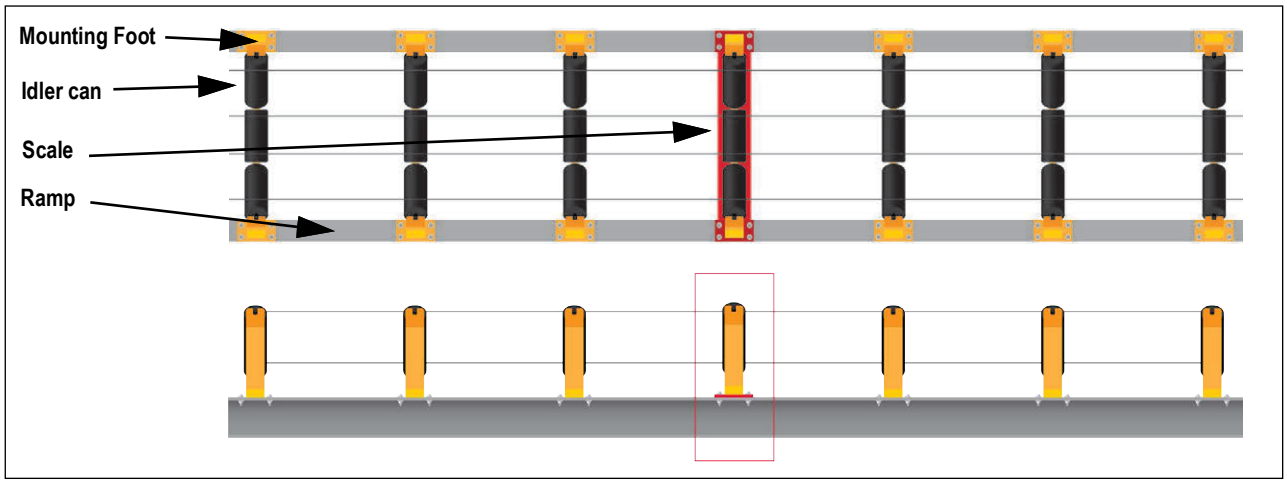

Figure 2-1. Aligned Idlers (top and side views)

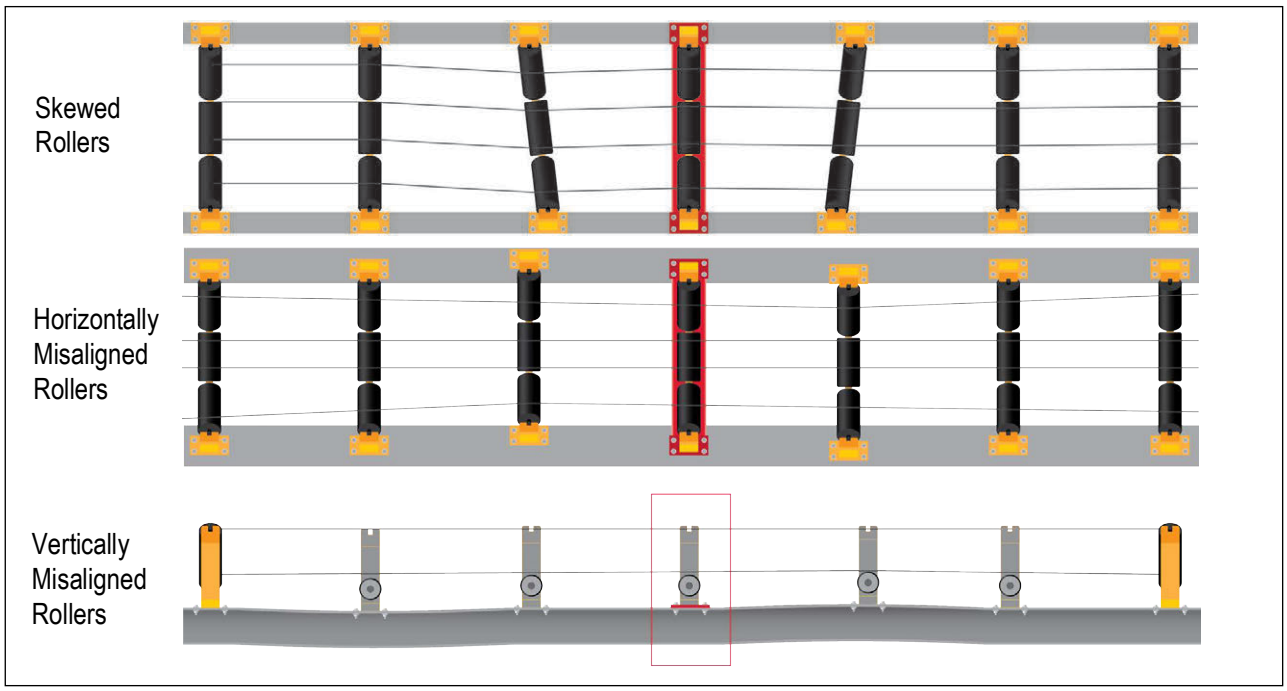

Figure 2-2. Misaligned Idlers (top and side views)

3.0 Scale Calibration Maintenance

It is generally advised, throughout the belt scale industry, that calibration checks be made frequently during the weeks after initial installation, then to increase the time frame between calibrations as statistical results are obtained. Calibrating too often can cost production time. Defining a calibration schedule is a balance of maintaining the accuracy required and minimizing the cost associated with calibrating the scale.

There are several considerations when determining the proper calibration interval for a conveyor belt scale such as:

- The condition of the conveyor
- The expected accuracy
- Seasonal temperature changes
- Conveyor maintenance

The condition of the conveyor and the accuracy required should be used to set the calibration interval, but wide temperature swings and conveyor maintenance are events that should be considered to determine when additional calibration is needed.

3.1 Conveyor Preparations

The condition of the conveyor is the primary consideration when determining the belt scale calibration interval, considering the calibration for the current model belt scales (that are properly installed), is mainly to adjust for changes in the conveyor. Starting with a fairly short interval is a good idea since it is impossible to quantify the condition of the conveyor or predict how much error there will be based on a specific conveyor problem. It is suggested to start once every week or two in the beginning of an installation.

During the belt scale calibration, most integrators will provide a deviation (the error between the previous calibration and the current calibration); this number is the most useful tool in determining the proper calibration period for that scale. If, after several calibration intervals, the deviations are less than the desired accuracy, the calibration interval can be increased. If the deviations are higher than the desired accuracy, calibrate more frequently.

3.2 Weather Issues

Wide temperature changes can cause a belt to be longer or shorter. Of course, changes in length will affect the tension of the belt as well as alter the accuracy. Using a gravity tensioning device on conveyors longer than 100 feet and setting the belt tension as loose as possible, without allowing the belt to slip, will minimize the effects of temperature changes. Even when taking these precautions, it is still a good idea to include at least two calibrations per session.

3.3 Conveyor Maintenance

There are many things that can occur on the conveyor and affect the scale's accuracy causing a shift in the zero calibration such as:

- Adjusting the tracking or gravity take up
- Replacing or even lubricating the idler
- Changing the belt speed

it's a good idea to always calibrate the scale after any maintenance is done to the conveyor. Set up a system to flag conveyor maintenance when regular maintenance is being performed.

4.0 Belt Scale Troubleshooting Tips

The following section covers basic troubleshooting tips for the belt scale. If the in-motion belt scale fails to operate properly during or after performing set up and calibration, it's suggested to perform the procedure again, and if the problem still persists, follow the troubleshooting procedures listed in the following sections.

4.1 Calibration Shifts

Frequent calibration shifts should be isolated to zero shifts or span shifts.

4.2 Zero Calibration Shifts

Zero shifts are normally associated with the conveying system. When a zero shift occurs, the span will shift by a like number of TPH, this then appears as a span shift.

Common causes of zero shifts:

- Material buildup on the carriage/weighbridge assembly
- Rocks lodged in the carriage/weighbridge
- Conveyor belt tracking
- Non-uniform conveyor training
- Conveyor belt belting stretch due to material temperature variations
- Trouble in the electronic measuring components
- Severely overloaded load cell

4.3 Span Calibration Shifts

Span shifts are normally associated with the electronic measuring of components of the system, with one exception, which is conveyor belt tension. A span shift is present if both points change by the same percentage TPH.

Common cause of span calibration shifts include:

- Change in conveyor belting tension
- Speed sensor roll build-up and/or slipping
- Conveyor scale alignment
- Severely overloaded load cell
- Trouble in electronic measuring components

4.4 Field Wiring

If a wiring problem is suspected, use the following points to double check the electrical portion of the scale.

- Check for proper interconnections between the components of the system. All the wiring must be as specified on the installation drawings.
- Check all wiring and connections for continuity, shorts, and grounds using an ohmmeter.
- Loose connections, poor solder joints, shorted or broken wires and unspecified grounds in wiring will cause erratic readings and shifts in weight readings.
- Check that the grounding of all cable shields is made at only the locations as specified in the installation drawings.

5.0 Integrator Troubleshooting Tips

The following table lists general troubleshooting tips for various hardware and software error conditions regarding the in-motion belt scale.

Symptom	Remedy
Integrator does not power up	Possible blown fuse or bad power supply. Check fuses and replace if necessary. If fuses are good, check all voltages on CPU board. Power supply should output both +6V and –6V levels to the CPU board. If power supply appears bad, check the small glass fuse (2.5A, 5x20mm) on the power supply board.
Front panel power integrator blinking ( )	Power supply overloaded. Check for shorts in A/D card regulators or in the DC-to-DC converter of any installed analog output or pulse input cards.
"Blue screen"	Check LCD contrast pot (under interface board access cover; possible corrupt core software; reset or reload software).
Tare storage is corrupt error messages at startup	Possible dead battery. Perform configuration reset then check for low battery warning on display. If battery is low, replace battery, perform another configuration reset, then reload files.
Divide by zero error message at startup	User program error.
Dashes in weight display	Overrange or underrange scale condition. Check scale. For out-of-range conditions in total scale display, check all scale inputs for positive weight values.
Display reads ***0.000000***	Scale not updating. Check for bad option card hanging the bus.
Cannot enter setup mode	Possible bad switch. Test switch; replace interface board if necessary.
Serial port not responding	Possible configuration error. For command input, ensure port INPUT parameter is set to CMD.
A/D scale out of range	Check source scale for proper mechanical operation. Check load cell and cable connection. Possible bad load cell: check integrator operation with load cell simulator.
Locked — Scale in use	Scale is assigned as an input to a total scale or is the source for a serial scale, analog output or setpoint. If not correct, deconfigure this scale assignment and reconfigure as required.
Option **x** Error	Field bus card (Profibus, DeviceNet or Remote I/O) in slot **x** failed to initialize.
Option card failure	Possible defective card or slot. Disconnect power, install card in different slot, then apply power again.

Table 5-1. Basic Troubleshooting for the In-Motion Belt Scale

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