SUPPLIERS' TIPS

What are some tips for selecting a feeder for my fibrous material?

Fibrous, low-density materials pose unique material handling and weighing challenges. The material's strand length, moisture content, and flowrate range play a role in determining if a loss-in-weight (LIW) or weighbelt feeder would be suitable for this application.

I'd recommend LIW technology for flowrates less than 600 lb/h. Single- or twin-screw discharge systems tend to compact and damage fibrous materials. Therefore, a vibratory tray-based LIW feeder is better for metering fibrous, fragile materials. Given fibrous materials' tendency to interlock and mat, the feeder's weigh-hopper geometry must promote uniform mass flow to the vibratory tray. Conventional horizontal agitators will simply turn the weigh hopper's contents *en masse*, so a vertical agitation system that gently lifts/dilates the material is needed to prevent bridging in the hopper.

I'd recommend weighbelt feeder technology for flowrates greater than 600 lb/h. A weighbelt accurately measures materials on the belt, providing it features a proven weighbridge design suitable for low-density, low-loading measurement. Consequently, this application would strictly become a material handling issue that requires uniform, uninterrupted material flow to the belt, so you could use a *metering tube*, which is a specialized transition, above the feeder. The metering tube can be equipped with level control or internal flow aids selected based on the material's strand length and density. Depending on the weighbelt speed, a discharge doffer may be required to break up the strand mat to improve discharge uniformity.

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Conveying fibrous materials, such as carbon fibers and fiberglass will break up or fuzz when conveyed, resulting in very poor flow characteristics. Using a hopper with a fibrous material will be extremely difficult or impossible for the feeder to handle. These materials may have to be handled in bulk and emptied into a surge hopper (located above the feeder), which may require a live bottom to promote material discharge.

Fiber strand length, bulk density, and moisture content are all factors that affect flow characteristics so conducting material evaluation and testing will help equipment selection. Typically, fibrous materials with short strands and heavier densities flow better, such as cut-strand fiberglass from $^{1}/_{8}$ to $^{5}/_{16}$ inches in length, which is used in engineered plastics. Large-volume storage and discharge isn't a problem with that material, but long-strand fiberglass, polypropylene, and carpet fibers tend to interlock and are more problematic. In applications handling those materials, hopper capacities are reduced, and hopper geometry will differ and may include a vibrator, hopper agitator, or some other flow-promotion device.

Achieving uniform flow at the feeder's discharge is easier when handling the short-strand and heavier-density materials. The longer-strand materials pose a much greater challenge, so mainly vibratory-tray, screw, and belt feeders are used with a hopper that has a wide throat area, an agitator, and, in some cases, a uniform discharge.

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Feeding fibers is notoriously difficult because they can vary greatly, don't flow unaided, are often very low bulk density, easily bridge in hoppers, and can compact and form strong interlocking matrices. All these characteristics pose problems for your feeder supplier as standard designs are usually inadequate. It's also much more difficult to feed fibers because as the desired feedrate decreases, the fiber length stays constant while the required feeder size and geometry decreases.

I'd recommend providing your supplier as much information as possible about your fibrous material, including a material sample for analysis and testing at their facility. Generally, your supplier should consider using a hopper with a straight cross section with an agitator design at a suitable rpm to match the material and required feedrate. Typically, screw design is custom because long fibers can be easily damaged, so a large gap is needed between the screw and the tube. The screw will often have a variable screw pitch and rotate slower than normal, producing a pulsing flow at the discharge, which makes adding a rotating flow blade at the discharge helpful for reducing pulsation.

If you're considering a belt feeder, then think carefully about how to change the direction of fiber flow from a vertical orientation in the hopper above the belt to a horizontal orientation on the belt, again a large feeder geometry helps. Finally, a discussion surrounding feeder refill and material handling should also be part of your supplier's recommendation.

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