

# Checklist for selecting a volumetric or gravimetric feeder

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Whether you're in the market for a volumetric or gravimetric feeder, there's a lot to think about before you can select one. This article provides a detailed checklist of what to consider when choosing a feeder to handle your dry bulk solid material.

To select a volumetric or gravimetric feeder for your application, consider your feeding requirements, the feeder's components and operation, feeding test results, maintenance and service requirements, and the supplier's qualifications. [*Editor's note:* For detailed information on the components and operation of volumetric and gravimetric feeders, see the later section "For further reading."]

## Your feeding requirements

Consider:

- How well the feeder can handle the required minimum, average, and maximum feedrates for each material it will feed in your process.
- How your material will get to the feeder (such as by pneumatic conveying, belt conveying, or dropping from a live-bottom bin) and whether this method will affect your material's characteristics (such as by fluidizing, densifying, or degrading the material).
- What equipment the feeder will discharge your material into and whether this will expose the material to moisture, pressure, temperature extremes, or other conditions that can affect the feeder's mechanical operation or performance.

## Feeder components and operation

When selecting a volumetric or gravimetric feeder, consider:

- Whether the feeder has the necessary operating range to handle your required feedrates.
- Whether the feeder is versatile enough to handle variations in your material characteristics or different materials.
- How easily the feeder can be modified to handle any feedrate or material changes. (For instance, handling feedrate changes could require changing out the metering device [an auger, vibrating tray, or belt] or discharge cylinder or tube. Handling material changes could require replacing the metering device with one of a different configuration and size, switching to a different hopper agitator, or using a different hopper configuration. Ideally, you should be able to make these changes in only a few minutes.)
- Whether the feeder's mechanical components (such as the metering device or discharge cylinder) or electronic components — or both — require periodic calibration or adjustment. (For a volumetric feeder, changes in your material's flow characteristics or density will require adjusting the feeder speed on the control system to maintain the desired feedrate. For a gravimetric feeder, you may need to periodically calibrate the scale, depending on the type of weight sensor it has, and you may also have to adjust the control system to handle changes in material flow characteristics or different materials.)
- Whether the feeder's mechanical components appear to be well-built and likely to provide the service life your application requires.

- Whether the feeder's control system is easy to use, reliable, and based on the latest technology.

When selecting a gravimetric feeder, also consider:

- How precise and durable the scale's weight sensor is.
- Whether the weight sensor's accuracy requires periodic verification.
- How much overloading or shock-loading the feeder scale can tolerate.
- Whether the feeder must be installed on a special structure to isolate it from vibration, air currents, or other environmental disturbances so that the scale can operate properly. (Whether such installation is required depends on the scale type, scale size, and feed-rate and is more critical with smaller scales and low feedrates.)

### Feeding test results

Arrange to witness feeding tests of feeders made by various suppliers. A vital component of your volumetric or gravimetric feeder selection process, these tests will be performed by experienced technicians in each supplier's test lab using samples of your material.

During each test, consider the feeder's design, components, and size and how well they'll meet your application requirements, including:

- Whether the test feeder is the same type, model, and size as the feeder required in your application. (Feeders — particularly gravimetric units — of different sizes don't necessarily perform the same way.)
- Whether the feeder's hopper size, metering device size, and, for a gravimetric feeder, scale capacity, match your application requirements.
- Whether you must make a mechanical change to the feeder, such as changing out the feeder auger and discharge cylinder set, to achieve your application's required feedrate range.
- Whether the feeder has high-quality, rugged construction to provide a long service life with low maintenance. (Major components on the test feeder shouldn't show signs of wear, fatigue, or discoloration and should be soundly affixed to the feeder.)

- Whether the feeder has a directly coupled drive system to minimize maintenance.

Also during the tests, consider how well the volumetric or gravimetric feeder's operating characteristics will meet your application requirements, including:

- Whether the feeder has the material-handling capabilities and versatility to effectively meter your material (or materials) under a normal range of conditions.
- Whether during feeding the metering device is full of material, without any voids, so it can achieve the highest metering accuracy. (You should select and size the metering device to provide reliable, optimum performance. If the metering device is an auger, the feeder supplier must carefully evaluate the auger design to ensure that it will feed your material uniformly and smoothly, depending on your requirements.)
- Whether an auger or twin-auger metering device operated at high speed to minimize pulsating material flow (if so required) is causing other problems, such as generating heat, degrading your material, or increasing the feeder's horsepower requirements.
- Whether a vibrating tray or belt metering device has problems with feeding accuracy. (For instance, although material flow from a vibrating tray may look extremely uniform, this can be deceiving. Not only may the device feed less accurately than it appears to, it may provide inconsistent accuracy, especially when compared with a custom-designed auger metering device's high feeding accuracy at less than 1-second intervals. If your application requires extremely uniform feeding, carefully evaluate the vibrating tray or belt metering device and how its accuracy can be affected by your material's characteristics, especially if the material has a potential for flooding, bridging, and flowing erratically in response to headload effects.)
- Whether the feeder's hopper provides uniform material flow to the metering device without ratholing or bridging and whether the hopper is flexible enough to handle changes in material characteristics and atmospheric conditions without affecting flow.
- For a volumetric feeder, whether material flows well from the hopper despite changing headloads. (This requires testing the flow from the hopper over a range of hopper-fill levels, from full to empty.)

Consider how the volumetric or gravimetric feeder's short- and long-term feeding accuracy is measured and verified, including:

- Whether the feedrate and sampling method for the feeding test — including the number of samples, sample duration (in seconds or minutes), and sampling type (consecutive or random) — are identical for each feeder you're testing, including different feeder types and sizes from one (or more) supplier. (The feedrate and sampling methods must be identical to accurately compare the feeders.)
- How the feeder control system collects data to verify the feeding accuracy (or error), how it calculates the feeding accuracy (or error), and how well this relates to the supplier's performance guarantee. (Some suppliers guarantee feeder accuracy in terms of a number of time-based samples taken during testing, and some base accuracy on a certain number of consecutive samples, the metering device's speed, or, for a gravimetric feeder, a percent of the total scale value.)
- Whether the control system's hardware or software provides any data manipulation or averaging that would improve the feeder performance calculations



**Tests conducted by the feeder supplier demonstrate this gravimetric feeder's ability to accurately feed an additive for a customer's plastics compounding operation.**

and, if so, whether such manipulation is clear to the operator. (Knowing that data manipulation has occurred would help you spot any large differences in the feeding accuracies for similar feeder types from various suppliers. Any large differences would require you to further investigate the sampling method, especially the sample duration.)

For a gravimetric feeder, also consider:

- Whether the feeder's scale is protected from vibration and other environmental disturbances and from upset conditions, such as a worker placing a tool on the feeder as it operates.
- Whether the feeder's output varies because of refill-related factors, such as the type of refill device, its location, and corresponding headload variations in the refill device. (Headload variations can result in flow problems such as flooding, bridging, or erratic flow, which will affect the feeder output. You can test for refill-related output variations by sampling the feeder output as the hopper is refilled during feeder testing.)

### Maintenance and service requirements

Consider the volumetric or gravimetric feeder's maintenance and service needs, including:

- How much maintenance the feeder will require during its first few years of operation.
- What the annual cost of feeder maintenance by your plant staff and, if necessary, the supplier, is likely to be.
- Whether the feeder will require more maintenance if it will operate in a tough environment.
- Whether the supplier has the expertise to cope with any type of operational problem the feeder may develop, including mechanical, electrical, or material-handling problems.
- Whether the supplier has experienced, factory-trained field service technicians available 24/7. (When a feeder is down, lost production can cost your plant thousands of dollars an hour. A supplier's round-the-clock service capability can be the deciding factor in choosing that supplier over another.)
- What spare parts are typically required for the feeder and what the associated annual maintenance costs will be. (These associated costs typically include the cost of labor for servicing or repairing the feeder and any lost production during the service.)

- Whether the supplier keeps spare feeder parts in stock for delivery within 24 hours or must make or order the parts.

### Supplier qualifications

Check:

- Whether the feeder supplier has experience with feeding dry bulk materials similar to yours. (Ask for and check the supplier's references. Also check the performance of any of the supplier's feeders that may already be operating in your plant or at other company locations, and consult others in your company with feeder experience.)
- What percentage of the feeder components (such as fabricated parts and control systems) are designed and manufactured by the supplier.
- Whether the supplier will test each new feeder — preferably with your material — before shipping it to your plant.
- Whether the supplier guarantees the feeder's performance and service life in your application. **PBE**

### For further reading

Find more information on feeder selection in articles listed under "Feeders" in *Powder and Bulk Engineering's* comprehensive article index (in this issue and at *PBE's* Web site, [www.powderbulk.com](http://www.powderbulk.com)) and in books available on the Web site at the *PBE* Bookstore. You can also purchase copies of past *PBE* articles at [www.powderbulk.com](http://www.powderbulk.com).

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