VOLTA BELTING Technology

Conveying Solutions

Volta Alternatives to Bucket Elevators

The Next Step in Belting

Bucket elevators are used in many food processing factories to move primary dry and bulk materials. They usually have a vertical section and sometimes additional horizontal sections for in-and/or out feeds.
When the elevator consists only of vertical elements for lifting and descending, the buckets can be bolted or riveted to a friction belt of canvas or rubberized fabric. When the infeed is horizontal, the buckets are adjacent one to another to ensure all the product is fed into them. They are assembled on a chain drive running on either side.
Vertical elevators are commonly used in the tea industry, as well as cereal, coffee, cocoa powder, salt and other bulk applications, both in the food industry and elsewhere.

A battery of friction driven bucket elevators used in elevating tea leaves

Vertical and second horizontal sections used in elevating cereals

Chain driven continuous buckets shown at infeed in the snacks industry

The main advantage of the bucket system is a high throughput capacity enabled by the depth and general geometry of the buckets.

However, the efficiency of capacity is often compromised by other factors such as:

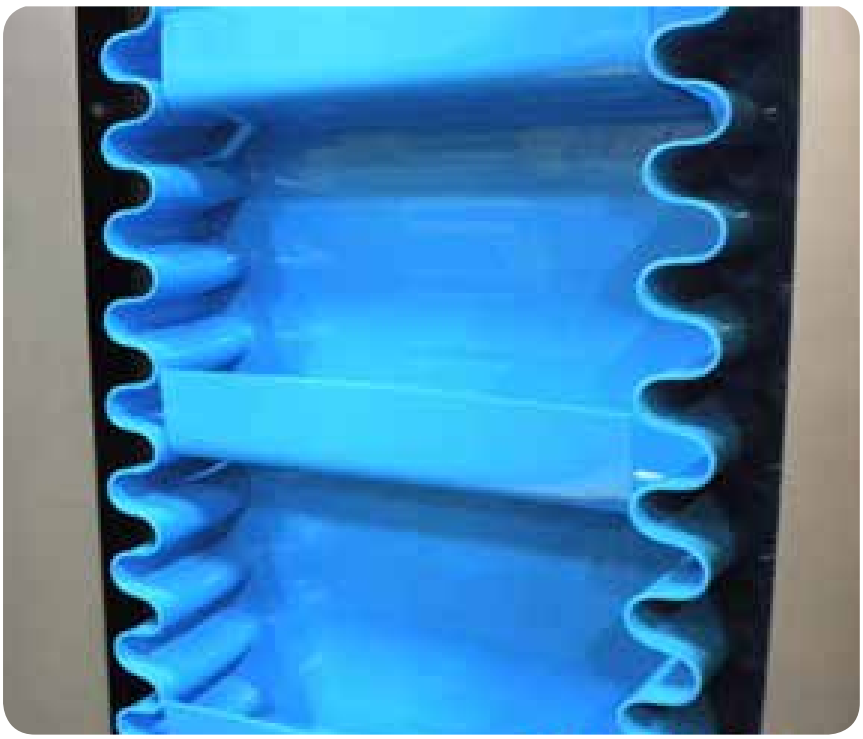
1. The system may need to work at a very high speed if the discharge is a throwing motion relying on inertia.
2. Relatively large motors may be needed especially where a friction belt system is used.
3. The bucket systems are high maintenance because chain systems can get clogged with dirt and are unhygienic in a food application. Friction belt systems have the buckets riveted on, causing unhygienic conditions and breakdowns where buckets rip away from the belt.
4. Bucket elevators running in a closed casing are difficult to access and therefore a problem for cleaning and for maintenance.
5. The conveyor can be noisy.
6. The footprint of the system on a factory floor is not flexible and the elevator may prove difficult to install and to adapt to changes in production procedures.

Open chain contaminated by food soil

Closed system - cannot be cleaned

Bottom side of a modular belt

Volta has succeeded in developing a Positive Drive design that can replace a classic bucket elevator. The design can incorporate welded integral side walling or a fixed conveyor side wall according to product type. The belts are accessible, easy to clean, low maintenance, can be run with small motors and can work at a variety of speeds. They can be made as Z conveyors to assist in infeed and discharge or in a simple elevator format where they can also be inclined to improve the material flow.

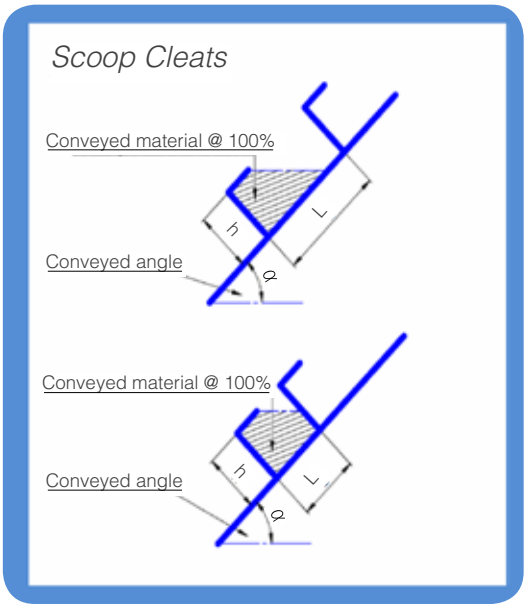


Integral welded side wall

Fixed conveyor side wall

In order to match the throughput capacity of an existing bucket elevator (or indeed to plan a new one in a projected factory layout) a number of key factors are taken into account.

A schematic representation of volume is translated into actual throughput capacity by factoring in product bulk density (i.e. kg in a cubic meter), belt speed and an estimated filling coefficient.



Schematic representation

The following chart shows 4 potential scenarios using scoop cleats on 90 degree elevators to achieve throughput capacities between 1296kg/hr and 2025kg/hr.

			1	2	3	4
Cleat Width	W	[mm]	400	400	500	500
Cleat Height	H	[mm]	100	100	100	100
Scoop lip width	w	[mm]	30	30	30	30
Cleat pitch	L	[mm]	200	300	200	300
Conveyor angle	α	[deg]	90	90	90	90
Conveyor speed	V	[M/min]	15	18	15	18
Vol weight of conveyed material	G	[Kg/M^3]	500	500	500	500
coefficient of filling %	μ	%	60	60	60	60

Flow Capacity	Q	[Kg/Min]	27	22	34	27
		[Kg/Hour]	1,620	1,296	2,025	1,620

The nature of the Volta design module enables engineers and users to design a hygienic replacement for a bucket conveyor at the lowest cost.

Increasing speed, cleat height, scoop length and width, as well as decreasing pitch distance, will all add to the throughput capacity. Even the relatively small variations here display options with a variance of over 60%.

The footprint of such a system on a factory floor is different. The Volta conveyor will usually be wider, especially where welded side wall is used, but the conveyor is far more compact in terms of depth and can be more easily adapted to specific measurements by applying the available space and adjusting the other variables in a far less rigid way that a bucket elevator.

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