



Dust Control and Loading Systems Inc

Leaders in Innovative Bulk Loading Systems Design

CASE HISTORY

Technology Breakthrough Fully Automated Loadout Terminal

BULK LOADOUT AUTOMATION

By Lon Rice - Project Manager, Hanson Cement

Hanson Permanente Cement in Cupertino, California has successfully completed three fully automated bulk cement truck loading systems. This facility loads, hands free, between 150 to 400 trucks per 24 hour period. This new operator free system can load both semi-trucks and tandem trailers in less than 6 minutes from the start of truck entry until the truck exits the scale.

Hanson's upper management wanted to upgrade the bulk loadout to match the rest of the plant. Customer convenience and safety were the key issues in this project.

The goals were to:

- **Clean up the area** -- The area was constantly wet and muddy due to water leaks and poor drainage. There was a old lime plant in the area and the equipment obstructed traffic flow.
- **Reduce the loading time** -- The existing spout system could not be moved to reach the truck position, therefore the trucks had to move back and forth to line up with the spouts.
- **Make the system more customer friendly** -- Customers had to exit their trucks and carry the cement order up a set of stairs to the operator, loading was slow and inaccurate.
- **Increase safety** -- Keeping the drivers in their trucks would make the loading operation safer for the drivers.



Trucks are loaded dust free at rates to 1000 TPH.



Typical equipment arrangement for fully automatic loading.

The ideas were great, but there were many unknowns. So it was decided to do the work in two stages.

First Stage

- Demolish the old plant silos.
- Dig up the lime plant foundations.
- Reroute the gas line.
- Repair the water leaks and remove the mud.
- Lay down a new asphalt staging area.

Second Stage

- Build a fully automatic loading system without interrupting the flow of traffic.

This was the hard part. We knew what we wanted to do. The basic design had been drawn up and approved, but no one had built a fully automatic loadout station before. Most of the software for this endeavor had to be written specifically for the application. The Vision System used to scan the top of the trucks had not yet been adapted to a carriage and spout assembly and every truck is different. Card readers were not new, but using them to run a computer operated system was very complicated.

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Versatility was a primary requirement. This system was made to accommodate any truck configuration that could fit under the holding bin and onto the scale. Load rates, quantities, and percentages are varied automatically for each truck. The system even knows if there is product remaining in the trailer from a previous load.

Driver safety being an issue in all cement plants necessitated that we build a facility that would limit the requirement for the driver to exit his truck at the weigh master's office and at the loading scales. Drivers walking around the loadout area are in danger of being hit by mobile equipment and plant equipment. RF card readers are used to allow the driver to communicate with the loadout computer. The driver need only get the card within 3 feet of the reader to activate data transfer.

Every component was designed to minimize customer waiting and loading time. Keeping the driver in his truck cuts loading time loss due to drivers visiting when they should be loading. The spout being able to locate the trailer hatch has totally eliminated the trailer alignment time. The system was designed to place cement in the trailers as fast as air can be extracted from the cement. This appears to be at a maximum flow instantaneous rate of 1000 tons per hour. Above this flow rate the trailers tend to overflow before the full load can be placed. Before the installation 10% of the customer's trucks were over or under loaded, causing delays in loading and extra cost to the customer. After the installation, over and under loads are close to zero.



Driver never leaves his truck.

The SmartLoader being able to locate hatch openings has solved the problem of truck drivers having problems lining up with the spout. Using the articulating airslide, the spout travel dimensions could be any thing required to service our customers. In our case the spout covers a rectangular area 35 feet by 2 feet. There is no limit to the location and/or number of hatches the system can be set to manage.

The loadout system is driver friendly. Drivers only need to know where the loadouts are located and how to use the RF cards. Everything else is automated and intuitively placed such that drivers can follow flow and get loaded with out any additional assistance. First time customers are given a very short explanation by the weigh master. This has proven to be more than sufficient for the last year of operation.

Physically, the loadout systems consist of a weigh master's office, cement holding bins, truck scales, articulating airslides, dust collectors, computers and the SmartLoaders which are the heart of the system.

LOADING SEQUENCE

The loading process is as follows; customer's truck enters the plant and stops at the weigh master's drive up window. The weigh master issues the driver a RF card. The card is used by the driver to gain access to the loadout and the computers, obtain loading information from the server and to track the loading operation. The driver proceeds to the appropriate loadout where, without exiting his truck, he flashes the card at the RF card reader. Traffic lights guide the truck onto the scale. Once the truck is in place, DCL's patented Smart Spout Vision System scans the top of the vehicle locating valid open hatches and automatically places the spout in the trailer's first open hatch. The fully automated on-scale loadout system feeds weight data to the host control system for cement flow modulation. When the first hatch is full the spout automatically moves to the second and third hatches filling them in the same manner. When the filling of the trailers is complete, traffic lights signal the trucks to exit the scale. The weight and time data are transferred electronically to the weigh master's office. When the customer reaches the weigh master's office, he places the RF card in a slot and the computer prints out the BOL to the driver. Daily sales data is forwarded to our main frame computer each night via modem.

*Lon Rice / Project Manager and
Reinhard Matye / DCL President.*



There were a number of contractors and vendors involved in the design and supply of the equipment used in this project.

- Bentley Engineering Civil, structural, mechanical design and construction management.*
- DCL, Inc Cement handling equipment and SmartLoader System.*
- Engineering Systems, Inc Electrical design.*
- Engineering Systems Integration, Inc Software and computers.*
- Pacific Processing Civil, structural and mechanical installation.*
- Contra Costa Electric Electrical installation.*
- JWS Ticketing and data transfer software.*