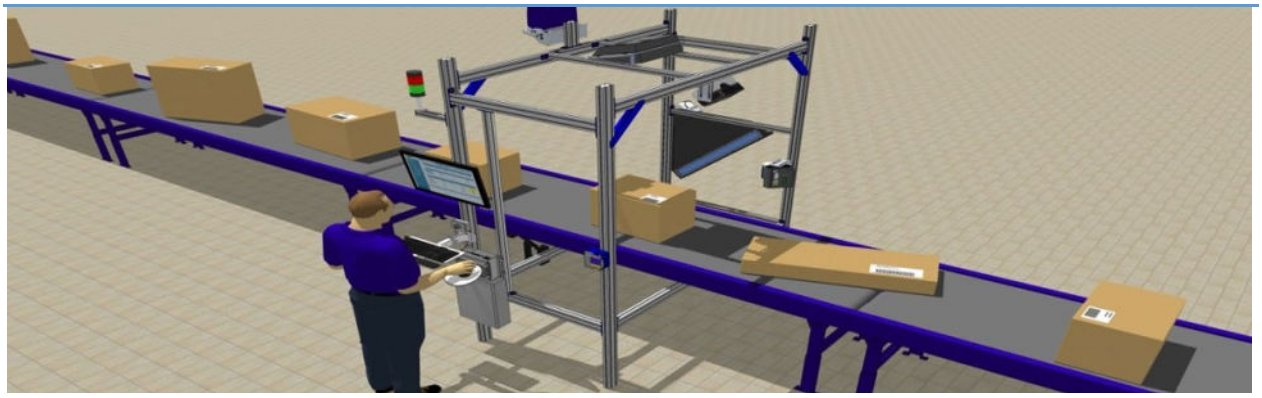
ALSTEF GROUP

DIMENSIONS, WEIGH, AND SCAN SOLUTIONS

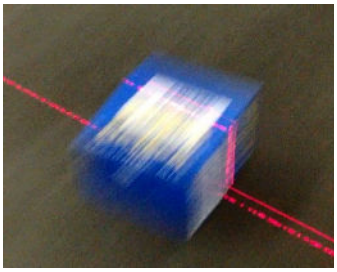
WHITE PAPER

www.alstefgroup.com



SUMMARY

"Package Intelligence" is a phrase that may be used to describe what today's package distribution companies consider the nucleus of their operations. The phrase reflects the objective of manufacturers, shippers, transporters and distribution centers to capture information about a package and do so automatically. The "intelligence" that package handlers want includes barcode data (shipper, customer, address, unique package ID, etc.), weight, dimensions, condition and even package material type.



The Dimension Weigh Scan (DWS) system integrates dimensioners, scales and barcode readers to provide parcel profiles. The DWS system combines parcel dimension, weight and barcode data into a single message that can be used for verification, trailer cubing, freight cost calculation, and sortation.

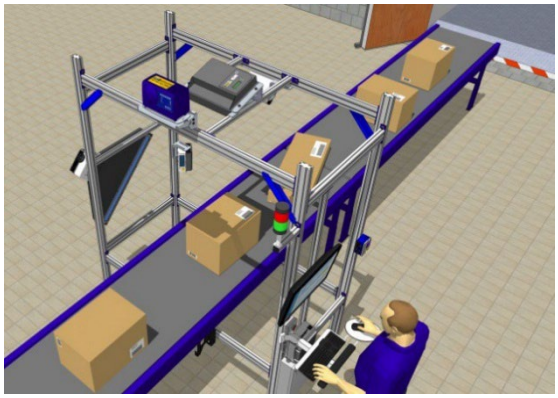
Many configurations of DWS systems are available. Choosing the best configuration is driven by key business requirements including inbound barcode location(s) and type(s), package sizes and weight ranges, package characteristics, throughput, scalability, host system interface and operator interface. The following section examines some key design considerations for an automated DWS system.

DWS TECHNOLOGY

BARCODE SCANNING

As a rule of thumb, the easier it is for scanning equipment to locate the barcode, the simpler (and lower cost) the scanning solution can be. For example, if the barcode location on a package is always on the same face (e.g., top) and in the same orientation (e.g., "ladder" orientation), the scanning solution is very simple and can be accomplished with a single line laser scanner.

As variation is introduced – random orientation, multiple package faces, multiple barcodes or barcode types, increased range of package dimension, conveyor size, conveyor speed – the complexity and cost of the scanning solution typically increases. Multiple scanners and/or omnidirectional scanners can be implemented to form a scanning "tunnel". This figure shows a DWS system with a top-front-side laser scanning solution.

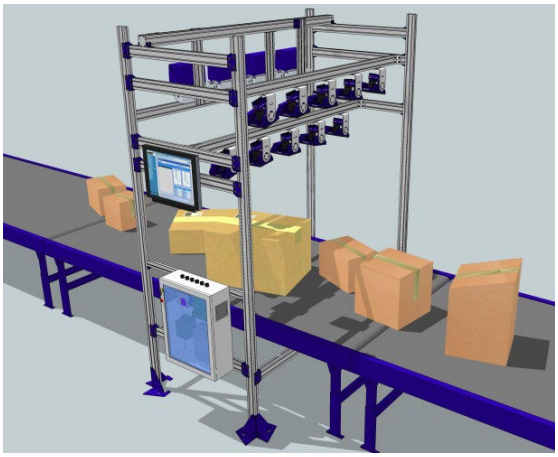


Laser scanner technology typically requires the lowest up-front investment and can read barcodes in any orientation on any face of the package. Laser technology is limited, however, by its ability to read only 1D barcodes, read only one package face at a time, and output only a data string.

Camera technology typically requires a larger per-unit investment but offers greater capability and performance. Camera technology typically outperforms lasers in terms of barcode read rate, especially when barcode types, sizes and quality drastically vary. Cameras offer other advantages including multiple-face scanning with one camera (e.g. reading top and front with one camera mounted at 45 degrees), 2D barcode decode (Data Matrix, QR code, PDF417, etc.), image capture (for diagnostics and/or verification) and lower operational maintenance. This figure shows a DWS system with a single camera reading the front and top of packages.

DIMENSIONING

Package dimensioning essentially falls into two categories – certified Legal-For-Trade (LFT) and non-LFT. Certified LFT systems are those used to generate shipping charges based on package weight and/or dimensions. These types of DWS systems, can be known as "revenue recovery" systems, are very popular among parcel distribution and other transportation/logistics operations and typically yield very attractive ROI for the owner. LFT certifications are regional and are administered by regional or local certifying entities, including NTEP and Canada Weights and Measures in North America and MID and OIML in Europe. LFT DWS systems typically provide dimensioning accuracy to within 0.2 inches for length, width and height.



Non-LFT applications are sometimes known as "rough dimensioning". Without LFT certification, these systems cannot be legally used to drive commercial transactions. Non-LFT uses of DWS systems provide "package intelligence" for inventory systems, trailer loading and fulfillment verification applications.

Another category of scan-and-dimensioning components of DWS relates to the package characteristics and flow. Singulated, cuboidal packages result in the simplest DWS solutions. Variations on that include non-singulated, near-cuboidal, irregular and Mass-flow systems. While advanced scanning and dimensioning configurations can be implemented to perform LFT or non-LFT data capture in these applications, packages must be singulated for proper package weighing in all instances. This figure shows a mass-flow scan-and-dimension system layout.

WEIGHING

Like dimensioning equipment, DWS weighing solutions can be categorized as LFT and non-LFT. In-motion scale conveyors are used in automated DWS systems. The type and size of the in-motion scale varies based on requirements including package size, conveyor speed and weighment accuracy throughput.

Package size is a primary determinant of the physical aspects of the scale. The scale belt length must be as long as the longest package, plus transport time necessary for the package to settle and for the weight to be accurately captured.

Packages must be singulated on the scale belt so that weight can be accurately captured and assigned to the package. Typically, singulation is performed by an infeed control/ brake-metering conveyor positioned immediately prior to the scale belt. This infeed belt is typically provided as part of the DWS or in-motion weighing solution.

DWS PERFORMANCE

DWS systems typically operate at conveyor speeds up to 250 feet per minute and process packages with the following characteristics:

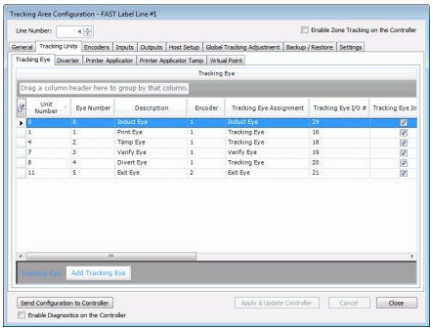
- Weight range between 1 lb. and 100 lb.
- Weight accuracy to 0.1 lb. accuracy
- Package lengths between 6 in. and 36 in.
- Package heights between 1 in. and 36 in.

- Package widths up to 36 in.
- Package throughputs up to 2500 packages per hour (41 packages per minute)

When package specifications exceed these common parameters, alternatives include enhancing design (and increasing initial cost) to handle wider ranges of variables. For weighing, this translates to consideration of longer or wider scale belts, faster speeds and alternate designs, such as two-belt scale systems.

Integration

INTEGRATION



At the heart of the DWS system is the station controller, which provides all communications interface, conveyor I/O controls and user interface. The controller is centralized, typically mounted on the DWS frame and is housed in a rugged industrial enclosure. The embedded I/O control system makes the DWS system easily configurable, adaptable to user environments and very cost-effective. This figure shows a typical user-configuration screen.

While the base DWS system consists of the infeed conveyor, dimensioner, in-motion scale, barcode scanner(s) and system controller, various options can be added to the system including:

- Enhanced I/O for sortation or other package routing management.
- In-motion label print-and-apply for package re-labeling or destination labeling
- Rate-shopping and manifesting
- Image capture and storage for diagnostics, validation
- Package dimension verification
- Trailer cube planning

The DWS controller supports configurable conveyor functionality. Operators with appropriate access will be able to select the run/stop logic for the conveyors based on the following inputs:

- DWS run status
- Run status of downstream conveyor(s) interlock
- Alternative operational modes including bypass and maintenance
- Other external inputs

INTERFACE

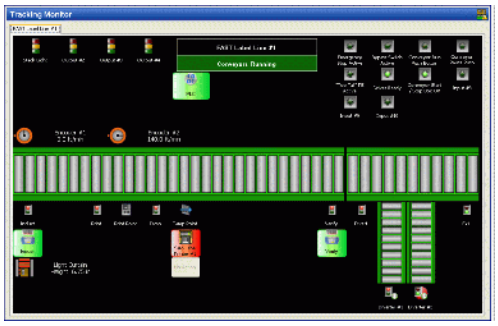
The system controller typically stores system data for 30 days. Host interface standards include serial and Ethernet connections. Each host interface can be configured for the protocol necessary to support host requirements. Typical protocols supported are:

- Simple serial strings
- TCP/IP Sockets
- FTP
- Ethernet/IP

The host message is configurable in format and content. Each of the fields is configurable in size, position in the message, format (for example: right justified, fixed length, zero filled, etc.) and content where applicable.

OPERATING SYSTEM

The DWS System controller is based on a Windows operating system and may be configured to include common standard virus scanning software. Software updates are field upgradeable. Version control procedures are defined and provided with system. Firmware version is easily determined through system display.



USER INTERFACE

The controller provides a configurable host interface, configurable conveyor control and interlocks with adjacent conveyors and a user interface for operational status, configuration and visual system diagnostics. The controller supports a keyboard and swing-arm-mounted monitor for all operator interfaces. This figure shows a graphic conveyor system diagnostic screen.

APPLICATIONS

INVENTORY VERIFICATION & PUT-AWAY

DWS systems can capture or validate package data as input for WMS and other automated inventory systems. For example, DWS systems provide package data to Automated Storage and Retrieval Systems (ASRS) where accuracy is critical to the proper and efficient functioning of these sophisticated inventory and warehouse systems. By capturing dimension, weight and barcode data, DWS systems provide real-time verification of package characteristics against expected values. This figure shows an inventory system that supports ASRS.

TRAILER LOADING

Shippers use scan-and-dimension systems to capture specific package dimension data and feed that data to Warehouse Management Systems (WMS) or business analytics systems to optimize trailer planning and loading.

REVENUE RECOVERY

Package distribution carriers charge shippers based on the dimension and weight of packages they transport. Shippers may use in-house shipping systems provided by the carriers, which typically provide a scale and label printer. DWS systems for revenue recovery identify both weight and dimension data and, if necessary, adjust the charges for transporting a particular package and apply those charges to the shipper's account. In this way, automated revenue recovery systems realize among the fastest ROI in the industry.

In these systems, all components and integrated systems must have LFT certifications and must store package data (dimension, weigh and scan) in electronic "alibi" storage with data available for a defined time (typically 30 days).

FULFILLMENT VERIFICATION

After pick and pack operations, DWS systems are implemented to verify accuracy of pick by performing real-time package characteristic comparisons against expected carton size, weight and label information for a give shipping package. By capturing this data it allows for check points throughout the fulfillment process. Add-on functionality including reject divert, out-of-tolerance warnings and image capture/storage can be added to the scalable DWS system. An add-on diverter function is show in this figure.

SERVICES

CONCEPTING

This consists primarily of data collection to best understand system requirements and priorities. This important, collaborative process step allows Alstef Group to configure the DWS system to meet current and future business needs in the most efficient design possible.

SITE SURVEY

A site survey is performed early in the development / configuration process to ensure that all design requirements – both physical and functional – are fully understood.

INTEGRATION AND TESTING

Alstef Group performs all system integration as well as component and integrated system testing.

INSTALLATION

Alstef Group installs the DWS mounting frame, infeed conveyor, scale, dimensioner, scanner(s) and other hardware. Typically, the DWS owner is responsible for providing conveyor leading to and away from the DWS as well as power, communications, compressed air and other support requirements to the DWS install point.

START-UP

Once all system components are installed and cabling is complete, Alstef Group installs necessary functional software and performs acceptance testing. For LFT applications, it is typically required that a representative from the certification body perform testing to assure LFT compliance. The representative will typically affix a stamp or sticker identifying the LFT approval.

POST INSTALLATION SUPPORT

The DWS Controller includes a means for providing remote support via dial-in or web access. The DWS owner must allow for access to the system(s) via the network(s) in the facility and access to the network from outside the facility.