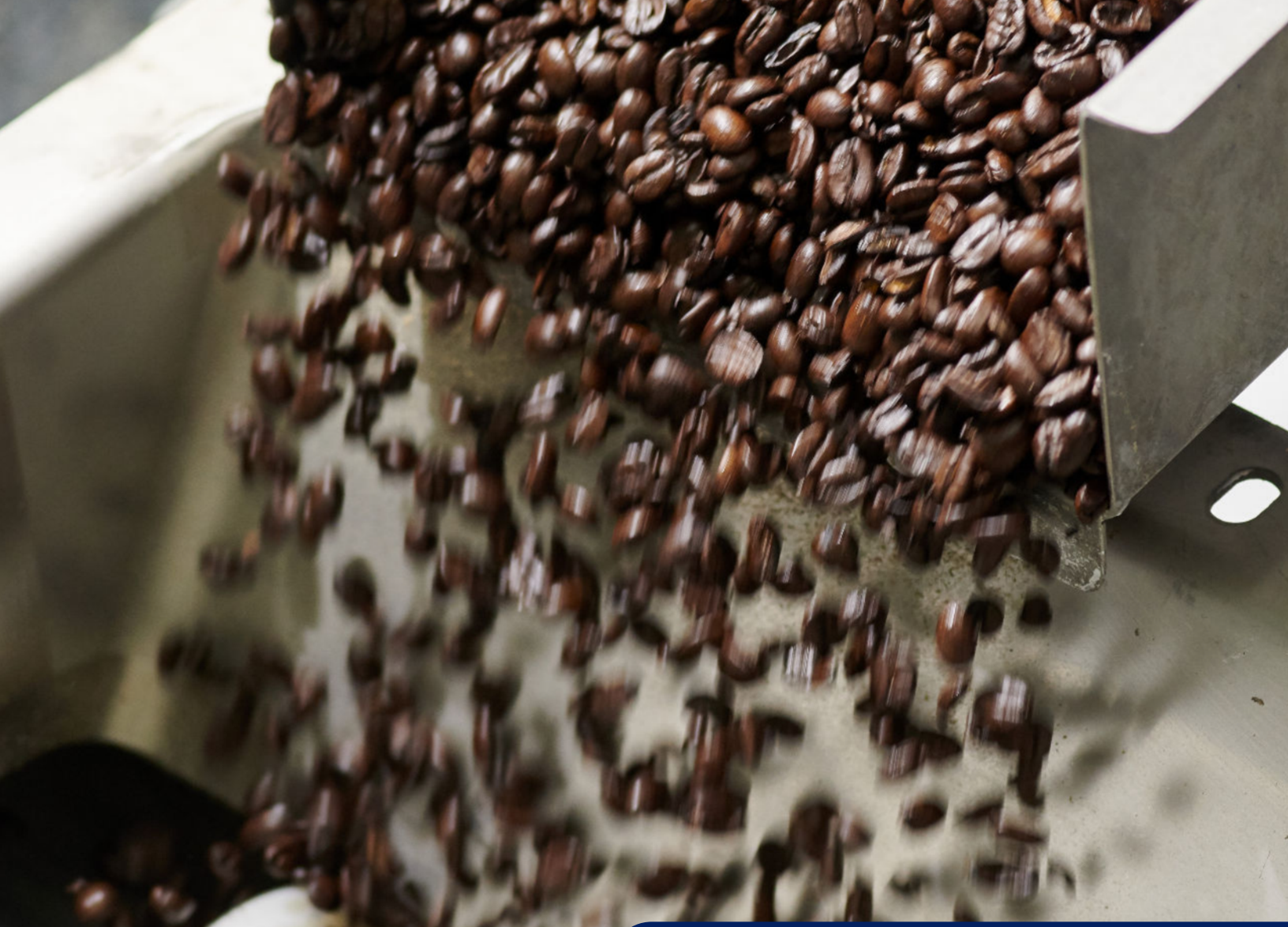


Choosing the right CONVEYOR SYSTEM *for Coffee*

CABLEVEY CONVEYORS

The Gentle Way to Convey

As roasters progress from small to larger scale operations, they need to consider many different technologies to meet both their immediate and future needs. Many people also find that the requirements of today have become more stringent than they were before. The higher standards resulting from roasting and packaging Specialty Coffee and forthcoming traceability requirements are making factors such as the level of bean breakage, cross contamination, product loss, product segregation and foreign material contamination more and more important. If you buy the best coffee, wouldn't you want to treat it the best way you can?

CONVEYORS WITHIN THE COFFEE ROASTING INDUSTRY FALL INTO TWO BASIC CATEGORIES:

1. **Pneumatics** (using air to convey the coffee) which include
    a. Vacuum dilute phase conveyors
    b. Pressure dilute phase conveyors
    c. Vacuum dense phase conveyors
    d. Pressure dense phase conveyors

2. **Mechanical** (using a mechanical device to convey the coffee) which include
    a. Bucket elevators
    b. Drag chain conveyors
    c. Augers
    d. Flat belt conveyors
    e. Aero-mechanical
    f. Tubular drag conveyors with a cable and disc
    g. Tubular drag conveyors with a chain and disc

There are many reasons why a roasterie would choose a particular conveyor.

Certain demands including the type of coffee they are using, the physical constraints of the facility and even an individual's personal experience can mean one roasterie will choose a different conveyor from another. This article is an attempt to review the conveyors on the market and help roasters to make informed decisions. At the end of the article, there is a score rating on a number of categories based on the author's perception.
The reader can weight these scores to their preference and
determine the best conveyor for them.

CATEGORIES CONSIDERED WERE:

- **Coffee protection** – level of how gently the coffee is transported. This affects bean breakage level and ground coffee segregation. The higher the number the higher the level of protection.
- **Protection from foreign materials** – the higher the number the higher the level of protection.
- **Protection from cross contamination** – this is important not only when running organic coffee and decaf in the same lines as regular coffee, but when running one batch after another and ensuring traceability is sound.
- **Level of internal cleanliness/ability to clean** – the higher the number the cleaner the system is or the easier it is to clean
- **Layout configuration flexibility** – the higher the number the better the system is at meeting different layout configurations.
- **Cost to purchase** – the higher the number the lower the cost to purchase the system is.
- **Cost to operate and maintain** – the higher the number the lower the cost to operate and maintain the system.

PNEUMATIC CONVEYORS

One often finds pneumatic conveyors in small roasteries and in large roasting facilities. A vacuum dilute phase conveyor, for instance, is often the first conveyor that roasteries purchase due to the fact a small venturi system is inexpensive to buy. In many situations a pneumatic system is also relatively cheap for industrial roasting facilities to purchase as their flexible nature allows them to reach many destinations with one system.

The differences between dilute and dense phase generally come down to how gently the coffee is conveyed. Nevertheless, all pneumatic conveyors treat the coffee violently in some form or other. Sometimes this is only in the purge cycles that are required to ensure batches are separated. Sometimes the damage occurs through the entire transfer.

Part of the fundamental nature of pneumatic conveyors is that it aerates the coffee. The implication is that it creates the need for dust control (either through filter bags or a dust collector). There is also the belief that aeration removes volatiles from the coffee. Attempts have been made to recirculate the conveyed gases in the endeavor to minimize the volatiles lost. However, it still is considered best to avoid the aeration of coffee whenever possible.

Pneumatic conveyors are also among the least efficient conveyors available. The energy required to pick the coffee up from a stationary position and transport it using air is quite high.

However, pneumatic conveyors do have their benefits. Among them is their ability to be configured in many different layouts and their ability to convey coffee at very high rates.

MECHANICAL CONVEYORS

Within this category there are many different types of technologies and here are brief summaries of their benefits and challenges

- **Bucket Elevators** – These have long been used in coffee roasteries due to their low purchased cost and low level of bean breakage. However, their limitations come in their lack of flexibility in layouts when long horizontal distances are required. Also they tend to have cleanliness issues when the interior walls of the outer shell and the underside of the buckets buildup with coffee dust over time resulting in potential for contamination in the form of stale coffee buildup.

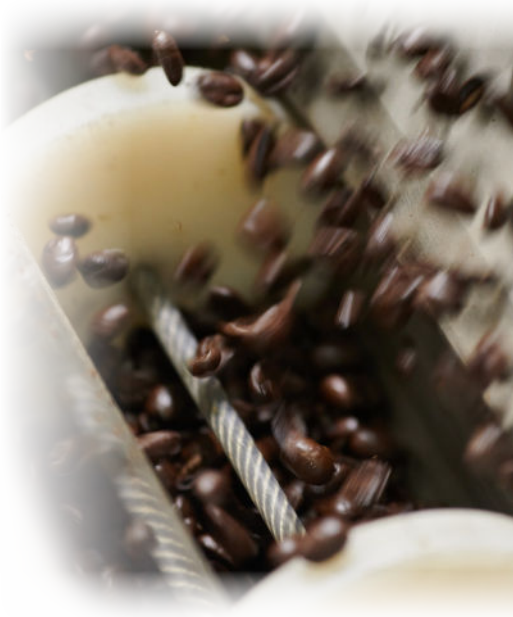
- **Drag Chain Conveyors** – These have also long been used for ground coffee. The application for whole bean coffee is not common due to the high level of bean breakage from the chain. They have a higher level of layout flexibility, but their main drawback is the level of product retention within the conveyor. This is difficult to remove and can result in cross contamination from batch to batch.

- **Augers** – These are used for ground and whole bean coffee. Typically the distances for whole bean are small as the bean breakage can be significant. Also the internal cleanliness can be an issue resulting in a cross contamination risk and the need to disassemble on a regular basis to clean.

- **Flat Belt Conveyors** – These can treat the coffee quite gently, but in order to protect against foreign materials the conveyor needs to be covered. This will result in the buildup of coffee dust on the interior of the wall leading to an increased risk of cross contamination. Also the layout flexibility is severely limited.

- **Aeromechanical Conveyors** – These have limited exposure within coffee roasteries as the coffee experiences similar treatment to dilute phase pneumatic conveying. They operate by running a cable and disc at high speeds to aerate the coffee and draw it along with the discs. While the aeration is less than pneumatics, it nevertheless results in the need for dust control and the potential loss of volatiles. The flexibility of the systems' layouts are moderate.

- **Tubular Drag With A Cable And Disc** – These also use a cable and disc, but operate significantly slower with the discs pushing the coffee towards its destination. The coffee is treated gently without aeration and no build-up within the inside walls as it continually cleans itself with each revolution. The coffee protection level is high and the energy required to operate is low due to the lower weight of the cable.



- **Tubular Drag With A Chain And Disc** – These operate similar to the Tubular Drag with cable except they are based on the heavier chain. Consequently the energy consumption is higher and the coffee protection is lower due to the moving links.

Below is the summary table of the different conveyor technologies with the ratings from the author. The perspective of this article is solely from the author who is an engineer that has been responsible for the design and building of over 300 million pounds per year in roasting and packaging capacity. The author is sharing his perspective with the objective of sharing best practices to all coffee roasters.

	Coffee protection	Flexibility in layout configuration	Protection from foreign materials	Protection from cross contamination	Level of internal cleanliness	Cost to purchase	Cost to operate and maintain
Vacuum dilute phase conveyors	2	8	9	7	7	9	2
Pressure dilute phase conveyors	2	8	9	9	9	7	2
Vacuum dense phase conveyors	5	8	9	9	9	7	3
Pressure dense phase conveyors	6	8	9	9	9	6	3
Bucket elevators	9	3	9	7	5	9	5
Drag chain conveyors	7	6	9	5	4	8	5
Augers	6	3	9	5	4	9	5
Flat belt conveyors	9	1	7	9	5	9	6
Aero-mechanical conveyors	3	6	9	9	8	6	5
Tubular drag conveyors with a cable and disc	9	7	9	9	9	7	7
Tubular drag conveyors with a chain and disc	7	8	9	9	9	6	5

ABOUT CABLEVEY CONVEYORS

Cablevey Conveyors, a division of Intraco, Inc., is the leading manufacturer of tubular drag cable conveyors and material handling systems for whole bean coffee, pistachios, almonds and peanuts, cereal, beans, seed, snacks, and powder and bulk solids.

Cablevey conveyors gently move through an enclosed tube without the use of air. Systems can convey up to 1,500 cubic feet per hour. Powders, chunks, flakes, pellets, prills, parts, shavings, crumbles, granules, fluff, regrind and dust can all be handled with ease. The company makes available numerous layouts using multiple inlets and outlets. Product separation and degradation are practically eliminated. Since 1971, thousands of Cablevey systems have been manufactured and installed in 49 states and 60 foreign countries.