The In-Motion Checkweighing Buyer's Guide

Information to help you choose a system for your in-motion weighing needs

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Table of Contents

Introduction 3

Checkweigher Basics 4

Checkweighing Key Terms 6

Checkweigher Applications 7

Before You Buy 8

Weights and Measurement Agencies and Regulations 10

Checkweigher Accuracy 11

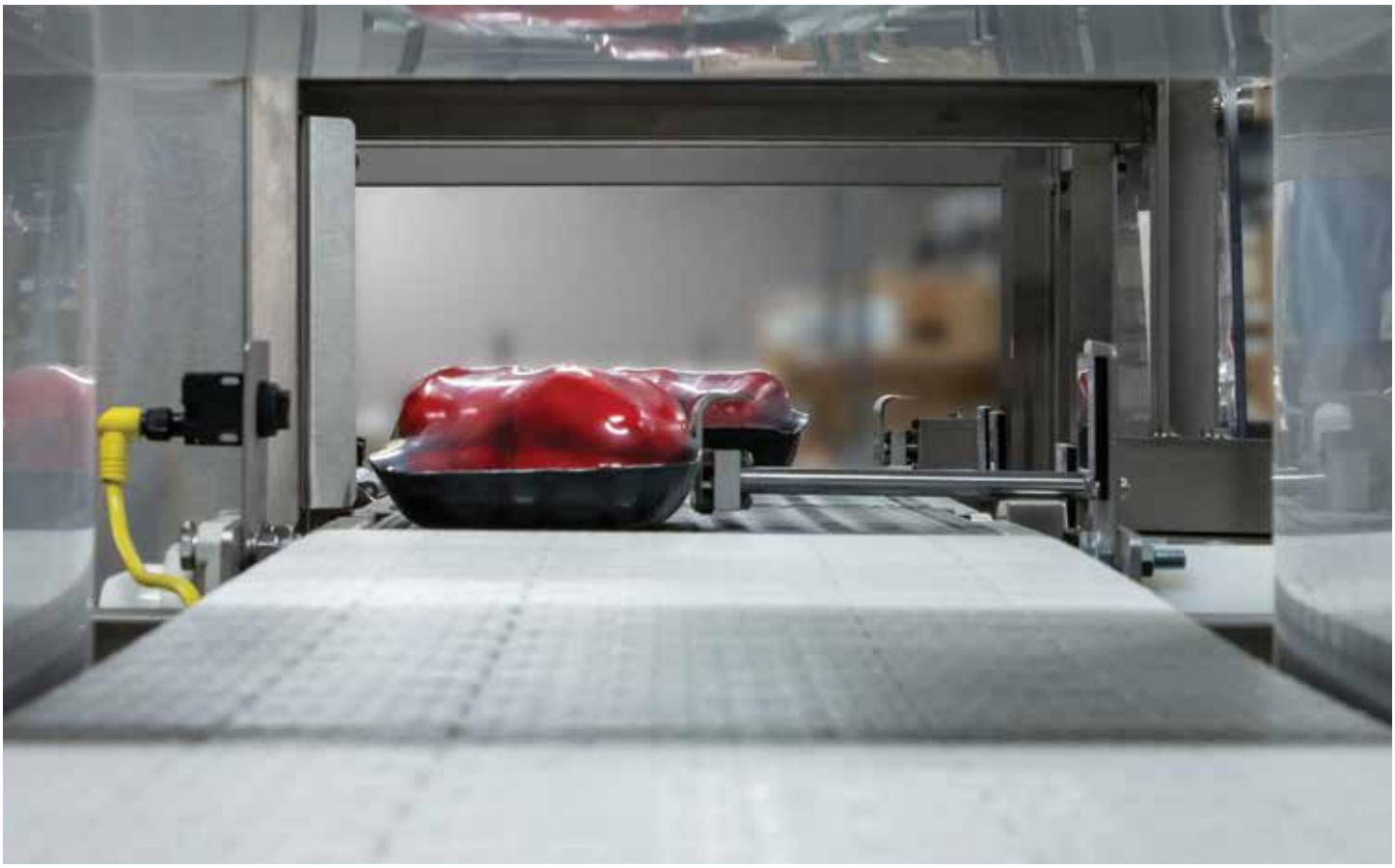
Scale Designs 12

System Accessories 13

Checkweigher Calibration and Maintenance 14

Glossary 15

Motoweigh IMW In-Motion Checkweigher and Motoweigh Metal Detection System



Introduction

Product inspection ensures quality control throughout all stages of the manufacturing process. From metal detection to product labeling, each task helps prevent issues with quality control. If your production line is missing an inspection component, it can create consumer safety hazards and risks to your business. Checkweighing is an essential step in product inspection because it increases efficiency without decreasing quality. If your business is considering purchasing a checkweigher to improve production, this guide will help determine what product will best suit your application needs.

Checkweigher Basics

Static checkweighing with a CW90 bench scale in a pasta-producing facility requires hands-on interaction.

What is an in-motion checkweigher?

An in-motion checkweigher is a system that weighs products, then rejects or accepts them based on preset weight zones.

The difference between static and in-motion checkweighing

Static checkweighers require hands-on interaction in order to move the product on and off the scale, whereas in-motion checkweighers automatically weigh products as they move along a production line at a high speed. Furthermore, in-motion checkweighers check 100% of the weight of the items inspected.

Advantages of static vs in-motion

Static

- Very little maintenance
- No process control to service or calibrate
- Lower initial cost

In-Motion

- Decreases operator time
- Fewer manual errors
- Automation increases productivity
- 100% inspection rate

What makes an in-motion checkweigher?

Conveyor belts

Infeed and outfeed conveyor belts move products through a checkweigher and along a production line. Since checkweighers are typically integrated into a pre-existing production line, conveyor belts can often be customized to fit your application needs.

Load cells

Load cells come in various types, but they all serve the same purpose—to accurately measure weight on a scale. When weight is placed on the scale, the load cell takes an analog measurement and converts it to a digital output, either at the load cell or junction box or in the scale indicator. Load cells are typically constructed of either aluminum or stainless steel, depending on the application requirements, and are located underneath the scale top, which is integrated into the conveyor.

Weight indicator

The indicator, or controller, displays advanced weight functions and serves as the command center for the calibration and operation of the checkweigher. Indicators show real-time monitoring of preset weight zones and allow viewing and printing of user, product, statistic and parameter reports.

Accessories

From reject devices to alarms and barcode scanners, checkweighers come with a variety of optional accessories that will help make your production line and checkweighing application manageable and effective.

Conveyor belt

Load cell

Stack light accessory

Checkweighing Key Terms

The information determined by a checkweigher will help you understand how it can meet your weight-related product inspection needs.

Gross weight

The total weight of the package or container and its contents

Tare weight

The weight of only the package or container

Net weight

The weight of only the contents

Weight zones

The different ranges of preset target weights that determine whether a product is accepted or rejected

Maximum allowable variation

A deficiency in the weight, measure or count of an individual package beyond which the deficiency is considered to be an unreasonable error

Benefits of a checkweigher

Checkweighers are designed to fit your application needs by optimizing your manufacturing process and reducing overall costs. There are several benefits of incorporating an in-motion checkweigher into your production line.

Meet legal standards

Many federal regulations are in place to ensure retail products are at a specified weight that is not shorting the consumers of product. If a product is underweight and fails to meet those standards, your business could face costly fines. With a checkweigher in place, you can avoid these fines altogether.

Reduce product giveaway

In order to avoid being fined for underweight products, businesses often overfill their packages. However, overfilling packages means your business is giving away free product, which results in loss of revenue. Checkweighers are designed to ensure any product exceeding the maximum allowed variation is removed from the production line, ultimately reducing product giveaway and saving your business money.

Maintain customer satisfaction and company reputation

Customer satisfaction depends upon the quality and reliability of the products they purchase, and checkweighers make it easier to meet these customer expectations. With the ability to detect missing components in packages, checkweighers ensure finished products are complete and contain all necessary parts.

Eliminate human error

Where manual labor is involved, error is inevitable. Automated checkweighing systems reduce the amount of rework due to manual mistakes without slowing down your process, increasing overall efficiency.

Provide data

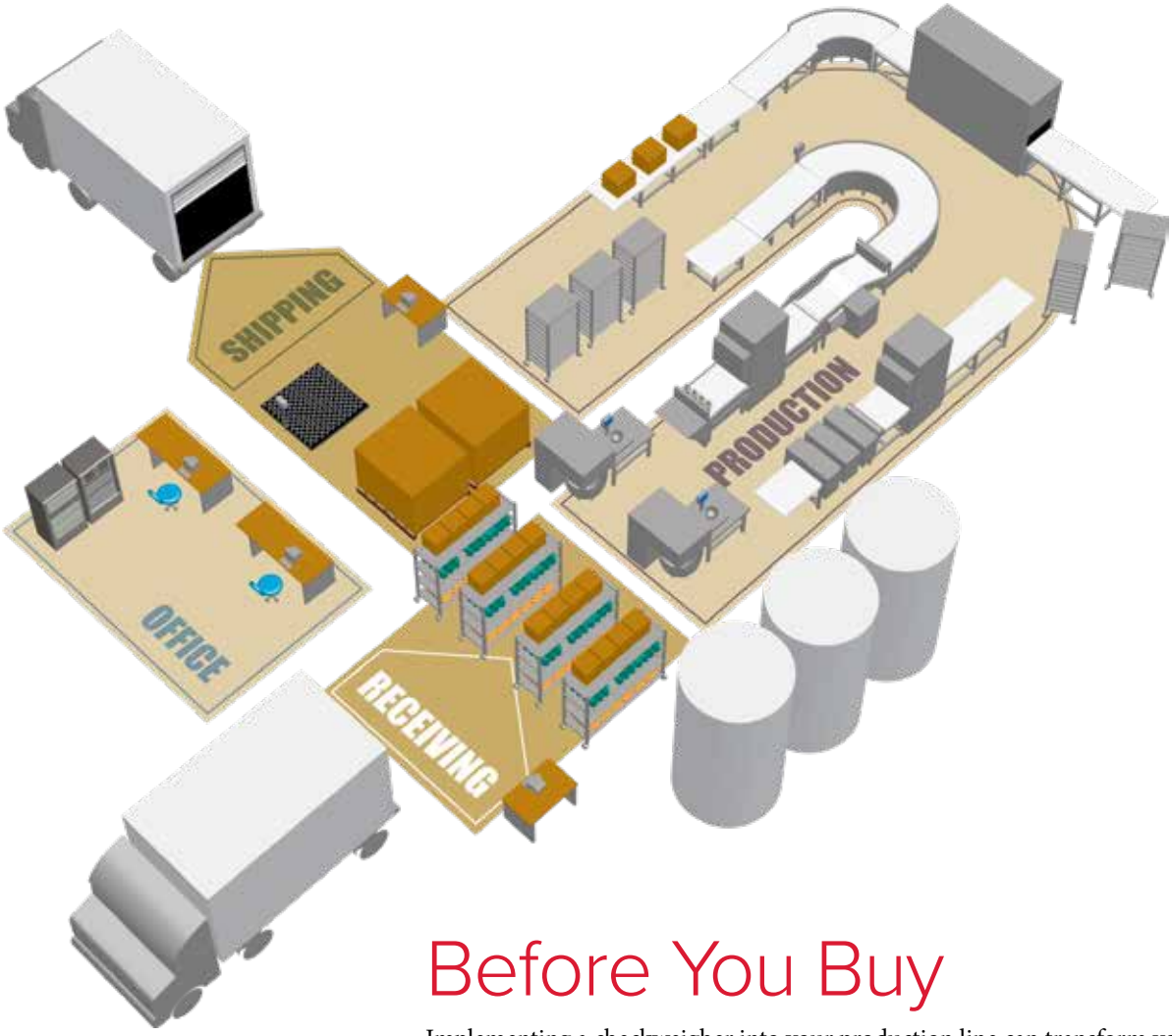
A checkweigher's ability to capture and save data is beneficial for tracking and managing productivity. User-friendly functions, statistics and reports supply data for supervisory analysis and production modifications.

Checkweigher Applications

Checkweighers are used in a wide expanse of industries, such as food and beverage packaging, pharmaceuticals, cosmetics and logistics. Most often, checkweighers are used at the end of a production line, but their uses go beyond simply weighing products. Possible uses for a checkweigher include both typical and statistical applications:

- Checking for under- and/or overweight products
- Classifying products into weight zones
- Ensuring product compliance with federal regulations and standards
- Monitoring product line efficiency
- Checking for missing package components, including caps, lids, labels or product
- Providing feedback reports for process analysis and adjustment

Motoweigh Cascade Scale



Before You Buy

Implementing a checkweigher into your production line can transform your operations, but first, assessing specific aspects of your business needs and production requirements will help you make important decisions in the purchasing process.

Choosing your scale supplier

Research scale suppliers in your area and choose one that will offer the best services. Scale suppliers who possess vast knowledge in basic checkweighing equipment, accessories and specialized scale services can be an advantage that could save your business time and money during the purchase and upkeep of your checkweigher.

When you've decided on a scale supplier, contact other businesses that employ checkweighers or request testimonials from your supplier to find a manufacturer that's right for you. Hearing firsthand accounts from trusted sources about a manufacturer's reputation for reliable, quality products can help you in the decision-making process.

Factors to consider when choosing a checkweigher

Type of product being weighed

The type of product being weighed will determine the design, accuracy and accessories of your checkweigher. Products such as raw or unwrapped foods, prepackaged food, beverage cans or cartons, pill bottles, shoes in shoeboxes, cases of batteries and child products are only some examples of products that pass through checkweighers. In some cases, strict government regulations play a significant role in the construction and durability of a checkweigher, so speak with your scale supplier about regulations your product application might need to follow.

Environment

Temperature fluctuations, humidity levels, air currents, debris and dust are all environmental factors that can affect your checkweighing process. Consider the climate in which your products are weighed when choosing a checkweigher.

Vibration

Vibration is a factor that affects all checkweighers. To minimize vibrations, check for available space away from nearby machines, moving parts or other conveyors.

Standards, regulations and specifications

Washdown and sanitation is a required procedure in many industries, especially in the food industry. Additionally, most packages must meet weight specifications set forth by government agencies, which will determine your range of accuracy. Another important factor to consider is the rate at which your production line moves, and keep in mind your existing site configuration, which will determine how much space the site will allow for checkweigher integration.

Weights and Measurement Agencies and Regulations

Product weight regulations

Packaged product weights are regulated by a maximum allowable variation set forth by the National Institute of Standards and Technology (NIST) for the safety of the consumer and the management of package processors, wholesalers and retailers.

State weights and measures officers enforce the laws set forth by NIST, including product inspection standards, scale requirements and product weight sampling procedures. Discuss with your scale supplier to select the necessary checkweigher features that comply with net content laws.

Sanitation regulations

In many industries, checkweighers must meet requirements for facility and equipment sanitation to ensure consumer safety and avoid liability concerns. Discuss product specifications and all washdown and sanitation procedures with your checkweigher supplier to meet government and industry standards.

Legal for Trade approval

Checkweighers used for weight-based transactions and commerce must have Legal for Trade approval to verify that speed and accuracy are within a certain range. Depending on your location, product and speed of production line, approval agencies such as the National Type Evaluation Program (NTEP) or state and local approval agencies will need to provide certification for commerce in your area.

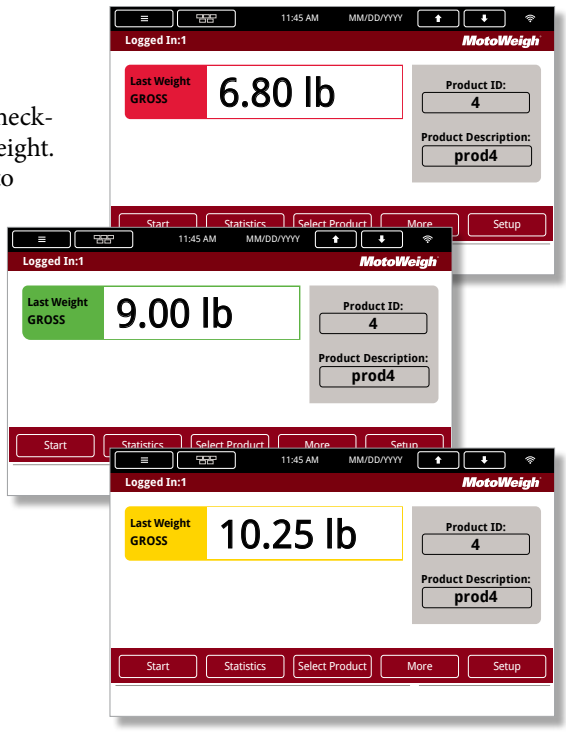
Checkweigher Accuracy

What is accuracy, and why is it important?

The accuracy of a scale is its ability to measure a known weight value correctly. In check-weighing, accuracy is determined by how close the product is to the preset target weight. Because checkweighers are used across many different industries that must adhere to strict regulations, accuracy is vital.

Understanding accuracy

The accuracy of a scale is composed of two main factors: linearity and repeatability. Linearity refers to how close to the actual weight of a package the checkweigher measures each time a test package is weighed on the scale. Repeatability is measured by using standard deviation and describes the weight variance calculated from weighing a specific mass several times. An accurate checkweigher is both highly linear and repeatable.



Scale Designs

Most manufacturers incorporate the same basic features into their checkweigher designs, but different suppliers may offer unique options and specific application advantages.

Checkweighers are not usually standalone machines. They are often integrated into existing production lines and are configurable to fit your unique operation while avoiding the inconvenience of costly site reconstruction.

Aluminum or stainless steel construction

Checkweigher construction material is dependent upon what products your business weighs, the environment in which the checkweigher is being used, and the potential washdown procedures your checkweigher needs to endure. Typically, checkweighers are built from aluminum, mild (powder coated) steel, or stainless steel. Stainless steel checkweighers are available in food-grade construction for harsh washdown environments and non-food-grade for frequent and easy cleaning. Aluminum construction is made for non-food-grade production. Talk to your scale supplier to decide which material will best fit your application needs.

System Accessories

Checkweigher system accessories

Quality checkweighing accessories enhance checkweigher performance and make production easy to observe and manage. Knowing which features are available to optimize your process can also help you select a checkweigher manufacturer.

Reject systems/diverters

What makes an in-motion checkweighing system unique is its ability to reject products outside of the accepted weight tolerance. Reject systems, or diverters, at the end of the production line ensure unacceptable products are removed from the conveyor. There are several different types of diverters available to suit your application needs.

- Linear thrust
- Air blade
- Conveyor stop
- Paddle
- Drop conveyor

Photo eyes

Photo eyes detect products coming onto the scale. They ensure only one product is weighed at a time and trigger the indicator to capture weight data.

Stack light bars

Observe under-, over- or on-target weight conditions from a distance with stack light bars.

Guide rails

Guide rails, usually made from metal or plastic-lined metal, are placed alongside conveyor belts to maintain product stability and to guide product during production.

Alarms

Alarms indicate when a product gets rejected from the production line.

Barcode scanners

Barcode scanners allow for product identification and data collection prior to weighing.

Emergency stops

In the event that your checkweigher encounters a problem, emergency stop buttons are provided for safety and to prevent excessive damage to your products or your checkweigher.

Drop conveyor

Photo eye

Emergency stops

Checkweigher Calibration and Maintenance

Calibration

Scheduled weight checks are vital to a checkweighing system to make sure weight readouts are accurate, especially in applications requiring Legal for Trade certification.

Checkweigher calibration occurs upon initial setup by a certified scale dealer. The system should not need additional calibration thereafter unless the daily weight checks are out of tolerance. After calibration, detailed reports should be provided to government authorities.

Scheduled maintenance and protection features

Most manufacturers incorporate features into their scales to help prevent system failure and minimize maintenance. For example, most scales have self-contained protection features to prevent them from being loaded above their rated capacity. Still, inspections of your checkweigher's conveyor belts, divert functions, lights and overall cleanliness should be scheduled to make sure your checkweigher is running properly.

Preventative maintenance

Preventative maintenance tasks are important in sustaining the durability of your checkweigher. Several different tasks can be performed to maintain your checkweigher's performance.

On a daily basis or at the beginning of each shift, run a test weight along the conveyor to ensure the weight reads correctly and that recalibration is not needed. Additionally, checking for and cleaning any dust or debris from checkweigher surfaces and accessories will optimize weight-data capture, and proper alignment of photo eyes will enhance product identification and overall scale performance.

Greasing the bearings on conveyor belts weekly, depending on the frequency of use, will ensure stable product transfer.

Finally, periodic inspection of belt tension and alignment and software backup will make your checkweighing system as reliable and efficient as possible without having to halt production.

Glossary

Accuracy

The ability of a scale to measure a known weight value correctly.

Alarm

An audible signal that indicates when a product gets rejected from the production line.

Analog to digital

Conversion of continuously varying (analog) voltage levels to discrete binary-numbered (digital) values (e.g., a load cell output can be fed through an A/D converter to produce a continuous stream of digitized information and sent to a digital indicator).

Barcode scanners

A product that allows for product identification and data collection prior to weighing.

Calibration

The comparison of load cell outputs against standard test loads.

Capacity

The amount of weight the scale is capable of weighing accurately.

Checkweigher

A system that weighs products, then accepts or rejects the product based on preset weight zones.

Emergency stops

Devices that allow for immediate cessation of the production line to prevent excessive damage to the products or the checkweigher.

Food and Drug Administration (FDA)

An agency within the U.S. Department of Health and Human Services responsible for protecting public health by ensuring the safety and security of human and veterinary drugs, biological products and medical devices. The FDA also ensures the safety of our nation's food supply, cosmetics and products that emit radiation.

Food Safety Modernization Act (FSMA)

An act set forth by the Food and Drug Administration which focuses on preventing foodborne illnesses, rather than responding to them.

Guide rail

An accessory that maintains product stability and guidance during production.

Handbook 44

A comprehensive set of requirements for weighing and measuring devices that are used in commerce and law enforcement activities; not a federal law, but developed and updated annually by the National Conference on Weights and Measures. Its complete title is "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices."

Handbook 133

A procedural guide for the compliance testing of net content statements on packaged goods, adopted and updated by the National Conference on Weights and Measures. Its complete title is "Checking the Net Contents of Packaged Goods."

Indicator/controller

Indicators function as the control device for a checkweighing system. They collect the digital weight readout from the scale's load cells and also provide process reports and analytics.

International Organization of Legal Metrology (OIML)

Treaty organization that recommends technical requirements for weighing and measuring equipment prior to the sale or distribution of a model or type within the state, nation, etc.

Legal for Trade

An industry recognized term to distinguish approval from the appropriate weights and measures regulating authority to use a scale for weight-based transactions and commerce.

Linearity

A factor that makes up a scale's accuracy. Linearity is the scale's ability to measure as close to the target weight as possible.

Load cell

A device that produces an output signal proportional to the applied weight or force.

Maximum allowable variation

A deficiency in the weight, measure, or count of an individual package beyond which the deficiency is considered to be an unreasonable error.

National Institute of Standards and Technology (NIST)

An agency within the United States Department of Commerce. NIST regulates measurement in the United States to ensure accurate weight-based commerce. NIST's specifications and requirements for fair and accurate weighing systems are documented in Handbook 44 (H-44). If a checkweigher conforms to NIST H-44, it can be tested for NTEP Legal for Trade Certification. NIST's specifications and requirements for packaged goods are documented in Handbook 133 (H-133).

National Type Evaluation Program (NTEP)

A program of cooperation between the National Conference on Weights and Measures, NIST, state weights and measures officials and the private sector for determining conformance of weighing equipment with the provisions of H-44.

Glossary Continued

Output

The signal (voltage, current, pressure, etc.) produced by a load cell. Where the output is directly proportional to excitation, the signal must be expressed in terms such as volts per volt, millivolts per volt, or volts per ampere, etc., of excitation.

Photo eyes

Devices used to detect incoming items on a production line and trigger the indicator for weight-data capture.

Repeatability

A factor that makes up a scale's accuracy. Repeatability is the scale's ability to measure and display the same weight each time it is tested. Repeatability is measured in standard deviation.

Reject systems/diverters

A checkweighing accessory that prevents unacceptable products from passing through the production line by removing them from the conveyor.

Sanitary Design Principles (SDP)

Developed by the Equipment Design Task Force in consultation with equipment manufacturers, certifying organizations and government officials, Sanitary Design Principles regulate sanitation requirements for equipment in the meat and poultry industries.

Stack light bars

Lights that indicate the under-, over-, or on-target weight condition of an object.

Tare

The weight of an empty container or vehicle, or the allowance or deduction from gross weight made on account thereof.

Tolerance

A value fixing the limit of allowed departure from the labeled contents, usually presented as a plus (+) and minus (-) value.

Units

The unit of measure that is to be represented: lb, kg, oz, etc.

Weight zone

The different ranges of preset target weights that determine whether a product is accepted or rejected.

Zone limit

The weight values set by the operator or packager which establish the cut-off point between consecutive weight zones; a filter that allows only acceptable weight packages to continue through the flow of production.

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