

When to Convey Mechanically and When to Convey Pneumatically?

*How mechanical conveying compares & contrasts
to pneumatic conveying when transferring
dry bulk materials to processing & packaging lines*

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When to Convey Mechanically and When to Convey Pneumatically?

How mechanical conveying compares & contrasts to pneumatic conveying when transferring dry bulk & friable materials to processing & packaging

While pneumatic conveying is by far the most hygienic conveying method for dry bulk powders, there are instances where mechanical conveying may be a better choice: processing facilities with nominal head room above equipment; a need for high speed transfer with minimal energy consumption; and transferring friable materials.

The main differentiator between mechanical and pneumatic is that mechanical conveying—including conveyors or belts, slip stick, aero-mechanical, flexible screw, and bucket elevators - use a mechanical device that is in direct contact with transferred material. Pneumatic conveying uses gas (usually air) to transfer suspended material through tubes.

Because every material transfer system has unique characteristics and each organization aims to accomplish distinctive objectives, no standard equipment is suitable for all applications. Expert conveyor manufacturers typically combine off the shelf components to design custom or semi-custom systems that integrate seamlessly into a customer's process.

The advantage of mechanical conveying over pneumatic conveying is the ability to move large amounts of material with minimal energy consumption. In mechanical systems, there is only a motor driving the system. Opposingly, a pneumatic system requires a motor and air to move the material. Due to the additional power components needed in a pneumatic conveying system, and the lack of a dust filtration system, the dollar-to-dollar comparison makes the mechanical system less expensive to operate.

Additionally, control panels on a mechanical conveyor are about as simple as it gets, requiring minimal integration. Unless a company is working with a level controller or load cell, most of the time the control panel is just a fancy motor starter, reducing initial cost.

In a pneumatic conveyor system, the control panel includes a programmable logic controller (PLC) or programmable relay, which dictates the sequence of events that are to occur, can handle complex information, and provides customers the ability to download data for evaluation.

Aero-mechanical conveyors are regularly used as an alternative to pneumatic conveying using two parallel tubes with a sprocket on each end, and a drive motor on one end. Inside the tube is a cable with discs on it, often called a cable assembly. As the cable assembly moves, it displaces air and material, thus fluidizing the material, and carries it in suspension along the conveyor.

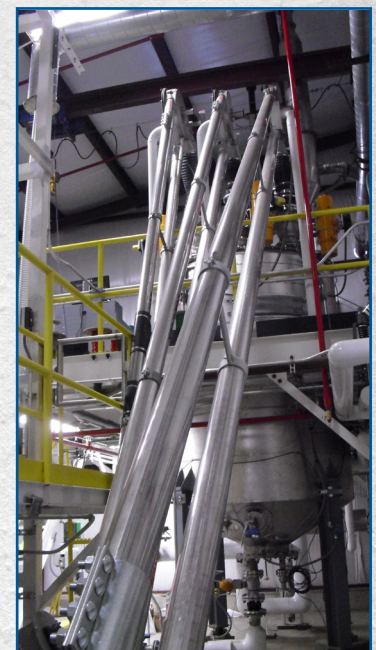
Aero-mechanical conveyors move material at approximately 20 ft³ (0.6 m³) per minute with a 3HP (2.25kW) motor, contingent on material bulk density and other factors. Depending on the design of the conveyor, the cost of a mechanical conveyor vs. a pneumatic conveyor for the same output can be one third the cost.

Flexible screws, also known as shaftless augers, helices, or spiral conveyors are used similarly to aero-mechanical conveyors. Flexible screw conveyors, however, utilize only one tube and instead of a cable assembly, they contain a metal spiral that rotates. The spirals look like a stretched slinky or spring, having the same diameter from end to end.

Flexible screw conveyors move less material than aero-mechanical conveyors, but they operate continuously, unlike the aero-mechanical. A common use for aero-mechanical systems is batch processing; and, a flexible screw is ideal for continuous, batch, or intermittent processing. Both can convey 2000lbs of material into a mixer in 10 minutes, however, the flexible screw conveyor can operate continuously. Aero-mechanical conveyors require metered in-feed and must start-up and finish without material in the tubes. Flexible screws can be started and stopped with a headload of material at the feed end.



VAC-U-MAX Vacuum Conveying System pneumatically conveying food ingredients to processing line. Material is contained within the system minimizing plant and personnel exposure to dusts and combustible dusts, eliminates manual refill of process equipment - maximizes safety & production.



VAC-U-MAX AEROCON Aero-Mechanical Conveying System conveying material to mix tank - floor level to mezzanine.



Conveying with flexible screws is common in industry leading some to look at the equipment as a commodity item; but that is far from true. Heavy duty flexible screws are more rugged than the standard and last longer, meaning less maintenance and downtime, and therefore have lower replacement expenditures. These rugged flexible screws generally come with two-year guarantees against twisting out, unraveling or breaking.

Where mechanical conveyors fall flat is the life of the equipment. Because mechanical conveyors contain more moving parts than pneumatic conveyors, maintenance costs are much higher and machinery is more susceptible to unscheduled downtime: More moving parts also means more difficult to clean, making them less desirable in sanitary conditions. High-purity applications which cannot accept any foreign contamination, will not utilize flexible conveyors due to the plastic conveyor tube which can degrade over time. Aero-mechanical conveyors are constructed with food-grade components, but nevertheless have disc wear over extended periods of time.

Regardless of the downfalls, sometimes, mechanical conveyors are the only sensible cost-friendly solution. While pneumatic conveyors are a gentle method to move most materials, when there are legitimate concerns about material degradation, as is the case of moving a fragile cereal product or pet food, a bucket elevator is ideal for that, despite higher maintenance costs and parts replacement.

Another example where mechanical conveyors are more suitable is when customers need to transfer 5000 lbs. (2268 kg) an hour, but only have 3 feet (1m) of headroom above the equipment to which they are transferring. The options are to either put the vacuum receiver on the roof and build a structure around it and modify the building, or use a mechanical conveyor.

When pneumatic systems make more sense to an operation, but ceiling height is a problem, integrating both pneumatic conveyors and mechanical conveyors is the solution. An example of this type of application is when a manufacturer wanted a pneumatic system to load a loss-in-weight feeder, but the feeder was in such a place that a vacuum receiver would not fit above it. The solution was to transfer the material from bulk bags to a vacuum re-

ceiver that then discharged material into a rigid screw, and then the rigid screw conveyed it up at a 45-degree angle to the loss in weight feeder to replenish that feeder because there wasn't enough headroom above it.

The controls of the auger integrated into the pneumatic conveyor system and then that system interfaced with the loss-in-weight feeder because when the loss-in-weight feeder indicates it needs more product, the pneumatic system conveys and discharges product to replenish the feeder.

Situations like nominal head room above equipment, the need for high speed transfer with minimal energy consumption, and transferring friable materials tend to be the most common advantages for mechanical conveyor use whether it is an aero-mechanical, a flexible screw, a rigid screw or bucket elevator.

Working with a manufacturer with decades of experience providing both mechanical and pneumatic conveying systems for many types of bulk materials including friable product, ensures customers get a conveying system that meets their needs and objectives. Manufacturers that perform testing with customers' materials before equipment delivery can supply written guarantees that the conveying system will work as promised, and provide equipment warranties.

To learn more about how a mechanical or pneumatic conveying system can improve throughput, efficiency, ergonomics, preserve product integrity, or reduce costs, write to:

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