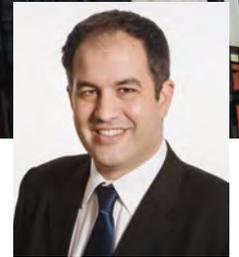




CONTAINER WEIGHING OPTIONS

A BUYING GUIDE

Simon Rush, Trimble, Auckland, New Zealand



 **Trimble**

There are many technologies available to port operations to achieve compliance with the new SOLAS amendment, including weighbridges and weighing systems for ship to shore container cranes, mobile harbor cranes, RTGs, straddle carriers, reach stackers and container handling fork lift trucks. Each of these options has pros and cons that will impact port operations workflow. Ports should consider the following criteria when considering options.

ACCURACY

Accuracy is generally defined as a margin of error from the true weight, either as a percentage (e.g. +/- 1%) or as a discrete error over the full scale (e.g. if the total range is 50 tonnes and inaccuracy is 1%, then the absolute weight inaccuracy is +/- 500 kg). This assumes correct operation of the system according to the manufacturer's instructions.

WORKFLOW DISRUPTION

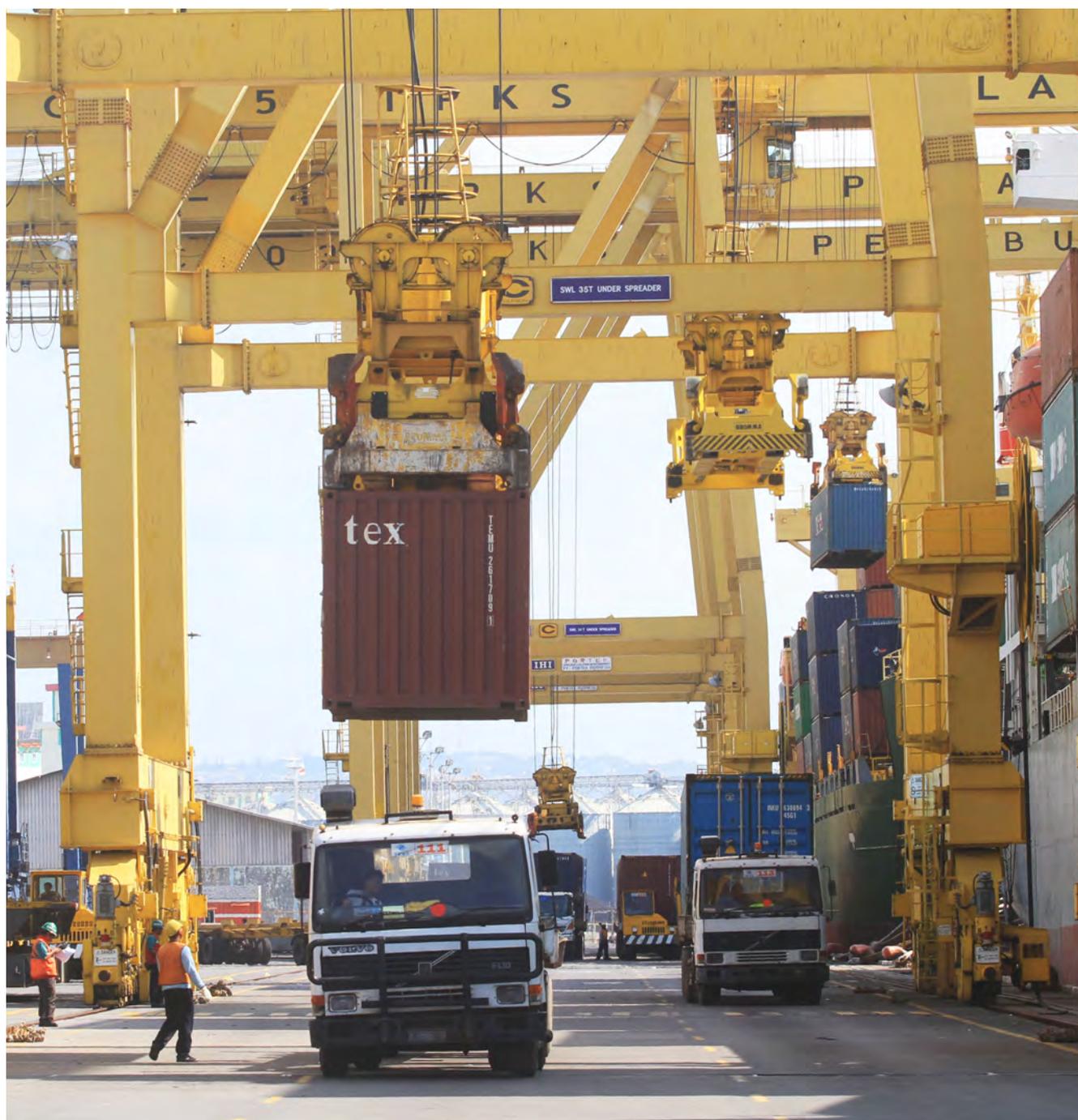
Ports should consider the entire activity of weighing as part of an overall workflow. The exercise of weighing is quite quick, but the supplementary activities may introduce delays or additional workload. When weighing, the systems will not only weigh the container, but in many cases all the hardware required to lift the container. A quay crane trolley operator will need to deduct the weight of the spreader and headblock, crane cables and ropes. Some reach stacker scale systems will have these pre-programmed so the operator can change out implements and automatically deduct from the total, which reduces human error.

Every container movement costs the port money, so reducing container handling as much as possible will reduce costs and lower the chance of misplacing the container. Weighing in the workflow should ideally be part of the standard operation, without interruption to the

operator or movements. When using weighbridges, ports should estimate the impact of additional return travel for the container to get to and from the weighbridge. During busy periods, line-ups at the weighbridge may cause delays that impact productivity. Allowing every container movement machine to measure weight allows more flexibility in the operation and prevents delays.

The actual event of weighing may also cause delays – technology requires that a machine comes to a complete stop in order to accurately measure weight. Across thousands of operations these pauses add up to losses in productivity. For example, some weighbridges require a truck to come to a complete stop to weigh. Axle weighbridges allow vehicles to weigh 'in motion' at speeds up to 9.5mph at a lower accuracy than a weighbridge: even this slowing of the truck causes a minor delay.

Containers must be individually weighed, so where multiple containers



are carried, they must be reloaded and weighed independently. Truck and trailers with two containers need to be separated as dual container lifters must be weighed one at a time. Additional movement of containers also creates a safety risk on the site that needs to be managed. Moving containers back and forth from a weighbridge may require containers to move from the stacking yard to the incoming access roads and thereby that could create vehicle congestion.

OVERALL COST OF OWNERSHIP

Installation costs for weighing technology varies, a surface mounted weigh bridge may add up to hundreds of thousands of

dollars including the preparation of the site, with ramps, pits and barriers. The land area required for a weigh bridge installation should also consider space required for turning circles, line-ups and a scale house and operator. A weigh bridge may also require additional staffing to operate, with on-going operating expenses.

When considering inland ports or small container depots, the cost of installation may be prohibitive.

SYSTEM LOCATION

Look for opportunities to be able to weigh a container as early as possible in your workflow, and also as late as possible in your workflow. This provides more

flexibility and reduces interruption to your process. Across your operation, a number of technologies may provide the best solution.

Weighing a container only when it is being loaded onto a vessel may be too late in the process as it becomes more difficult to update the ship stowage plan however it will allow verification of container weight and prevent any errors due to mis-declaration. Weighing the container as soon as it enters the facility may be a logical process, but may be more efficiently verified in the stacking yard.

COMPLEXITY OF INSTALLATION

Installation normally takes place during

Technology	Form factors
Weighbridge	Surface-mounted or pit-mounted weighing surface that weighs the entire vehicle
Load cells on ship to shore cranes	Load cells installed at rope ends on the crane trolleys or booms, in the sheave pins or rope system
Load cells on rubber-tired gantry cranes.	Load cells installed in the shafts of rope sleeves on the trolley or the rope anchors
Mobile harbour crane weighing system	Stability control for the crane depending on boom outreach, installed by manufacturer or after-market. Measure hydraulic pressure in the boom lift cylinders
Load cells on straddle carriers	Similar to container crane load cells systems
Reach stacker on-board scales	Pressure transducers measure changes in hydraulic oil pressure and sensors measure boom angle, boom extension and machine chassis angle
Container handling fork lift trucks (FLT)	Measure hydraulic oil pressure in the lift cylinders, or use load cells under the chain anchors
Crane spreader twistlock weighing systems	Measure load weight on crane spreader twistlocks

Weighing technology options

Weighing technology	'Legal for trade' available	Weighing accuracy	Workflow disruption
Weighbridges	Yes	0.2~ 0.5%	Disruptive
Load cells on ship to shore cranes	No	3-5%	Non-disruptive
Load cells on Rubber gantry cranes (RTGs)	No	3-5%	Non-disruptive
Weighing systems on mobile harbour crane (MHC)	No	5~%	Non-disruptive
Load cells on straddle carriers	No	5%	Non-disruptive
Reach stacker onboard scales	Yes	1-3%	Non-disruptive
Container handling fork lift trucks (FLT)	No	5~%	Non-disruptive
Load sensing systems using spreader twistlocks	No	0.5~1%	Non-disruptive

Weighing technology comparison

the purchase and delivery process of a new machine, and may be installed before the machine is delivered to the customer. Local suppliers of weighing technology should be able to cover all the requirements of the installation without the machine being out of action for more than a day. Ask your supplier if they expect to have a simple installation as without details of some machine components (e.g. RTG sheaves and shafts) additional complexity may be introduced during the review of the installation.

DATA COLLECTION AND REPORTING

All weighing technologies will have a method to capture the container reference and weight on a printed ticket or report. Some technologies will also centralise this data in a central store for future reference or analysis. Traditionally, these technologies will be software-based, now ports can choose to access data anywhere at any time in a secure centralised web environment that doesn't require the installation of software.

CERTIFICATION AND CALIBRATION

Container weighing technology must be

certified if the weight data is to be used for commercial transactions, also known as 'Legal for Trade'. A certified system has to meet national regulatory requirements and the individual system has been tested and approved by the local authority or companies designated to inspect the system. In some cases, this service may be performed by the installing technician.

Of all the weighing systems available, certifiable systems can include weighbridges and reach stacker scales. Ask your supplier to provide documentation that attests to certification or Legal for Trade status. To maintain certification the system should be re-tested at regular intervals to ensure that no inaccuracy has been introduced. Finally, when comparing options, consider the frequency and cost of recalibration.

COMPENSATION

Weighing systems are subject to a range of environmental factors (e.g. temperature change) and operator factors (poor lifting technique, incorrect operation) that may compromise accuracy. Hydraulic measurement systems may compensate for changes in the consistency of hydraulic

ABOUT THE AUTHOR

Simon Rush is the Marketing Communications Manager for Trimble Mining | Aggregates | Weighing Division. He has five years' experience in the weighing industry across quarries, mines, civil construction, waste, ports and intermodal logistics. His background is in power electronics and construction, and lives in Auckland, New Zealand.

ABOUT THE ORGANISATION

Trimble applies technology to make field and mobile workers in businesses and government significantly more productive. Solutions are focused on applications requiring position or location—including surveying, construction, agriculture, ports, marine, fleet and asset management, public safety and mapping. Founded in 1978, Trimble is headquartered in Sunnyvale, California.

ENQUIRIES

www.trimble.com.