



Leaders in Innovative Bulk Loading Systems Design

Dust Control and Loading Systems Inc

## Aeration Conveying Equipment

**CONVEYORS ● BIN BOTTOMS ● LUMP TRAPS  
TROUGHS ● SILO PENETRATION ADAPTORS  
ROTARY THROTTLE & VERTICAL SLIDE GATE VALVES**



**ADIPIC ACID, ALUMINA, BENTONITE, BARIUM SULFATE, BAUXITE, CALCIUM CARBONATE, CALCIUM PHOSPHATE, CARBON BLACK, PORTLAND CEMENT, CLAYS, PULVERISED COAL, DOLOMITE, FELSPAR, FLOUR, FLOURSPAR, FLY ASH, FULLERS EARTH, GYPSUM, IRON POWDER, KAOLIN CLAY, LIME, PULVERIZED LIMESTONE, MAGNESIUM OXIDE, MAGNETITE, MAGNESITE, PULVERIZED ORES, PERLIGHT DUST, PETROLEUM COKE, PHOSPHATE DUST, PLASTIC POWDER, PVC RESIN, POTASH, POZZOLAN, PYROTOL, FOUNDRY SAND, SEMOLINA, SILICA, SODA ASH, SODIUM BICARBONATE, SODIUM SULFATE, STARCH, STUCCO, TALC, TEREPHALIC ACID, WHITING, ZINC OXIDE**

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Aerated bin bottom discharging into a conveyor with slide gate valves.



Aerated distribution box with four discharges.



Aerated lump trap with slide gate valve.



## AERATION EQUIPMENT OVERVIEW

Under normal conditions a powder runs down a chute only when the slope exceeds the natural angle of repose of the powder. A fluidized powder however, runs down a chute which has an angle much less than the natural angle of repose of the powder. The principle of air gravity conveying involves the reduction of the natural angle of repose of a pulverized material to a fluidized angle which is slightly less than the angle of declination of the conveyor. This is accomplished by passing low pressure air through a porous membrane and into a bed of pulverized material.

A large variety of materials are handled on aeration conveyors regardless of their abrasive nature or bulk density. The only criteria is particle size and moisture. Generally, a product should have a particle distribution of 100% through a 20 mesh screen. It is possible to convey coarser materials provided there is a greater percentage of fine material to fill the voids. Free moisture content should be below 1%, however materials with higher moisture contents have been conveyed. With some materials, the characteristics of particles may make aeration impossible or uneconomical. A powder that can be fluidized usually possess the characteristic of flowing freely through the fingers, feeling clean and dry, and not flaky or fibrous.



## AERATION CONVEYORS

Aeration conveyors are used to convey products from point A to point B by using aeration and gravity. Minimum suggested conveyor angle is 8 degrees, but may be as low as 6 degrees depending on product material type. Turning boxes, headchutes, and distribution boxes are available to use in conjunction with aeration conveyors.

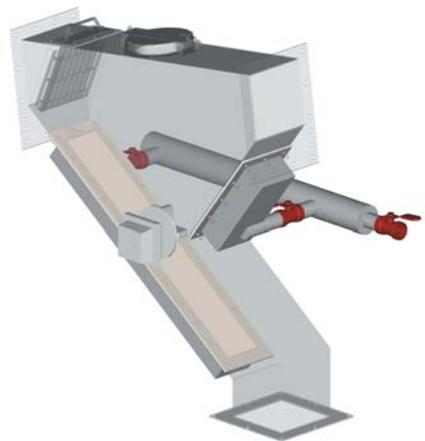


DCL offers a large selection of aeration conveyors from 6 inches [152 mm] wide up to 36 inches [914 mm] wide and conveying capacities up to 1000 cubic feet per minute [28.3 m<sup>3</sup>/min]. Conveyors also are available in a high top or low top design allowing for maximum flow rate or minimum head room depending on the application.



## AERATED LUMP TRAPS

Aeration lump traps are a ideal when large lumps are present in material. Lumps are generally created in the silo by moisture and are typically unacceptable for the consumer's vehicle being loaded. The lump trap eliminates large lumps by creating a gravity trap in-line with a aeration conveyor. This is accomplished by passing low pressure air through a overlapping configuration of porous membrane media and into the bed of the material being handled. Heavy lumps fall and are caught in the bottom of the lump trap which automatically empties using a level sensor accompanied by a series of slide gate valves.



DCL offers a selection of aeration lump traps from 6 inches [152 mm] wide up to 36 inches [914 mm] wide and conveying capacities up to 1000 cubic feet per minute [28.3 m<sup>3</sup>/min]. Lump traps also are available in a high top or low top design allowing for maximum flow rate or minimum head room depending on the application.

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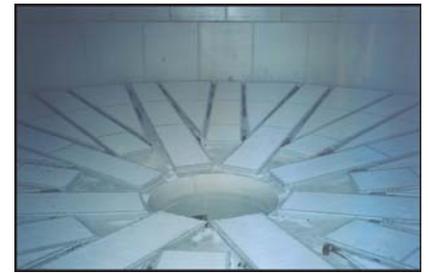
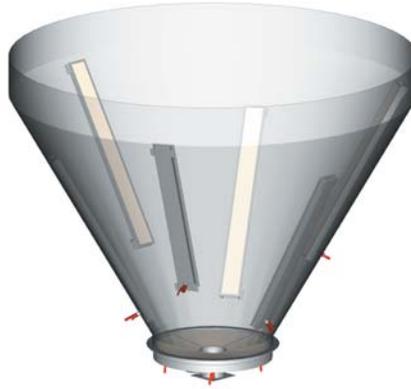
## AERATED BIN BOTTOMS AND TROUGHS

Aeration bin bottoms are used to promote consistent product withdrawal from large diameter flat or conical bottom storage silos.

DCL offers a large selection of aeration bin bottoms from 2 feet [610 mm] in diameter up to 16 feet [4.9 m] in diameter. Bin bottoms are also available with custom discharge configurations allowing for multiple conveyor runs from one silo.

Troughs are typically mounted inside the conical section of the silo and are equally spaced along a 360 degree pattern. However they can also be used in flat bottom silos and only require a 6 degree slope from the inner silo wall of the silo to the discharge point.

DCL offers a selection of aeration troughs from 6 inches [152 mm] wide up to 24 inches [610 mm] wide.



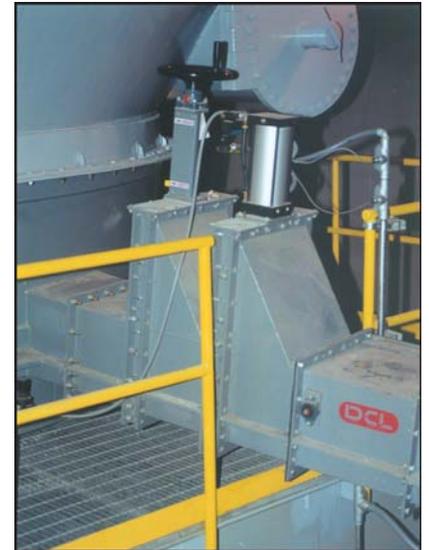
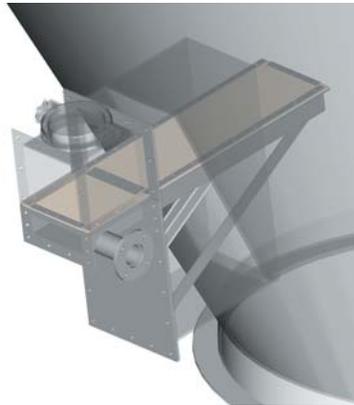
30'-0" diameter fully aerated flat bottom silo using aeration troughs.



## SILO PENETRATION ADAPTORS

Aeration silo penetration adaptors allow material to be withdrawn from the side of any silo. They can be easily retrofitted in the field to existing silos when silo bottom discharges are not possible.

DCL offers a large selection of aeration silo penetration adaptors from 6 inches [152 mm] wide up to 36 inches [914 mm] wide and conveying capacities up to 1000 cubic feet per minute [28.3 m<sup>3</sup>/min].



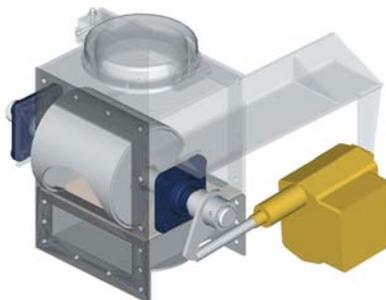
Vertical manual and pneumatic slide gate valve.



## FLOW CONTROL VALVES

Rotary throttle valves are an excellent means to control material flow while air gravity conveying.

The rotary throttle valve uses a rotary parabolic blade that allows for a low profile design that delivers precise flow control. A 4-20m electric actuator is used to actuate the valve when real time infinite positioning is required. If real time infinite positioning is not required DCL uses a pneumatic actuator with a 3 position positioning package.



Aeration conveyor run.

Vertical slide gate valves are used in applications where a material flow shut-off is required in air gravity conveying applications. The vertical slide gate uses a Blanchard ground chamfered blade. Not only can it be used to shut-off material flow, it can be used as a flow control.

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## CAPACITIES

Aeration conveyors can handle products varying in bulk density from 5 to 200 pounds per cubic feet at capacities to 55,000 cubic feet per hour. Materials will expand in volume or decrease in bulk density while in the aerated state. A "Rule of Thumb" for calculating material expansion is to use a density decrease factor of .66. In other words, cement weighing 90 PCF at rest would weigh  $90 \times .66 = 60$  PCF in a well aerated state. It is important to keep this in mind when selecting the conveyor size.

Approximate conveying capacities in cubic feet per hour are listed below.

Conveyor Size	6	8	10	12	14	16	18	20	22	24	30	36
Cubic Feet Per Hour	1500	4000	5000	9000	12000	15000	21000	27000	33000	39000	57000	75000

## ANGLE OF DECLINATION

Since one of the purposes of using an air gravity conveyor is to obtain near horizontal conveying, the angle of decline is usually held to a minimum, consistent with low fluidizing air flow and pressure requirements. Fluidizing characteristics determine the minimum slope of the conveyor. Most product suitable for air gravity conveying are handled on a conveyor sloped at between 6 and 12 degrees. The slope can be reduced to 1 or 2 degrees for product which have excellent fluidizing characteristics. Please note that there is no limit as to the length of any conveyor, so long as the proper slope is available.

## FLUIDIZING AIR

The volume of free air required for most applications is approximately 10 SCFM per square foot of conveying media when handling a product like cement, fly ash, phosphate rock dust, and lime products. However the air requirements may vary for other materials from 4 to 15 SCFM per square foot. In conveying alumina and bauxite, the air requirement for fluidization can be as little as 4 SCFM. Please be aware that there is no definite formula for calculating the volume of free air required. In order to establish the proper air requirements for materials not previously handled, DCL offers testing at their facility. The pressure required to convey a material having a loose bulk density of approximately 70 PCF or less is about 20 inches of water gauge in the plenum chamber while materials having a loose bulk density over 70 PCF will use 27 inches of water gauge. Air pressure for open type conveyors installed in silos or hoppers are generally determined by the head of product over the conveyor. A head of 2 FT = 1 PSI; 2-15 FT = 2 PSI; 15-25 FT = 3 PSI; 25+ FT = 6 PSI. A general exception to this rule is alumina for which a pressure of 3 PSI is adequate regardless of head.

Low pressure of up to 1 PSI can easily be supplied by a centrifugal blower. Pressures greater than 1 PSI should be supplied by a positive displacement blower. A high pressure air compressor or plant air is not recommended for use in supplying fluidization air as this source is considered "dirty air" meaning the presence of water and oil. The prevention of blockage of the porous membranes such as dirt, oil or moisture on the underside of the aeration media is so important that special attention should be given to the selection of air filters on the supply units. The best type of filters are an oversized, washable, dry type filter having a felt media. An oil wetted filter is not recommended. The filter selected should include a weather hood or screen depending upon blower location. Under no circumstances should the air blower be operated with the filter removed.