Weigh Belts and Weigh Belt Feeders

What is a Weigh Belt and what is a Weigh Belt feeder?

- Weigh Belt: constant speed, varying load, wild flow of material; Integrator (instrument) totalizes output and provides rate measurement.

- Weigh Belt Feeder: controlled speed or load to meet a setpoint; Controller (instrument) provides totalized output, rate measurement and rate control. Can be used for proportional rate control (ratio system).

Weigh Belt Components

- Conveyor: Belt, Pulleys, Idlers, Frame
- Inlet
- Skirts
- Drive
- Weigh Bridge
- Scale
- Speed Sensor

Thayer “M”, “MD” and ‘MDL” Weigh Belt Unique Design Features

- “FMSS” mass counterbalanced scale weighs net load and tares entire “dead load”.
- Load Cell utilization typically between 90-100%.
- Slack belt design lowers belt tension and insures good belt tracking.
- Speed sensor mounted on idling pulley senses actual belt speed, slippage and breakage.
- Scale located outside material handling area eliminates tare build-up and damage.

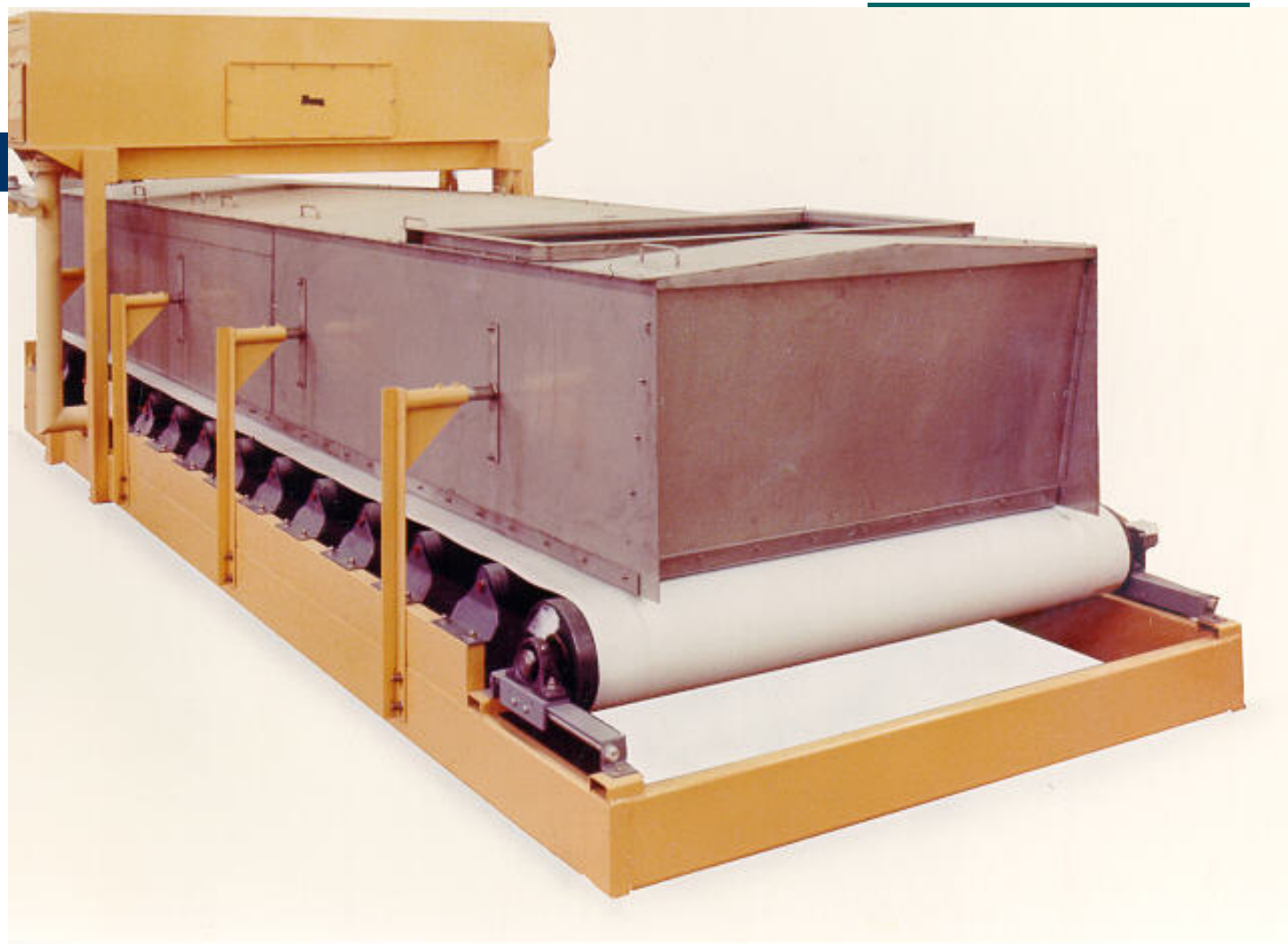
Thayer “M”, “MD” and ‘MDL” Weigh Belt Unique Design Features Continued

- Easy to access for maintenance and cleaning.
- Able to be fitted with ATWL assembly.
- Idler alignment adjusted with jack bolts; simple and easy.
- Full length, adjustable skirts.
- Welded frame construction eliminates distortion with quick removable side panels.
- Simple and flexible to rerate and rerange for future capacity and material changes.

Thayer Model "M" Weigh Belt

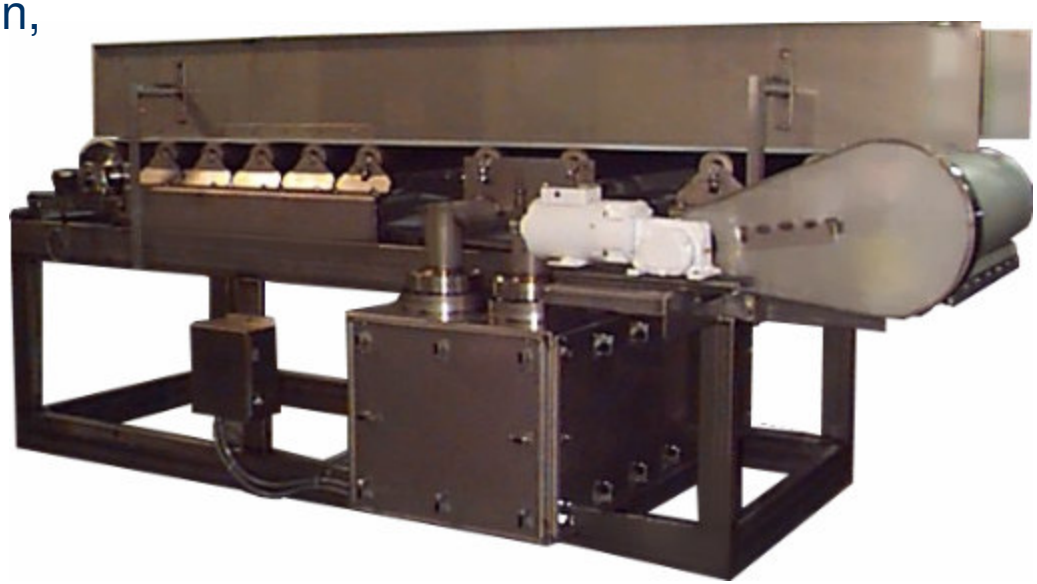
- The standard for high volume low density applications. Has no competition in the field of low density weighing !!!!
- Superior design includes flexure plate system (FMSS), slack belt, pulser location, scale location, ATWL, idler alignment using jacking bolts, welded frame, full length adjustable skirt boards, custom designs to fit customer's inlet to outlet configuration, and, rerate flexibility .

THAYER Model "M-66T" *Scale Over*

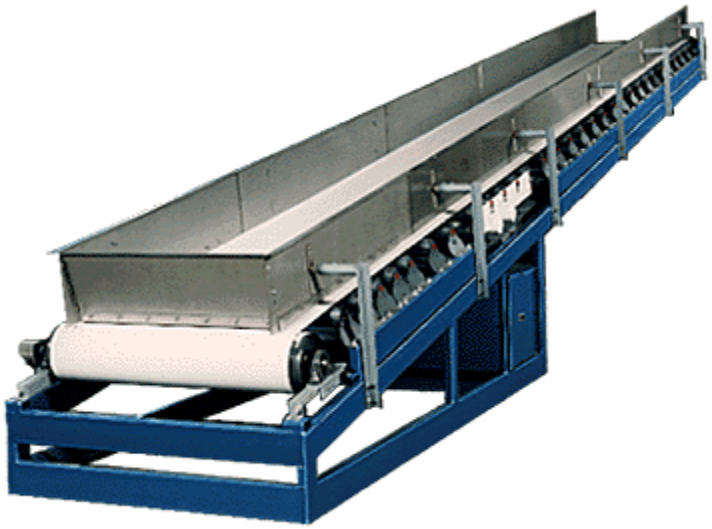


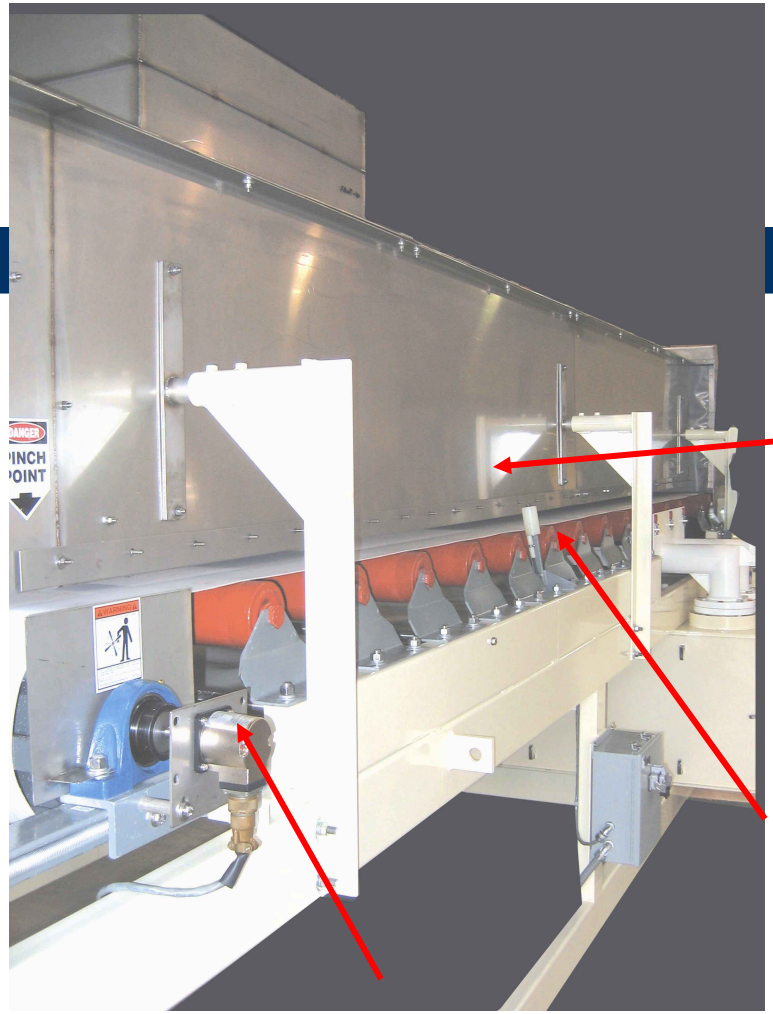
Low Density “M” Open construction,,
Scale under design

Low Density “M”, open construction,
scale under design, sanitary



Low Density “M”
Weigh Belts on Incline



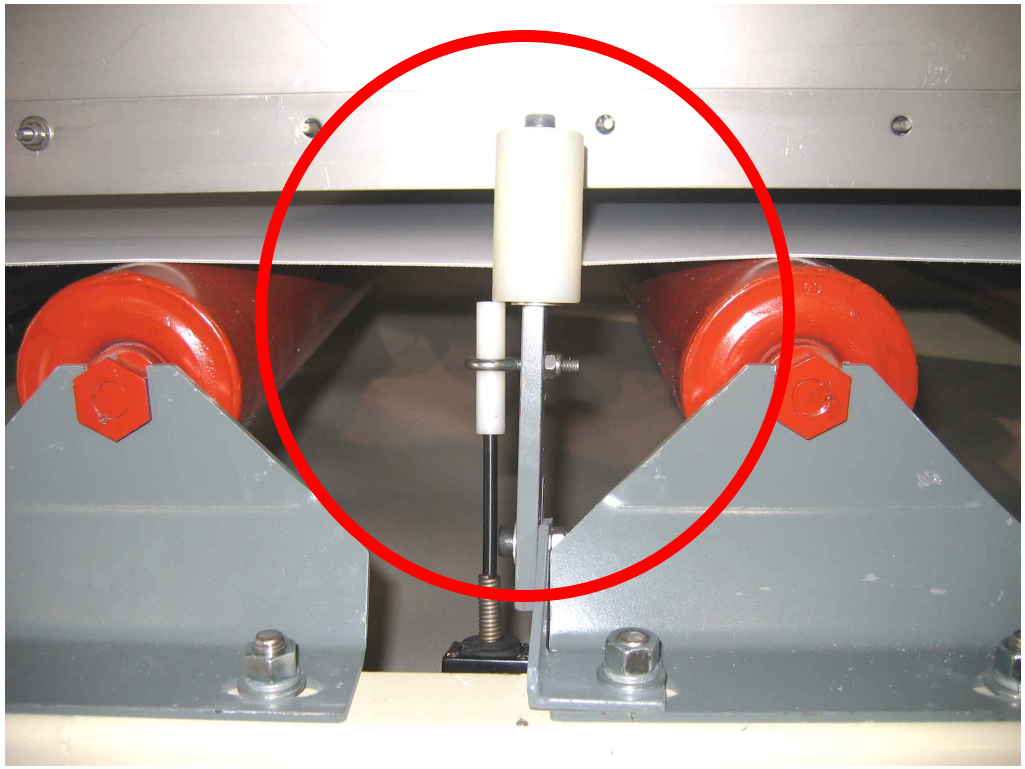


Removable Side Skirts

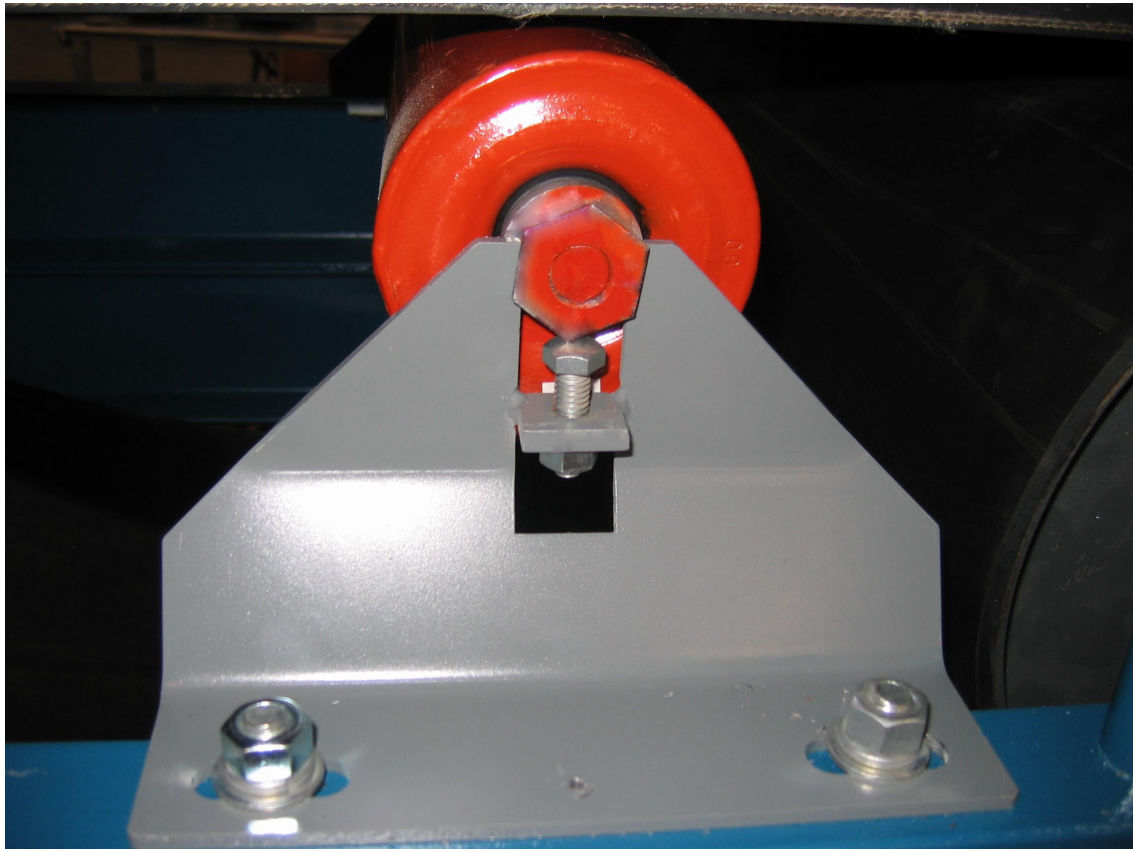
Individual CEMA idler support brackets

Digital speed sensor mounted to tail pulley

BELT MISTRACKING SWITCH



Individual CEMA idler support brackets

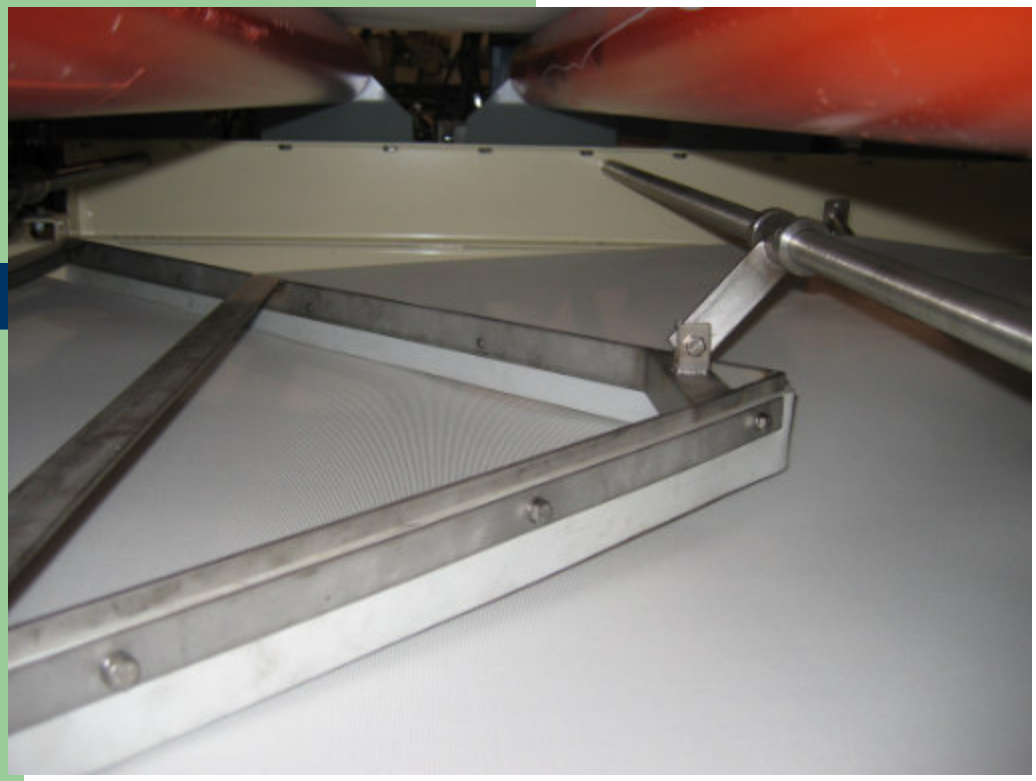


CEMA idler brackets mounted on either side of the weigh idler(s) are fully adjustable. This allows for perfect idler alignment for a higher degree of weigh belt accuracy.

Belt Tracker

Belt Tracking bar helps maintain straight belt tracking

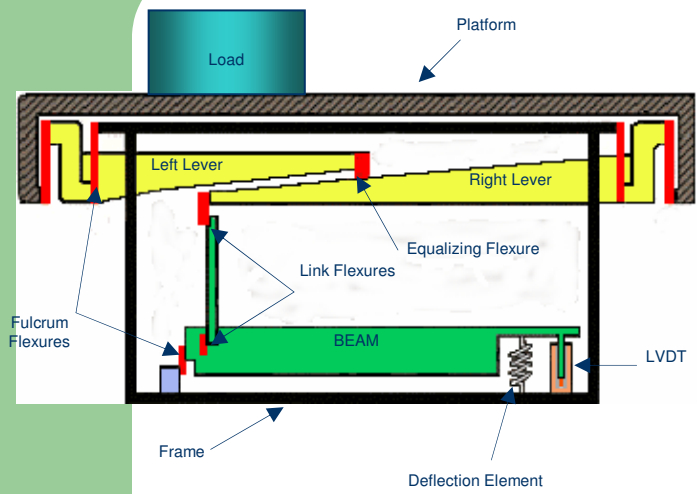
Return Side Belt “V” PLOW

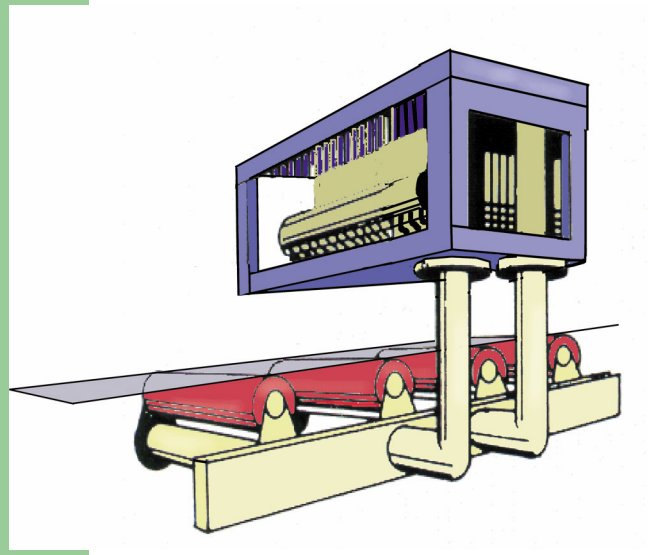


The lower strand of belting acts as a separate conveyor which moves material that falls onto it or is picked up by it, directly into the tail pulley. Unlike the top strand, the bottom strand conveys material on the side of the belt that contacts the surface of the driven pulley. When using a solid surface pulley which is incapable of self-scavenging, it is essential that the inside of the belting be physical “scraped” before it makes contact with the surface of the driving pulley.

Material finds its way onto the return strand in various ways. The five primary causes are spillage and dusting that accompanies refill, additional material edge spillage from the strand above, direct contact with “piles of material” that naturally ‘build up” over time on the bottom surface of the enclosure (directly behind the head pulley belt scraper and directly under the tail pulley itself), and on-going dust settlement within the feeder enclosure itself.

THAYER FMSS MODEL 18 MASS COUNTER BALACE FLEXURE SCALE





Flexure plate systems eliminate all wearing parts, such as bearings, pivots and knife edges, and is not susceptible to vibration. Flexure suspension system transfers to a single load transducer, which accurately measures load regardless of load position. Most platform scales are not designed to be immune to side loading and/or tortional loading caused by plant environment and by the movement of the feed screw, agitator, etc. These factors can cause poor accuracy and poor calibration stability. The THAYER flexure system cancels all horizontal force vectors and also tare loads to be completely mass counterbalanced, permitting load cell sizing based on net rather than gross weight.

The THAYER flexure suspension system with its linear variable displacement transducer utilizes a series of high tensile strength steel flexures coupled to summing levers to accurately focus force to a tension type load sensor. Force measurement is decoupled from load position and mass counterbalanced to accurately measure net material weight.

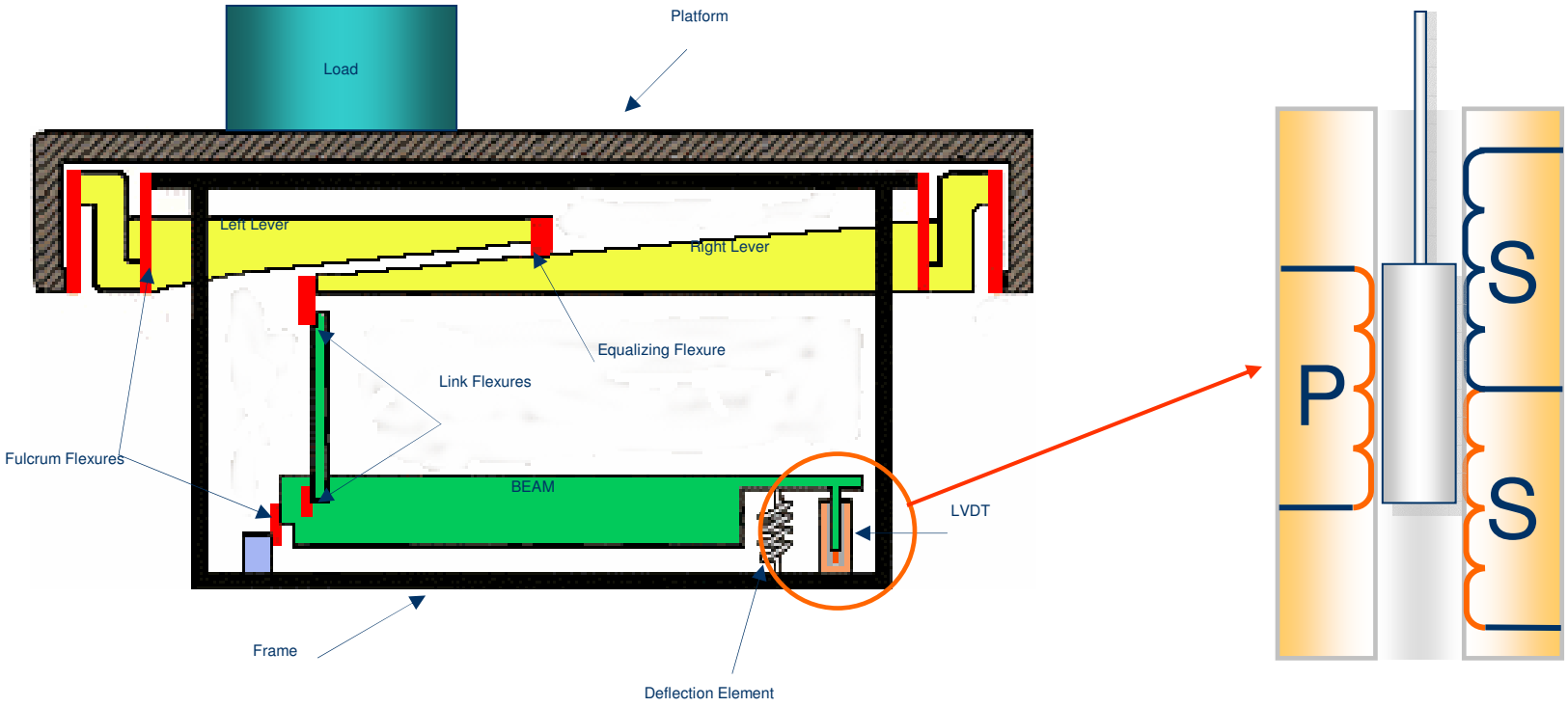
The most unique feature of a THAYER weigh feeder is a combination of a particular Thayer "Force Measurement Suspension System " (FMSS) and Thayer's LVDT load resolving measurement system.

A Force Measurement Suspension System (FMSS) is an arrangement of active mechanical elements (flexural supported levers) interposed between the load receptor (platform, hopper, belt) and the final weight resolver. Properly designed, the FMSS functions as a force vector filter that permits the sum of the chosen uni-directional force components to pass through the system to the weight resolver while blocking all other nuisance or destructive force vectors, including dead loads. The FMSS can be configured to provide outstanding benefits, depending on the particular needs dictated by the type of equipment employed and, how in, what environment it is to be used.

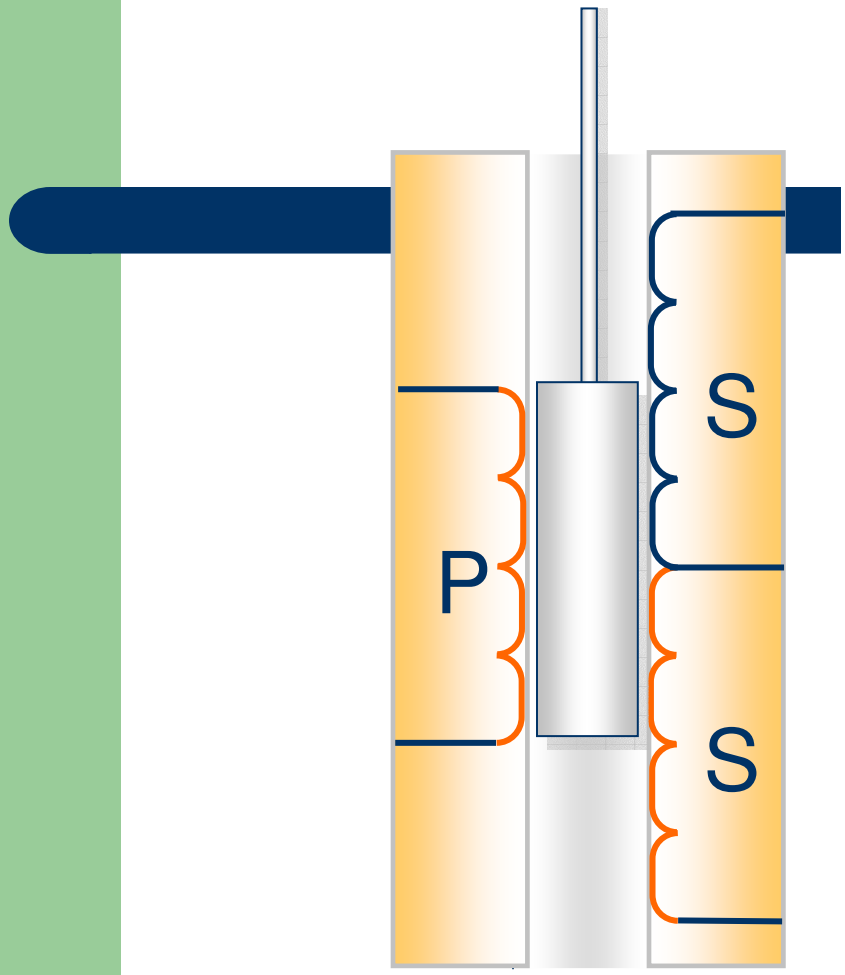
The FMSS might be configured as a mass counterbalanced constant sensitivity platform scale, a mass counterbalanced constant sensitivity hopper scale, a mass counterbalanced varying gradient sensitivity conveyor scale weighbridge, or a mass counterbalanced moment-resolving weighbridge.

An FMSS can operate with any type of load cell. However, in the majority of cases, Thayer Scale utilizes its proprietary designed LVDT load resolver which has proven to have no equal when it comes to the combination of "survivability", "measurement resolution" , "linearity", and "long term stability".

THAYER Model 18 Scale with LVDT LOAD CELL



LVDT LOAD CELL

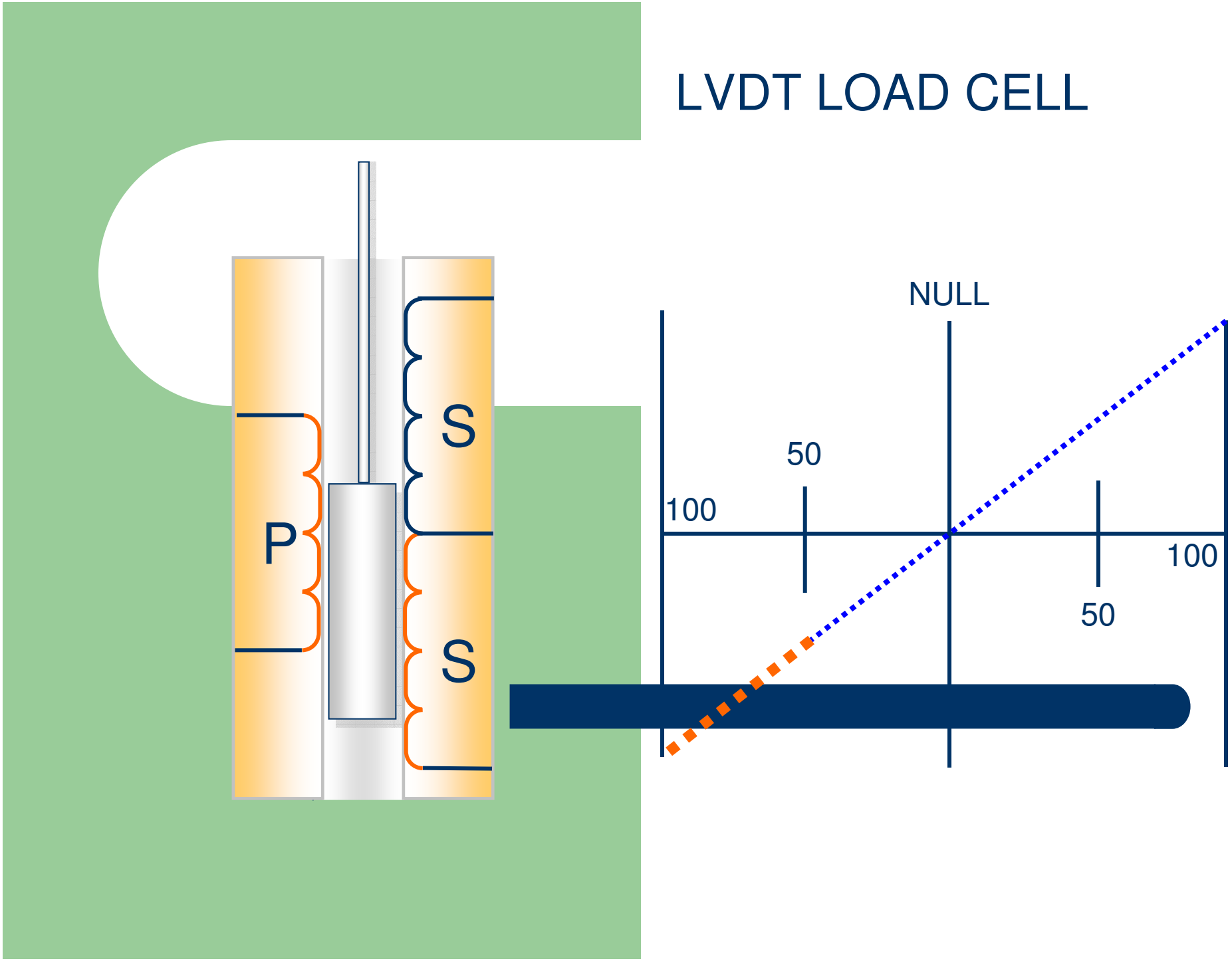


When an AC excitation signal is applied to the Primary Coil (P), voltages are induced in the two Secondary Coils (S). The MAGNETIC CORE inside the COIL WINDING ASSEMBLY provides the magnetic flux path linking the Primary and secondary Coils. Since the two voltages are of opposite polarity, the Secondary Coils are connected series opposing in the center, or Null Position. The output voltages are equal and opposite in polarity and, therefore, the output voltage is zero. The Null Position of an LVDT is extremely stable and repeatable. When the MAGNETIC CORE is displaced from the Null Position, an electromagnetic imbalance occurs. This imbalance generates a differential AC output voltage across the Secondary Coils which is linearly proportional to the direction and magnitude of the displacement.

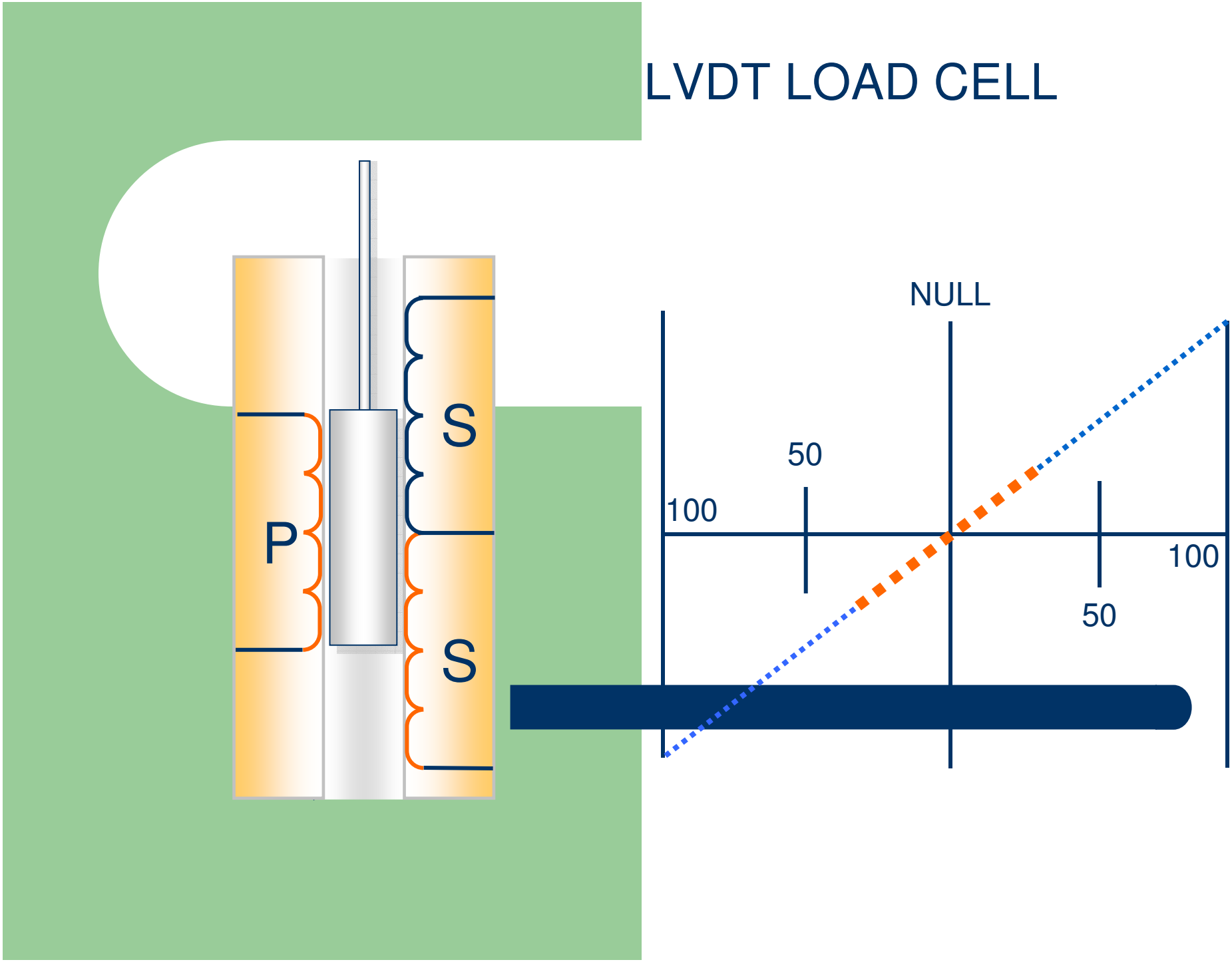
As shown in the figure, when the MAGNETIC CORE is moved from the Null Position, the induced voltage in the Secondary Coil, toward which the Core is moved, increases while the induced voltage in the opposite Secondary Coil decreases.

LVDTs possess the inherent ruggedness and durability of a transformer and truly provide infinite resolution in all types of environments. As a result of the superior reliability and accuracy of LVDTs, they are the ideal choice for linear motion control.

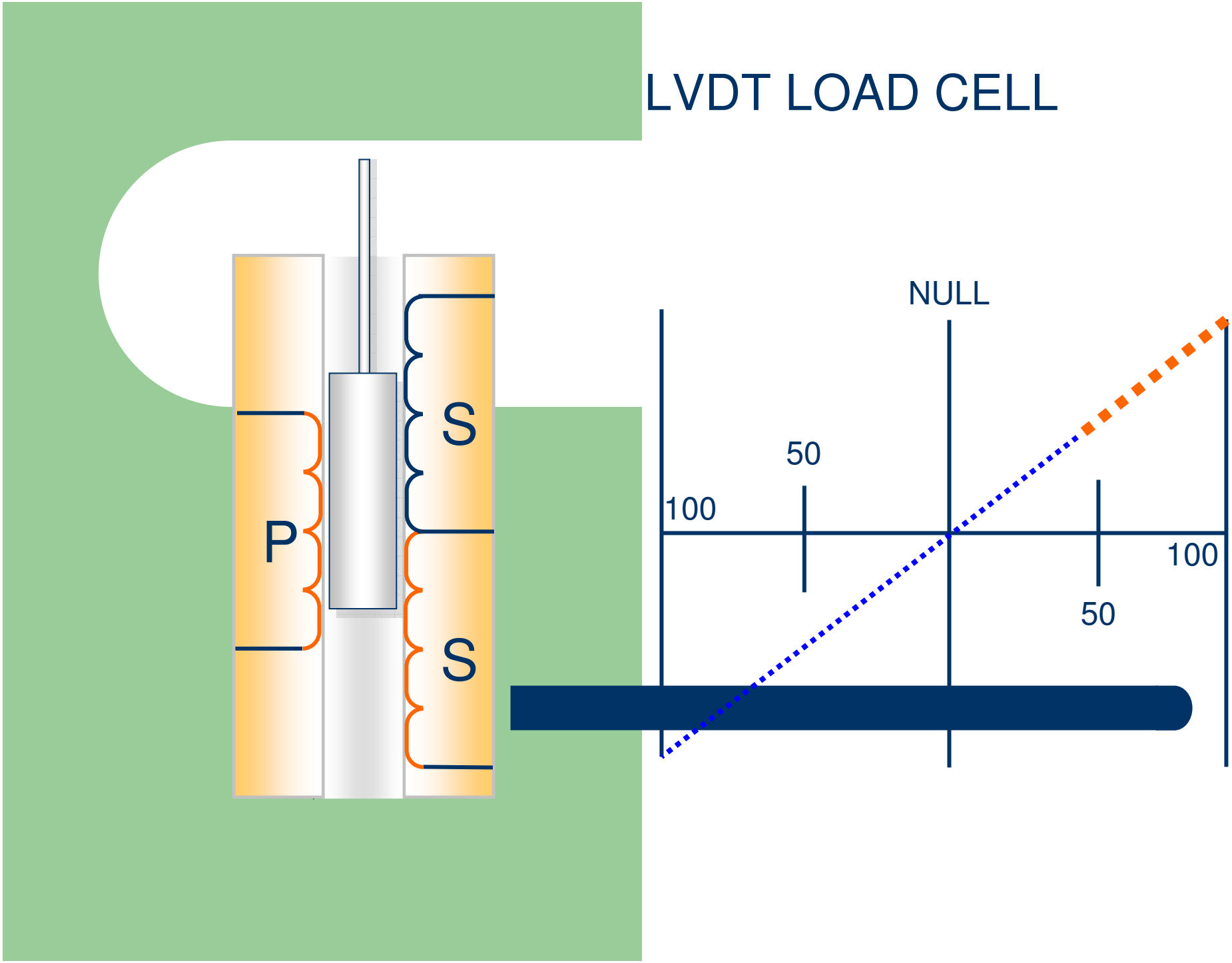
LVDT LOAD CELL

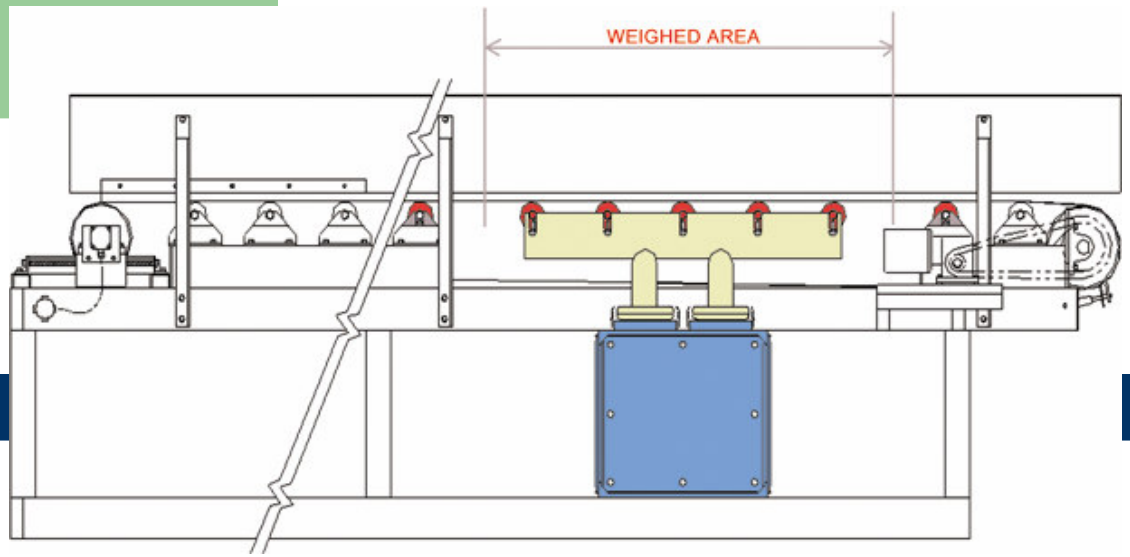


LVDT LOAD CELL

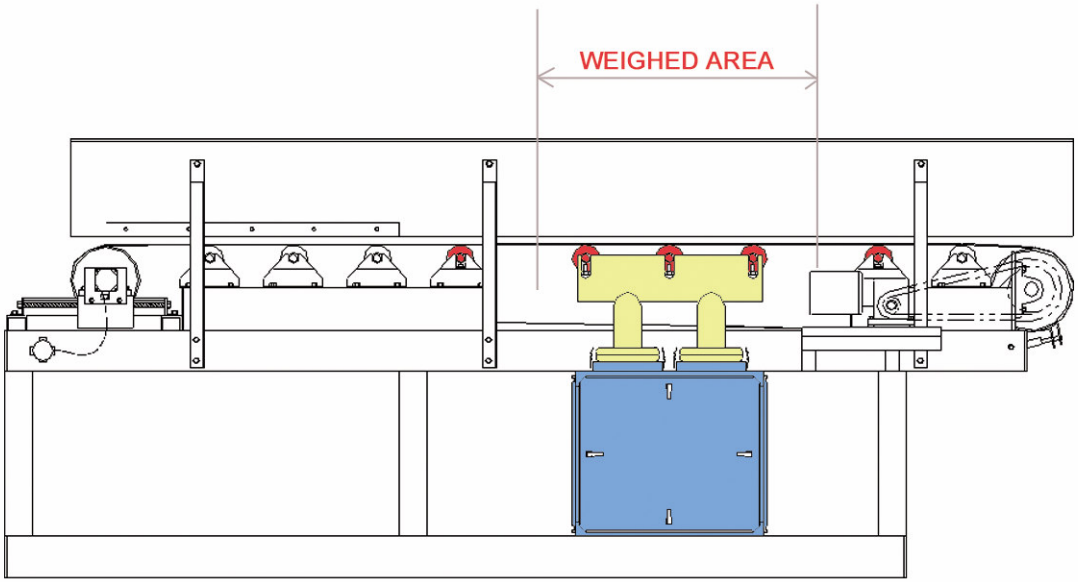


LVDT LOAD CELL



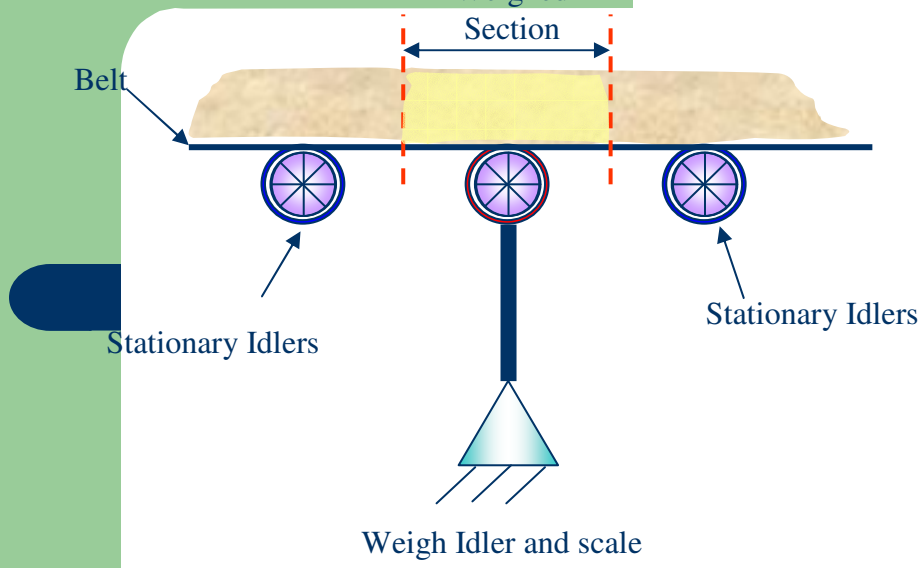


5 Idler Weigh Bridge, Low Density “M”

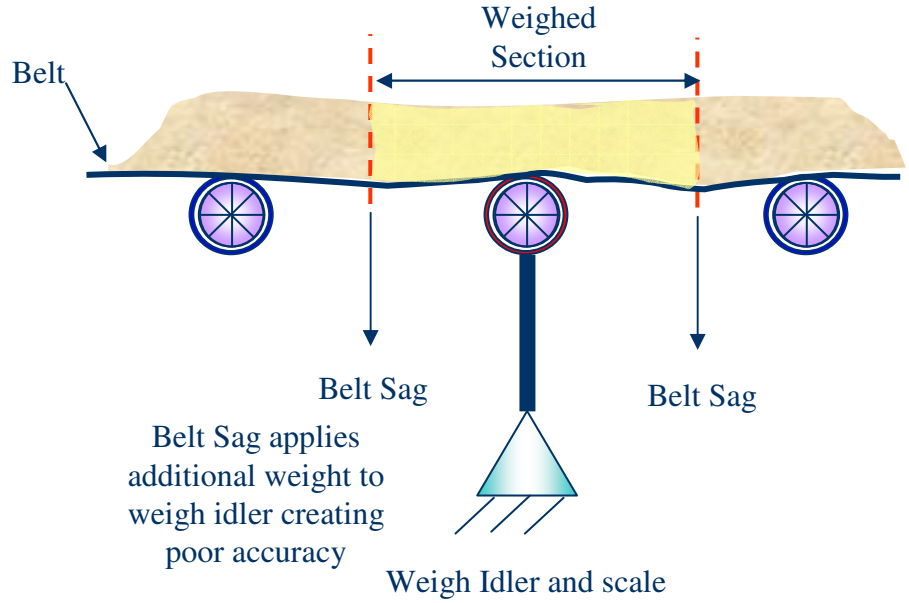


3 Idler Weigh Bridge, Low Density “M”

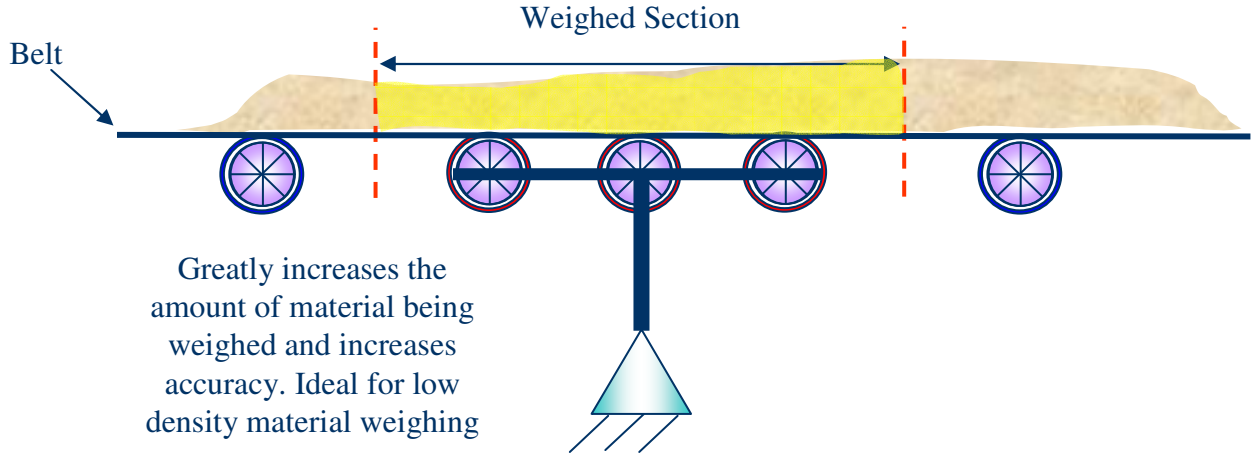
Single Idler Weigh Bridge w/ 12” on center idlers



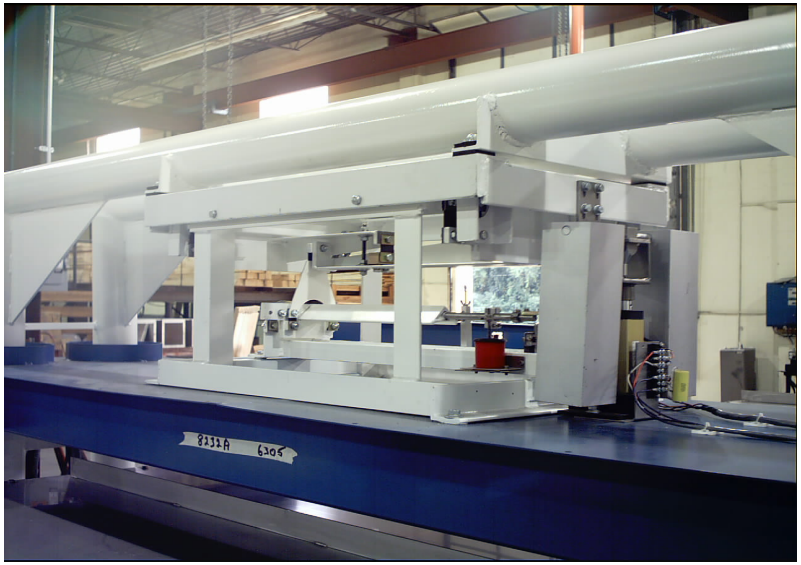
Single Idler Weigh Bridge w/ increase distance between idlers



Multiple Idler Weigh Bridge



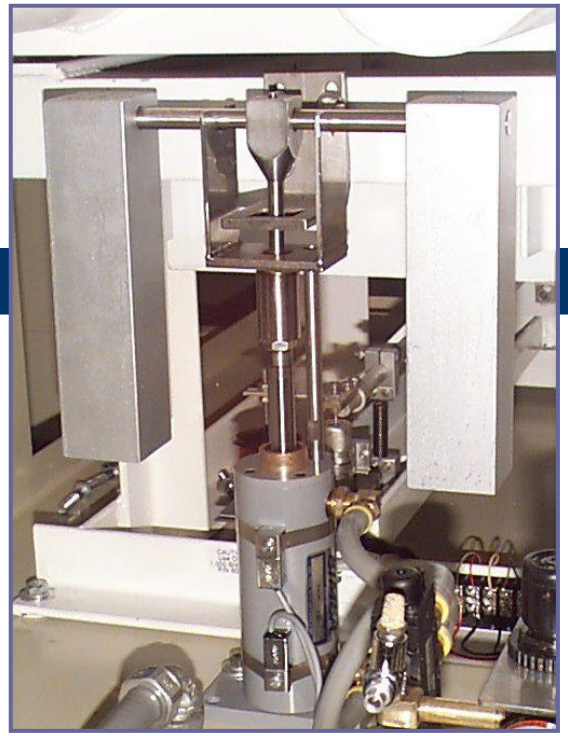
Thayer Model M-72T “FMSS” Model-18 Scale w/Automatic Test Weight Lifter



ATWL AUTOMATIC TEST WEIGHT LIFTER

Test Weight

The test weight is precision machined to provide scale loading in a specific lbs/ft value.



ATWL Benefits:

- Minimal downtime for calibration checks.
- When automatic calibration check is carried out via a remote computer or PC, human intervention is not required. Eliminates operator error and institutionalizes calibration checks at regular time intervals for compliance with QA programs.
- Eliminates risk of operator injury from lifting and placing test weights.
- Mechanically exercises scale.
- Actually verifies load cell operation, unlike an electronic shunt calibration.

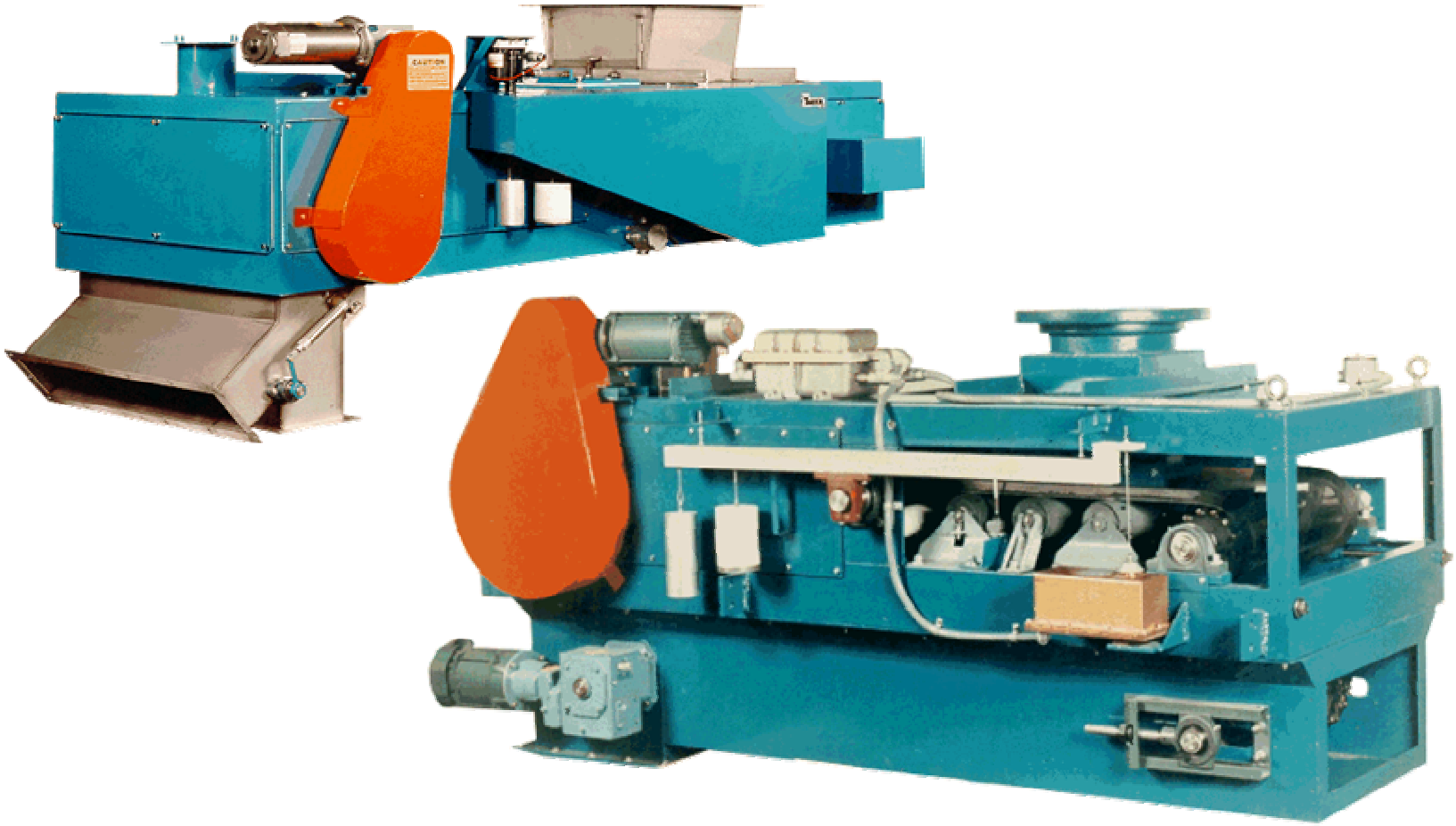
THAYER ATWL Features:

Auto Zero Calibration Check
Auto span calibration Check
Auto adjustment of zero and span errors.
History of past calibration results stored in instrument for trending and determination of required calibration interval.

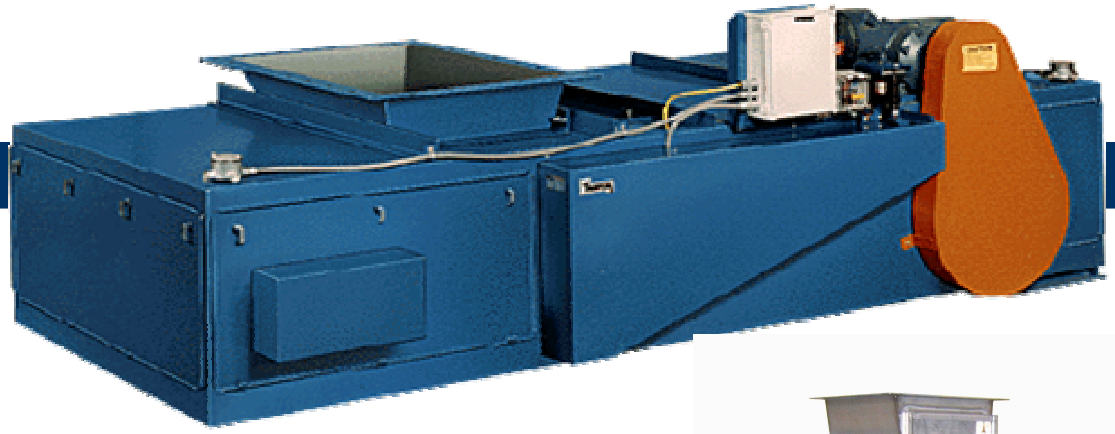
Thayer Model “MD” and “MDL” Weigh Belts

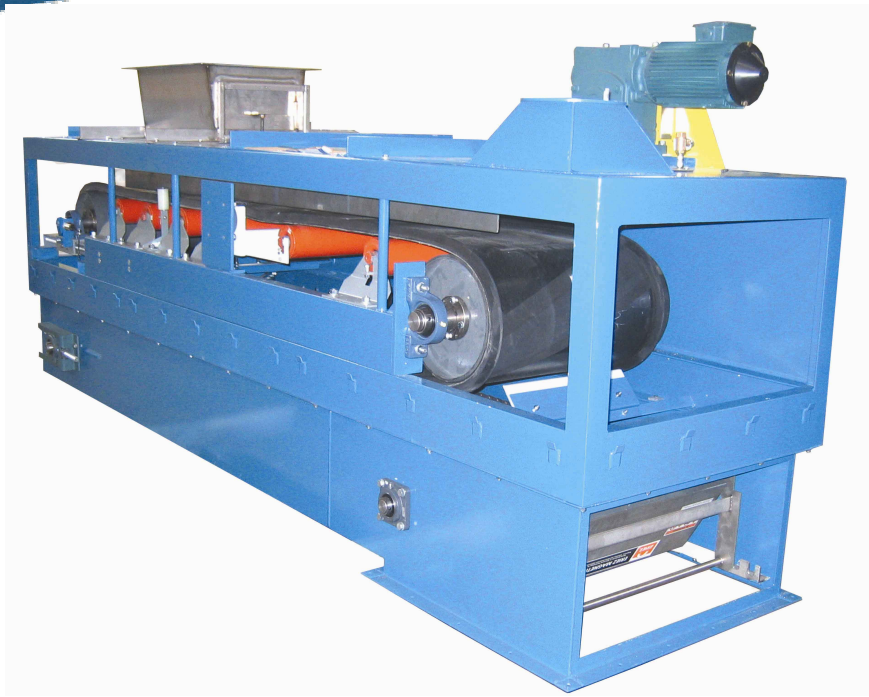
- Rugged construction, ideal for cement, steel and other smokestack industries.
- Design features includes slack belt, pulser and scale location, ATWL, idler alignment, welded frame with removal access panels, full length adjustable skirt boards, custom designs to fit customer’s inlet to outlet configuration, self-cleaning crowned wing type, tail pulley.
- Multiple sizes for light to heavy duty applications.

THAYER Model “MDL” Weigh Belt

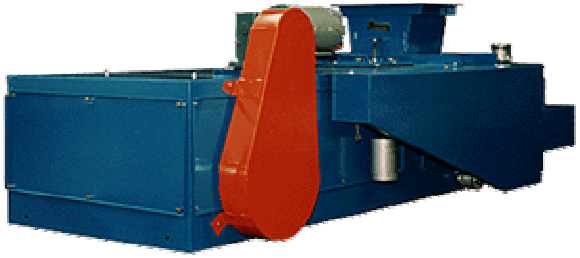


THAYER Model “MD” Weigh Belt



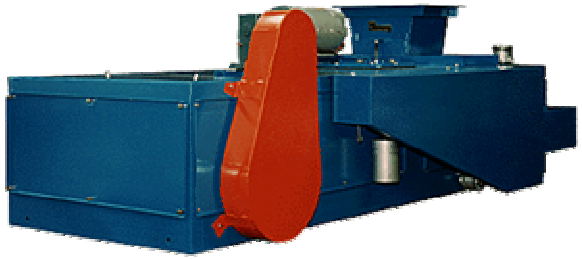


Rugged Support Frame



- Welded “box” construction.
- Self-supporting structural steel external frame provides superior durability and rigidity over the life of the weigh belt.
- Large frame openings permit easy maintenance of even the biggest parts.
- Structural integrity of framework maintains square-ness and protects from deformation and deflection caused by material loading and shearing forces.
- Easily accommodates, legs, and dust removal/scavenger systems.
- Accommodates a wide range of length and incline variations without significant changes in configuration.

Integral Inlet Chute



- Inlet length, width, slope angle of the side and rear plates, and the degree, type of flare and divergence of certain planes that make up the inlet are computer designed for maximum efficiency and low energy consumption.
- Level gate, manually adjustable from the outside of the weigh belt housing prevents lumps from getting wedged and cutting off flow.

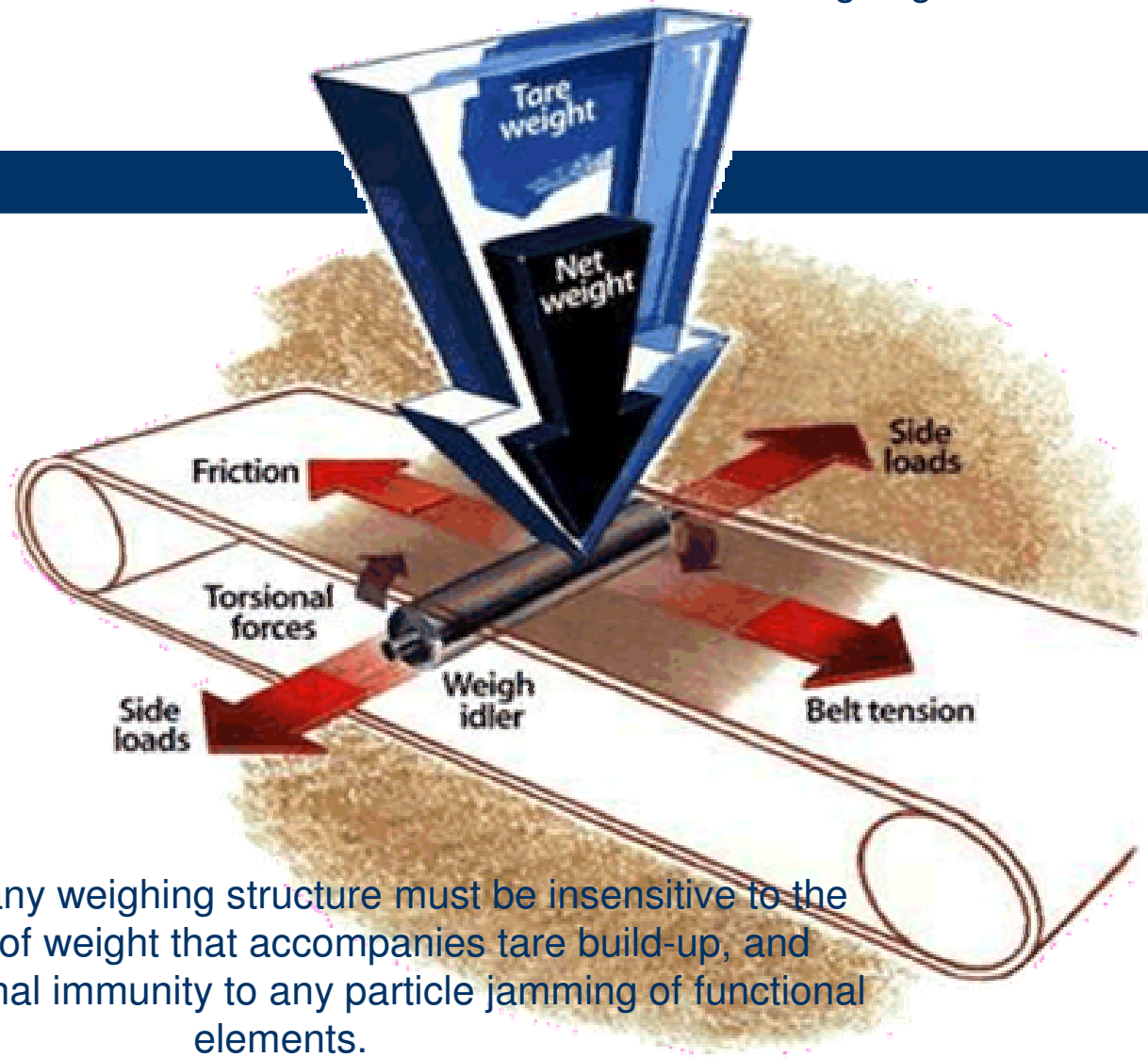
Total Material Confinement

- Flow stream channel provides total "boxed-in" material containment.
- Material is confined by the belt surface at the bottom seal, the skirt boards on each side and a plate spanning the two skirt boards at the top.
- The material itself seals the gaps between the belting and skirt boards.

Heavy duty skirt boards have variable gap gradient and degree of divergence, relieving pressure in the direction of material flow. This keeps material from getting wedged between the skirt boards and the belt.

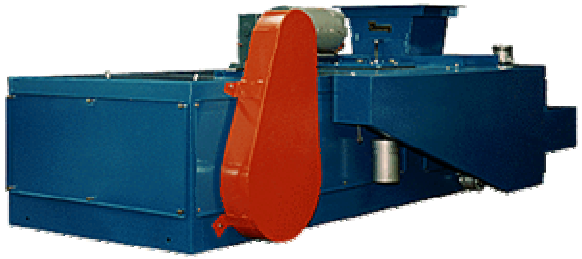
Force Vector Diagram

In a weigh feeder, unlike long, troughed conveyor belt scales, the scale is located very close to the material inlet where spillage and dust settlement are on-going events.



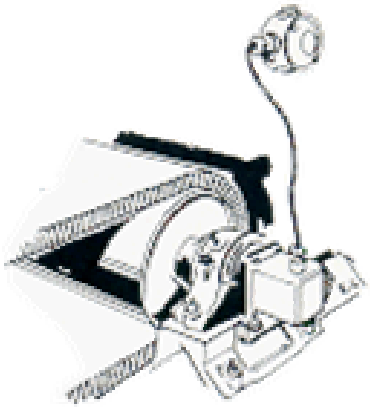
Consequently, any weighing structure must be insensitive to the accumulation of weight that accompanies tare build-up, and provide exceptional immunity to any particle jamming of functional elements.

Drive System

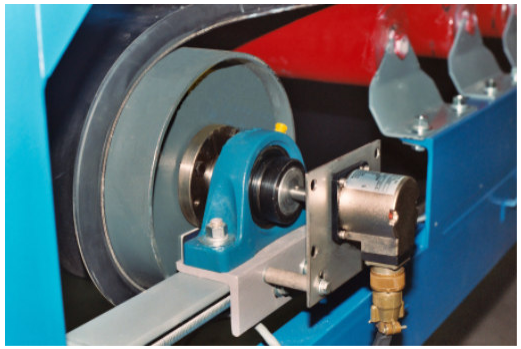


- All drive components meet CEMA industry standards to give you more flexibility during maintenance/repair evolutions.
- Bearings are positioned relative to the pulley hubs in such a manner as to substantially reduce bending moment contribution and reduce horsepower needs.
- Drive system can easily and economically be adapted to meet the need of future capacity needs.

Velocity Measurement



- Speed measured by ruggedly enclosed digital transducer with extremely high resolution (up to 2,000 pulses/ rev.).
- Velocity transducer is directly coupled to weigh belt tail (idling) pulley.
- Measures belt speed, not motor speed.
- Provides detection against belt slippage and/or breakage.



“WING” Self Cleaning Tail Pulley

Thayer’s crowned self cleaning tail pulley configuration is not affected by material build up and therefore eliminates the need for an internal belt scrapper (“V” plow)

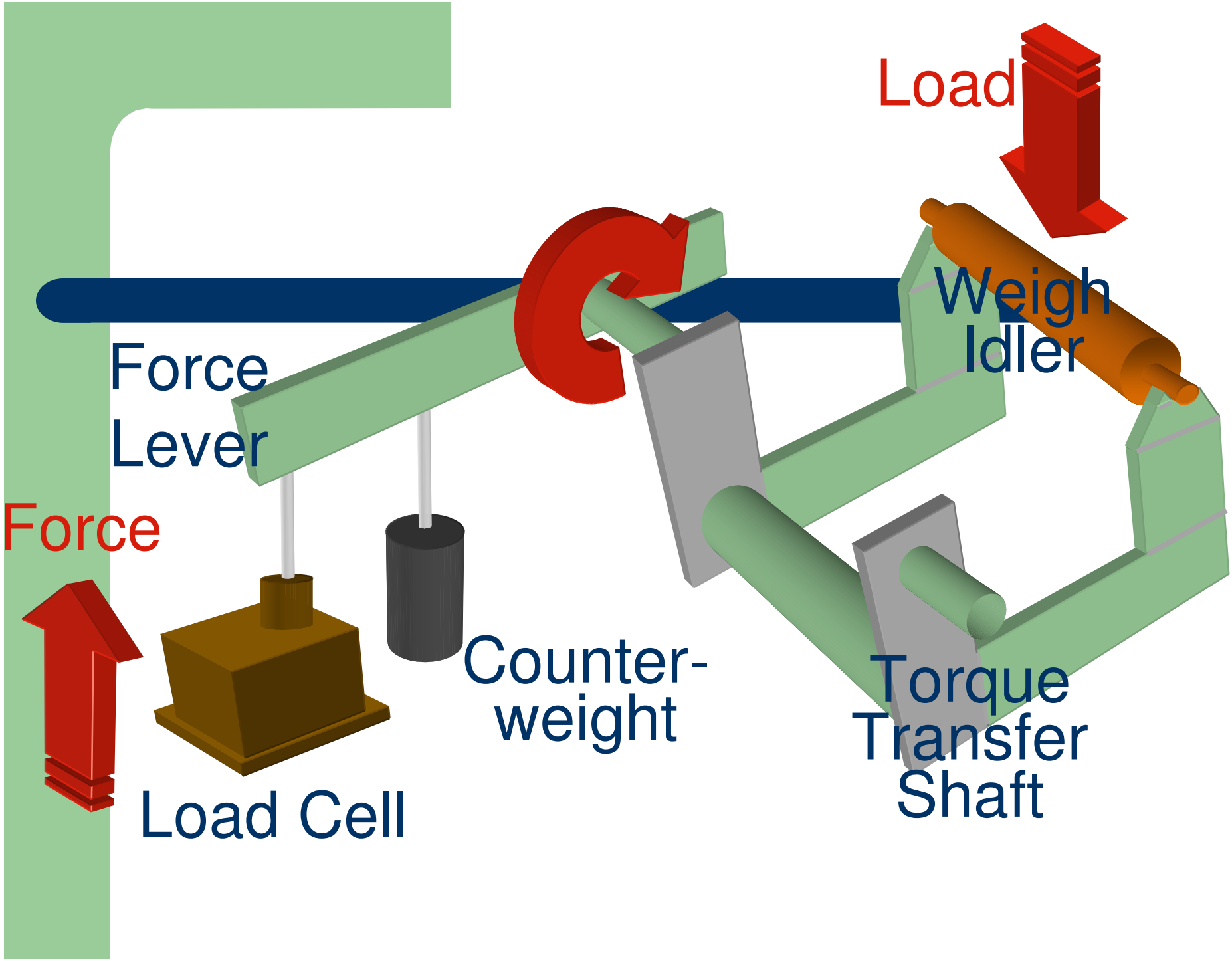
A Word About Weigh Belt Measurement Performance

Which is more important…

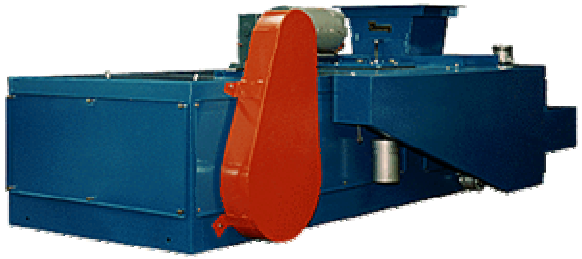
ac·cu·ra·cy **1:** freedom from mistake or error **:** CORRECTNESS **2a:** conformity to truth or to a standard or model **:** EXACTNESS **2b:** degree of conformity of a measure to a standard or a true value.

or…

re·peat·abil·ty **1a:** to go back to **2a:** to make, do, or perform again **: 2b:** to make appear again **:** cause to recur **:** PRESENT, SHOW, RE-PRODUCE **: 2c:** to say, do, or accomplish something again.

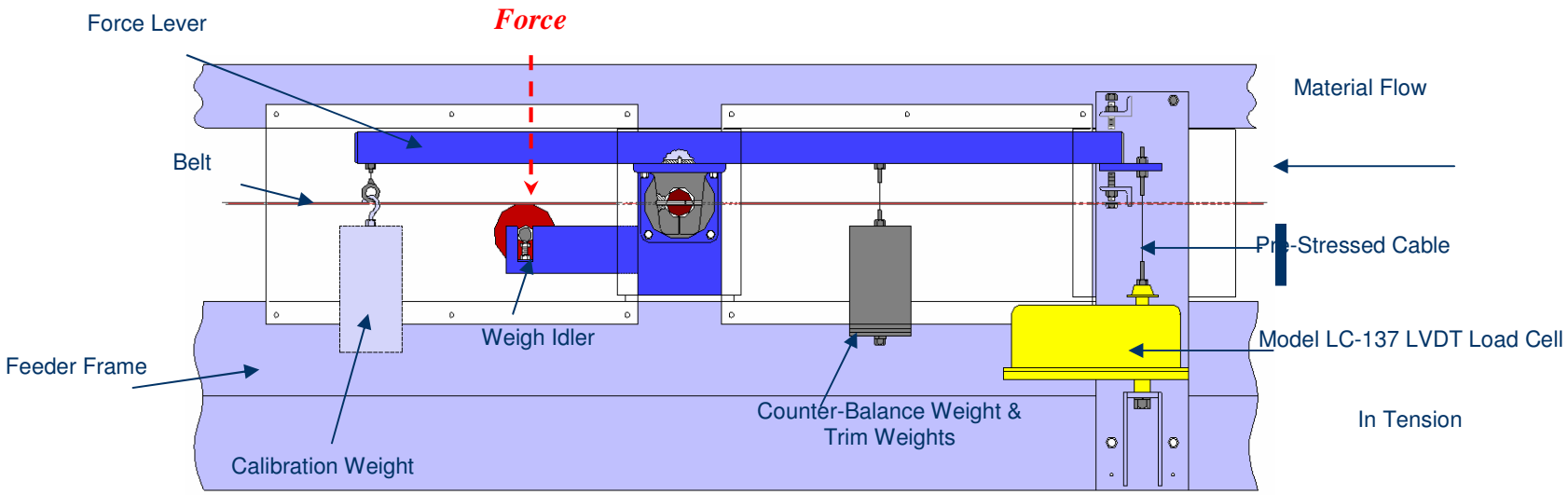

Load
Weigh
Idler
Force
Lever
Force
Counter-
weight
Torque
Transfer
Shaft
Load Cell

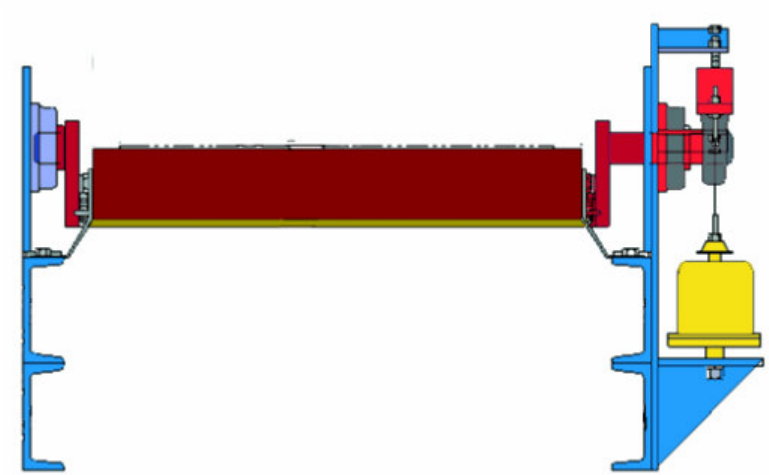
Mass Measurement



- Weight resolver is an isolated, non-contact, motion measuring device.
- Measures load moments as opposed to load forces.
- Weight sensing system is insensitive to material build up.
- Weight sensing system cancels idler friction forces.
- Load cell is located outside of the material handling area.

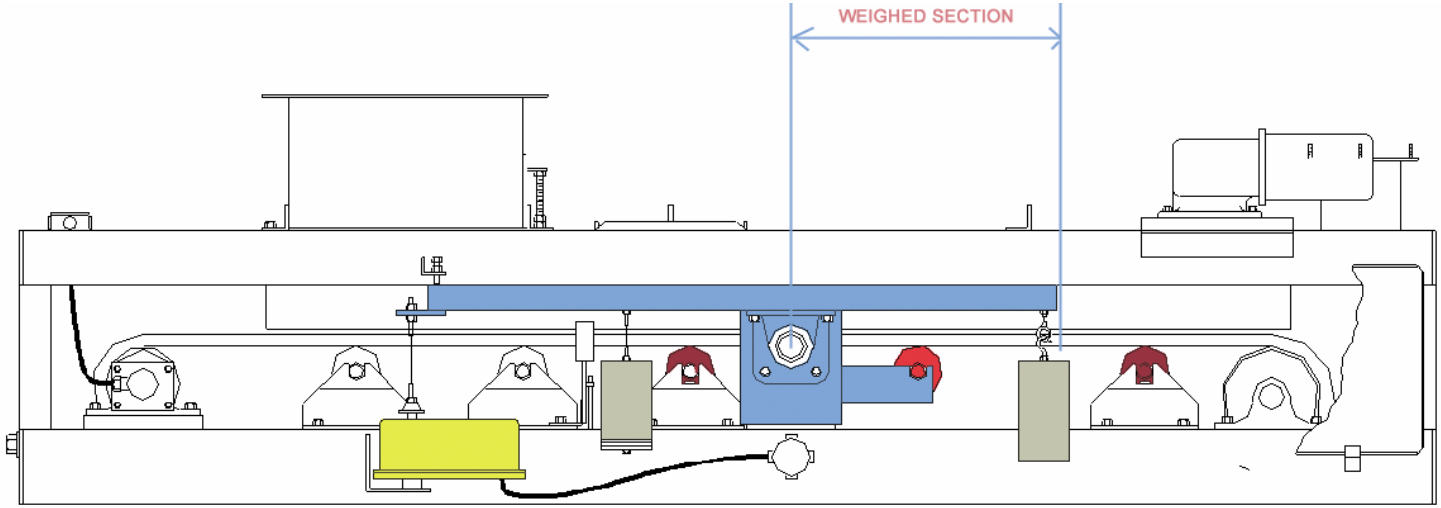
THAYER "D" LEVER SCALE





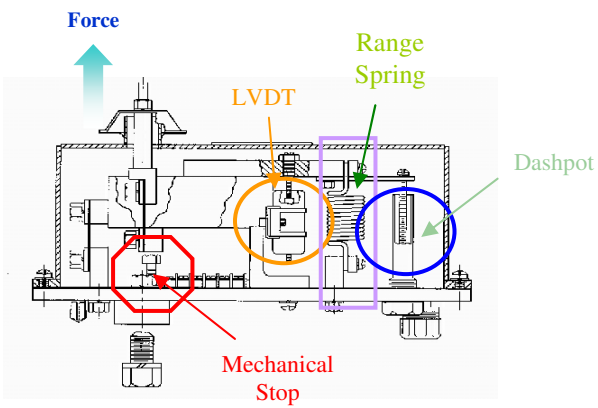
THAYER “D” LEVER SCALE

Weighed section

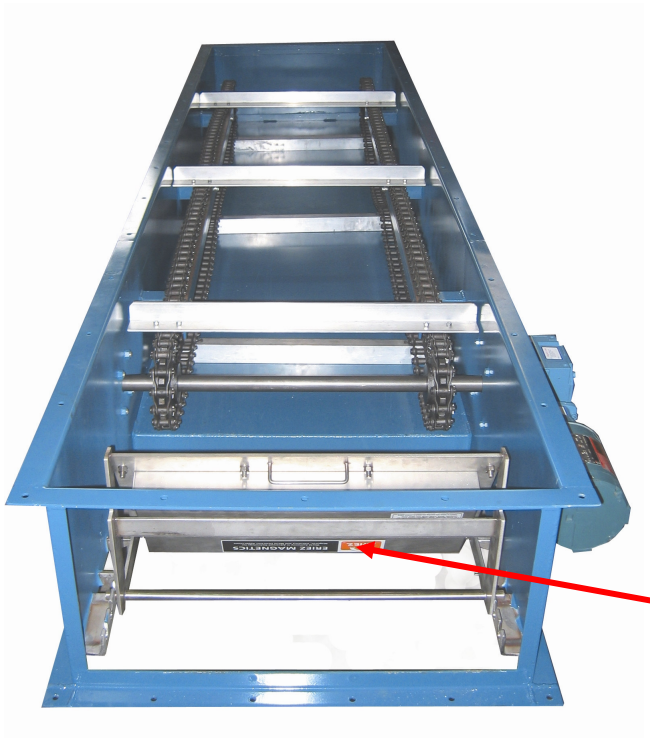


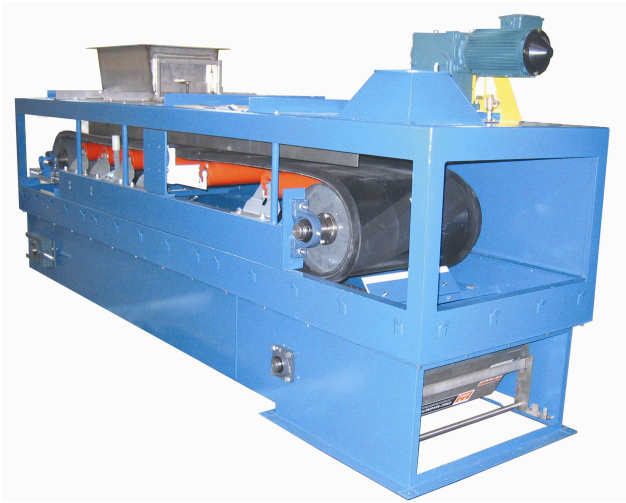
LC-137 Load Cell

- Load cell can be removed from weigh belt without affecting idler alignment.
- Load cell will not loose calibration when subjected to shock or impact loads.
- Can tolerate mechanical overloads in excess of 1000% of its rated capacity.
- Unconditionally warranted for fifteen years.



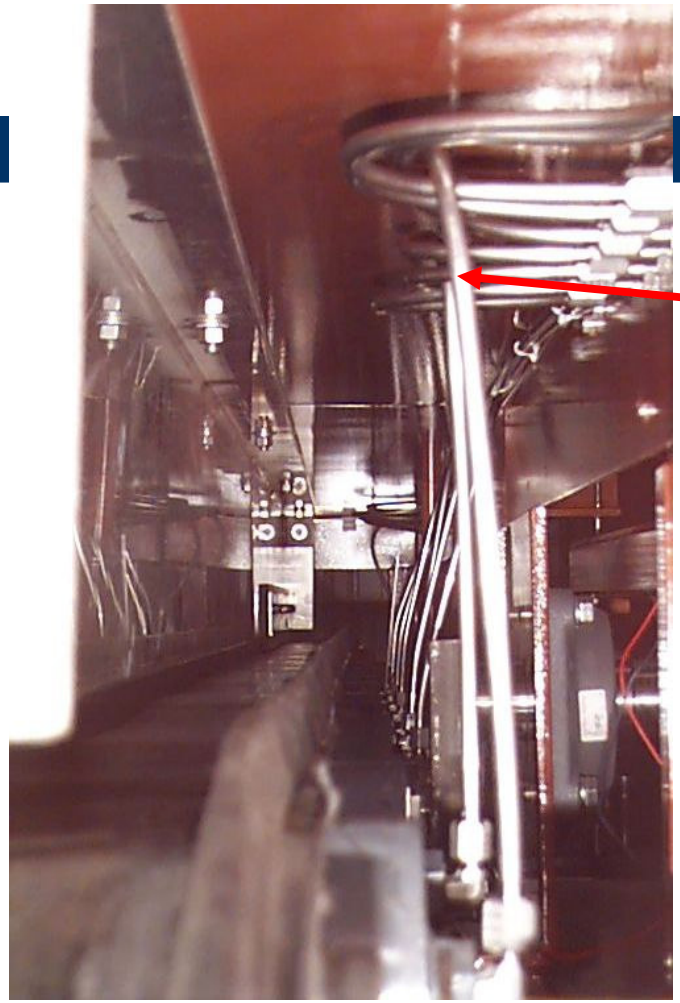
BELT SCAVENGER



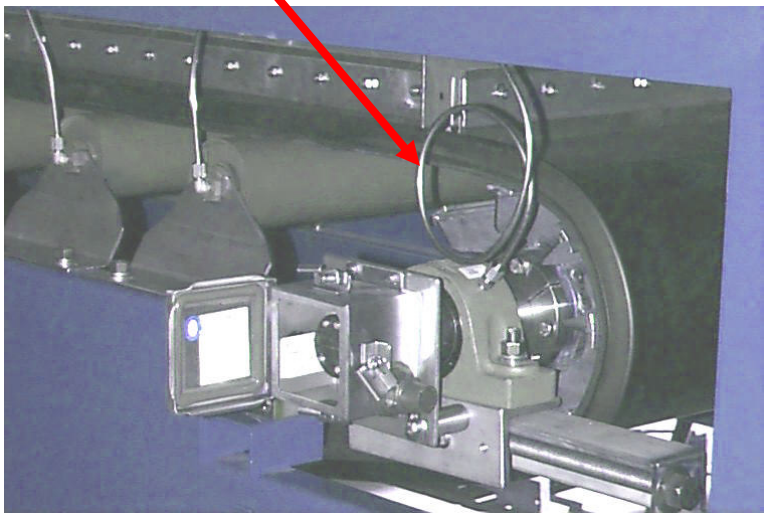


Shown here is optional drag style scavenger. Screw type is also available. Optional plate magnet to remove tramp material is located at discharge of feeder.

External Idler bearing lubrication system



Lubrication system allows the idler and pulley bearings to be lubricated without having to remove the dust covers



Thayer “MXL” and “MWF” Weigh Belt Unique Design Features

- Slack belt design lowers belt tension and insures good belt tracking.
- Speed sensor on idling pulley senses actual belt speed, slippage and breakage.
- Belt take-up “position memory” adjustment.
- Easy to access for maintenance and cleaning.
- Self cleaning tail pulley and lagged head pulley.
- Quick and easy belt removal.
- Full length, adjustable skirts.
- Welded frame construction eliminates distortion with quick removable side panels.
- Simple to rerate and rerange for future capacity and material changes.

Thayer “MXL” Weigh Belts

- “FMSS” mass counterbalanced flexure plate scale weighs net load.
- Load Cell utilization typically between 90-100%.
- Scale located outside material handling area eliminates tare build-up and damage.
- Able to be fitted with ATWL assembly.
- Stationary rod or free roller as weight sensing member.
- Available in welded closed frame, or open, low density style, in both standard and sanitary designs.
- Custom configurations to fit customer’s inlet to outlet configuration.
- Large inlet (12”-14” diameter).