



POV

# Optimization of Logistic Process with **Automatic Bag Counting**

Logistics plays a vital role in the cement industry by striking a fine balance between the supply and demand ratio. To leverage the vast production and dispatching capabilities of these cement plants, smooth logistics processes for loading, counting, weighing, and dispatching bags are critical. The cement is normally packed and dispatched in paper/plastic bags. In most countries, where there is large production and demand for cement, it is very important to finish the dispatch process within a short period to make sure customers get their products on time.

In the biggest plants, a few hundred trucks are dispatched daily. It becomes difficult to process them when bags are counted manually. Hence to achieve these figures, operators need to have automated systems to lessen the errors. A lot of fraud happens during this stage in some of the cement plants. During manual counting, if the operator makes errors, the truck is required to reload them, which consumes time, costs, and effort. The reload process creates several difficulties in the exchange and validation of the information from the purchase orders (present in the ERP) to the packing plant operator.

To satisfy the customer's expectation and timely delivery of cement, the plant needs to make sure that the number of bags requested by the customer for each particular order is correctly counted in the shortest time possible. Considering all these limitations and challenges, there is a requirement for an automated solution to count the bags. This will improve the entire process of loading and counting in cement plants.



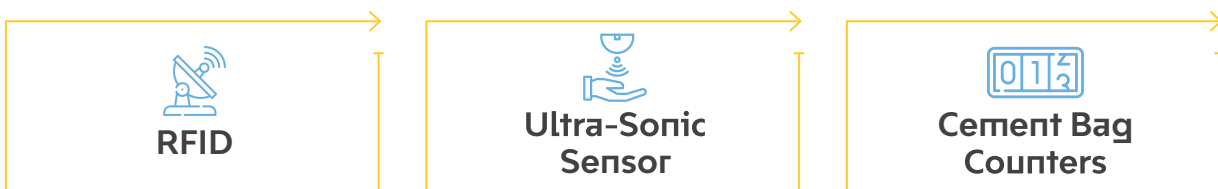
## What could be the solution?

One of the solutions is to fix a camera near the conveyor belt and take the picture of each passing bag. Then those pictures will be processed through another program that keeps updating the bag count. However, due to the cement powder at the loading bay, the area is normally very dusty and hence, the cameras don't last long and people find difficulties using this solution.

Another solution is to use sensors and controllers together. A system can be built to automatically count the cement bags while they are being loaded into the truck. Even these solutions can be used when the truck is loaded. Positioning sensors additionally can be used to track the vehicle, while the delivery is made and check any human interference with the cement bags.



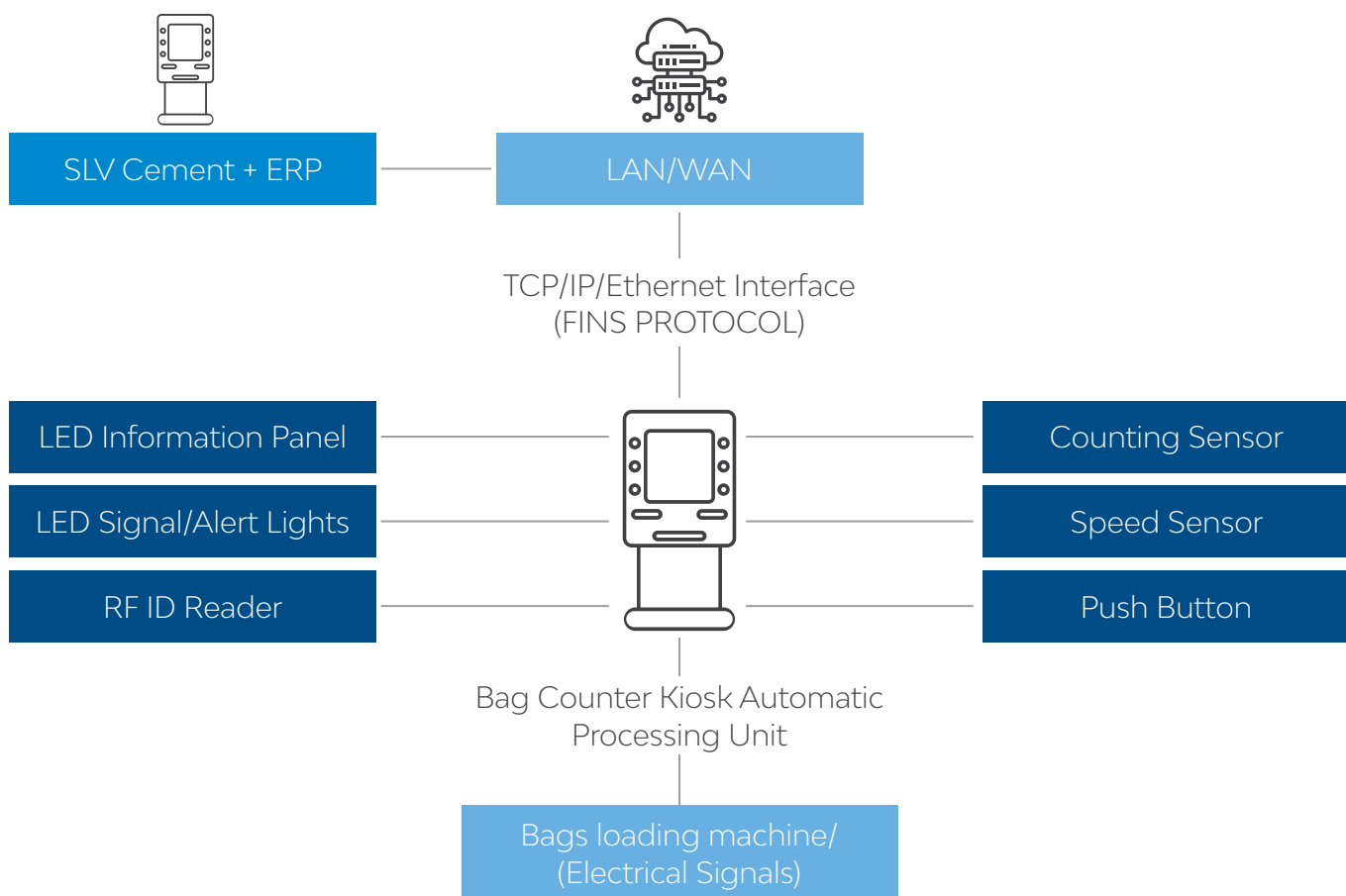
There are varieties of solutions available in the market, which count the bags automatically. Some of the examples are listed below:



## RFID

The system consists of a module that counts the cement bags while they are being loaded into the truck. The system ensures an accurate counting even in abnormal cases, such as bags being joint, and it relies on a proprietary algorithm developed by Cachapuz Bilanciai Group. This algorithm considers the characteristics of the bags, the speed of the belt, and the type of conveyor belt or the truck/wagon loading machines installed in the cement plant to count every bag.

This system consists of an SLV Cement Bags Counting Kiosk installed in each loading line, which is RFID activated, controls the speed and counting sensors, and uses alert lights and information panels to inform the operators about the status of the loading and counting processes.



This module can also be integrated with the customer's ERP. Hence, it automatically exchanges information about the number of bags associated with the loading/purchase order in the ERP and loading memo, and the number of bags loaded into each truck or wagon.

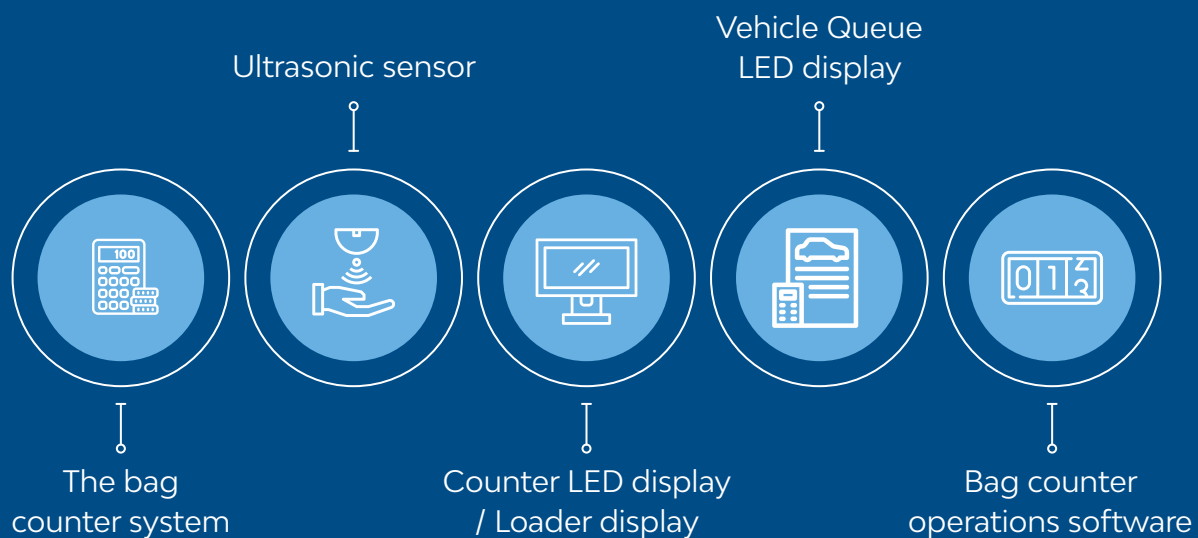
Along with automatic and accurate counting, this module generates and registers a set of data. This data will be aggregated to deliver comprehensive reports and KPIs like:

- ▶ Number of bags loaded per operation (and excess loading, to monitor destroyed bags).
- ▶ Start/end date and duration of each operation.
- ▶ Statistics and performance per loading line (speed, average time per loading, etc.).
- ▶ Statistics per loading line/shift.
- ▶ Quantities per product/customer/transporter.
- ▶ Anomalous operations (operations with speed sensor deactivated, an abnormal number of bags jointly detected, etc.).

## Ultra-Sonic Sensor

This solution uses the ultra-Sonic Sensor for accurate bag counting, which consists of a live LED Display<sup>[2]</sup>. Loading can be started automatically using an RFID reader. The user can set the number of bags to be loaded into trucks before the loading process begins. Once the loading process starts, it displays the information of the number of bags counted. This solution also has features to manage the vehicle queue and report rejected and torn bags.

This system consists of the following hardware components:



## Cement Bag Counters

There are a variety of options available to count the cement bags in the packing and dispatch section of the cement plant. Some of them are with large size bright displays to view them from a distance. The bags moving on a conveyor belt can be counted and be displayed at a required location. If required, this count can be transferred to a remote location with MODBUS connectivity. The input count pulse for such counter is received from a switch or sensor which is specifically offered for counting the product. Various types of sensors are also available like inductive proximity switch, photoswitch, infrared sensor, ultrasonic switch, encoder pulse, etc.,

There are some digital bag counters available. These are automated instruments used to get an exact counting of the bags. It has a sensing head attachment fitted on the spiral chute/ conveyor or loader of the unit. These devices display the number of bags loaded in the truck or wagon by respective loaders, with programmable counters to generate predefined signals after the counter figure is attained. Non-ohmic contact output is available for connecting external control devices.

The instrument consists of:

- ▶ Microcontroller based, Switch Mode Power Supply Unit (SMPS).
- ▶ Keypad for programming, counter-setting, and resetting.
- ▶ Seven segment display units for displaying the running count.
- ▶ Use of highly durable sensing head, instead of conventional optical sensors .
- ▶ Proximity switches give better results, longer life in dusty (cement industry), and rough industrial atmosphere.

## Conclusion

Using an automatic bag counting solution, the loading time gets reduced drastically, and hence, more trucks/dispatches can be done in a day. Customers get their products on time. Some of the other advantages of doing this automation are as below-

- ▶ Accurate bag count.
- ▶ Avoiding the trucks' return to the packing plants to add or remove bags due to an incorrect number of bags loaded.
- ▶ Detection and counting of joint bags.
- ▶ Identify the extra bags loaded.
- ▶ Elimination of manual counting of bags hence loading is fast.
- ▶ Reduction of paperwork and manual operations.
- ▶ Reduction of human errors.
- ▶ Avoid fraud.
- ▶ Reduction of TAT of the loading and counting processes.
- ▶ Extra control due to an external speed sensor.
- ▶ Information panel and alert lights to indicate the status of the operations can be achieved.
- ▶ RFID activated to enable the automatic identification of the loading operation.
- ▶ Possibility to automatically control the loading machine.

### **Additional features that can be added**

- ▶ Detailed logs and reporting.
- ▶ Alerts and notifications through email/SMS.



## About the Author

### Shivaji Gadhave

Associate Director -Projects, LTIMindtree

Shivaji has 20+ years of experience in the IT industry with 7+ years in the Oil and Gas Industry managing upstream and downstream IT applications and 9+ years of experience in the Cement manufacturing Industry managing and implementing logistic process-related IT applications. He has experience in Delivery Excellence, Customer Relationship Management, Strategic Planning, People Management, Change Management, Forecasting, Budgeting and Vendor Management.

## References

1. <https://www.slvcement.com/case-study-archive/automatic-bags-counting-solution/>
2. <https://www.imagicsolution.com/Cement%20Bag%20Counting%20System.php>
3. <https://www.smartsaa.co.in/bag-counter.html>

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