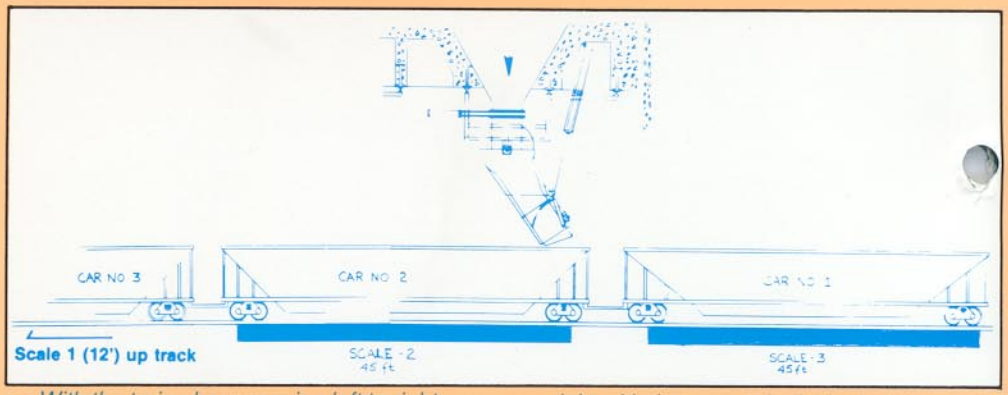
PEBCO®

LOAD CONTROL SYSTEMS

Our world, the world of moving and loading bulk materials, is in a state of accelerating technology, thanks in major part to PEBCO® research and development. In the 1960s, our engineers and management foresaw that the colliding pressures of regulations vs. economics were going to force a new loading technology to emerge from the bulk materials loading and handling industry. At that time PEBCO® began to design the bulk loading systems of the future. Those loading systems are now, in the 1980s, at work all over the world, loading with amazing speed and weight accuracies, in totally automated environments. PEBCO® has led the growth cycle that produced these loading and weighing advances, and is one of the few companies in the world that moves with complete authority in the area of bulk loading sciences.

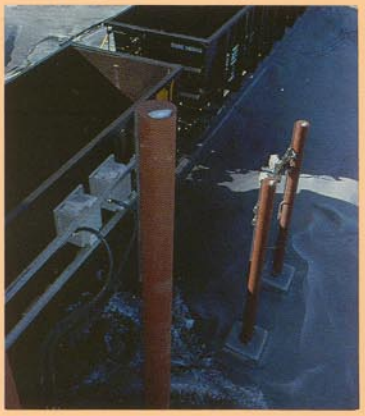
The new load technology addresses, and solves, the persistent problem of bulk loading — how to load at great speed, while measuring the weight and symmetry of the load very accurately. This accuracy of weight is paramount in today's environment, as transportation regulators put strict caps on weight per car size, and shippers demand no less than the maximum weight allowed per car. Coupled-in-Motion Weighing and Batch Weighing are two loading techniques that have been designed to reconcile these needs.

Coupled-in-Motion Weighing is an apt description of this weigh system. The cars of a unit train may be weighed and measured by track scales and scanners while coupled together and moving. A sophisticated computer calculates the optimum load weight for each individual car, and controls material delivery to the cars by actuating the chute above them as they move through the loading area.



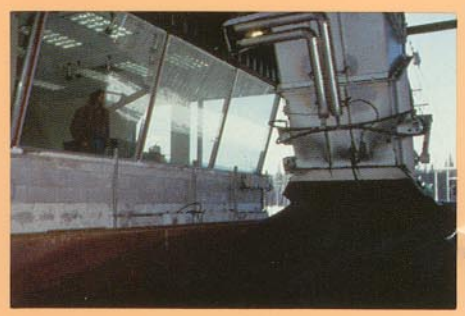
With the train above moving left to right, the front end of the car to be loaded is just under the chute. The position is detected and the chute automatically swings down into position, ready for loading. As soon as the chute is lowered, the gate is automatically opened and flood loading of the car begins. At this time, no weights are being taken. The car proceeds across the scale, and the first truck of car #3 has moved onto Scale 2. The chute is approximately in the center of car #2. Scales 2 and 3 are being used to determine the gross weight of the car and to compare that weight with the pre-set individual car "target"weight to control the cut-off point. In addition to car #2 being on Scales 2 and 3, the front truck of car #3 and the rear truck of car #1 are also scaleborne. The computer automatically calculates the actual weight of car #2 as follows: the weight of the rear truck of car #1 is subtracted from the weight recorded by Scale 3. Similarly, the front truck of car #3 is subtracted from the weight recorded by Scale 2. The two remainders are then added to give the actual weight of car #2.

A PEBCO® coupled -in-motion system serves this large coal mine with 8000 TPH capacity.



Output signals from detection equipment allow the computer to control the flood chute above the moving cars.

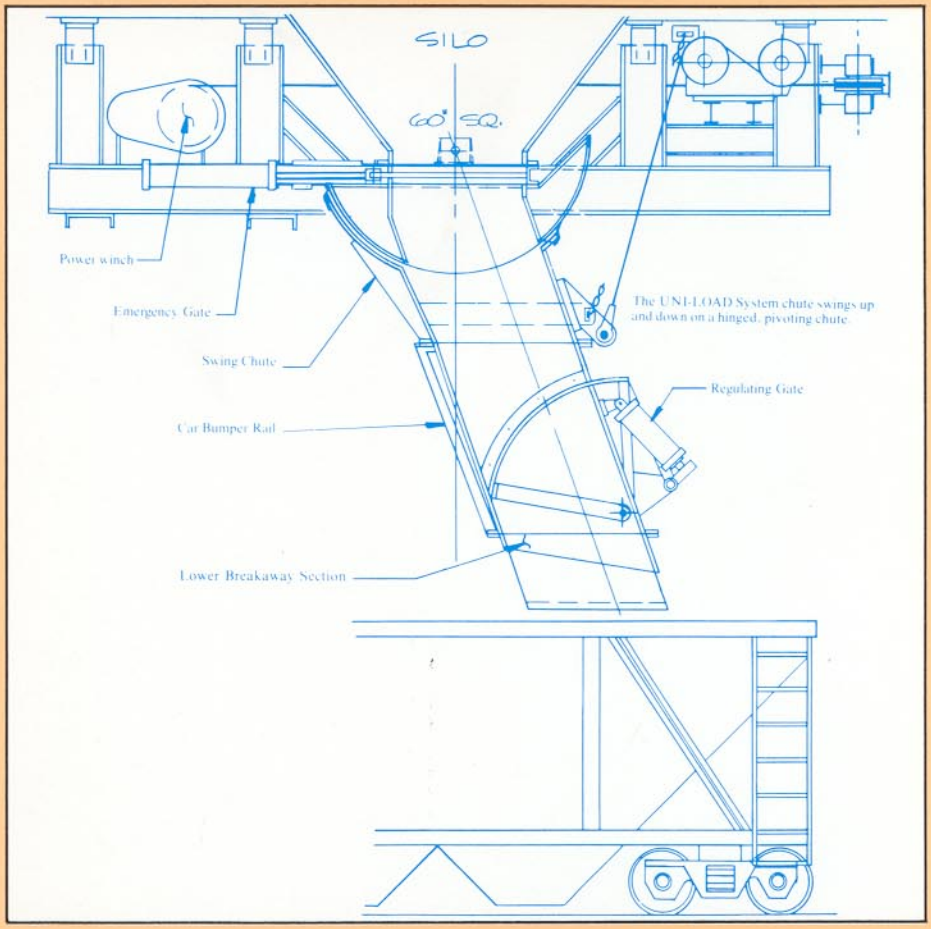
Operators monitor loading as computers gather data to deliver pinpoint loads.



Flood gates automatically close as the target weight is reached.

Coupled-in-motion weighing, as sophisticated as it is, would not be wholly effective unless it were used with a mechanical loading system that could activate as rapidly as the computers demanded. The old, slow traversing chute systems simply could not keep up, and would handicap the system's speed severely. PEBCO® engineers overcame this problem with their introduction of the UNI-LOAD® * system.

It is a mechanical loading system that features a unique, hinging and pivoting chute that has enabled operators to load coal unit trains in just over half an hour, and load as many as 11 unit trains in a 24-hour period.



The unique features of the UNI-LOAD® system are as follows:

The Chute — Rather than traverse horizontally from a side ("clear") position to a "load" position over the car, the UNI-LOAD® system chute is fixed in position directly over the car. When loading is required, the chute quickly swings downward on its hinged pivot.

The Gate — The non-jamming gate that regulates coal flow has been moved from a position at the top of the chute to the bottom of the chute.

These two changes, to the chute and the gate, radically alter traditional loadout expectations and improve the system in these important categories:

Speed — The UNI-LOAD® chute swings from "clear" to "load" in about five seconds, much faster than conventional designs. The regulating gate can be actuated in two seconds, giving the loadout operator virtually unlimited control of the load. With this control comes operator confidence and faster loading times.

Uniformity of load — The positioning of the gate at the bottom of the chute eliminates the problem of "in-transit" coal, i.e. coal travelling down the chute after the load is shut off at the top.

Maintenance — The simple design of the UNI-LOAD® arrangement requires fewer moving parts than traditional designs and substantially less structural steel. The design of the pivot chute provides protection against accidental contact with locomotives or moving cars.

Dusting — Because the material is dropped only the short distance from the gate at the bottom of the chute into the car, dusting is dramatically reduced and , in some cases, eliminated.

Safety — The precise flow available with the UNI-LOAD® system allows a safer operation. Even should an accident occur, the chute can be raised and the flow of material can be cut off.

At the operator's command, this gate activates from fully closed to fully open in seconds, giving pinpoint control to the operator.

Because the material is dropping only a short distance from the gate at the chute bottom to the car, dusting is dramatically reduced.

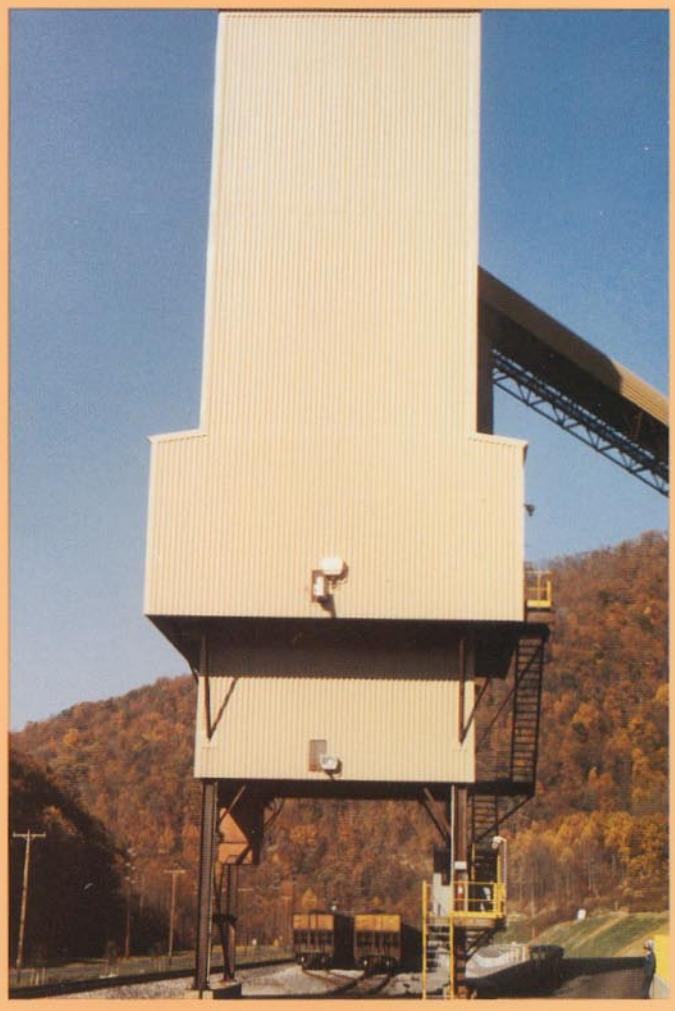
Uni-Load® plays a significant role in the effectiveness of the other advanced loading technique, Batch Weighing.

A batch weigh system utilizes a weigh bin to measure precisely a pre-determined amount of material to be loaded into truck or rail cars. The target weight is determined by means of computer calculations prior to load. Batch weigh systems are capable of static weight accuracies of 0.1% at a load rate of 7000 TPH.

Dynamic load control accuracies have been improved significantly by using the Uni-Load® with the flow control gate at the bottom of the chute and a loss-in-weight or weigh down mode for the electronics. The load control accuracy with the Uni-Load® has been documented at plus or minus (±) 500 lbs. for 90% of the rail cars loaded.

A typical batch weigh sequence would work as follows:

To initiate a load, the surge bin gates open to fill the weigh bin above the load chute. A precisely-measured batch of 100 tons, for example, would fill in about 10 seconds. When the fill is complete, a "ready" light is illuminated on the operator's control panel. With the rail car and the load chute in position, the weigh bin discharges, and continues as the car passes through the load area. When the weigh bin is empty, the computer closes the discharge gate. The computer automatically subtracts the car's empty weight from full weight, and records this net weight of delivered material in its memory. The surge gates automatically refill when the computation is recorded. This sequence continues until the computer recognizes the last car, at which time the re-filling procedure is stopped, and the batcher prints out the grand total in pounds.



(Right) A PEBCO® batch weigh system loading coal at 4000 TPH at an eastern United States mine. (Below) Controls for a sophisticated blending system, combining raw coal and clean coal to a PEBCO® loadout. (Below,inset) Interior of a control panel for a large western coal mine. Panels such as this can automatically control sampling systems, conveyors, belt scales, batch loading, blending and dust collection.

American industry's move to *automated* systems has now reached the bulk material handling field. The breakthrough facility was one designed by PEBCO® for the power generation plant in the city of Springfield, Illinois. This system weighs incoming coal trucks, batch-loads coal into those trucks and transmits the loading data both to the mine's central accounting computer for billing, and to the end user. In this loading sequence, the truck driver never leaves his cab, and it is accomplished without the need for an operator in the control room.

1. The truck enters a pitless truck scale; the driver inserts a plastic card into the card reader. The card records the driver's name, tractor size, load information and other specifics.

2. When this information is verified by the computer, the driver receives a green light and proceeds to the loading station under the 80'-tall loadout structure.

3. The batch is automatically determined by the information on the driver's card and his weight on the scale. The UNI-LOAD ® chute moves from a "clear" position...

4. ...to a "load" position when the batch is ready to be delivered. More verification of truck position and trailer configuration is being done by photo-electric cells.

6. When loading is complete, the driver receives a flashing green light. As he proceeds, the ticket printer gives him a record of the load just completed, and his cumulative daily total.

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