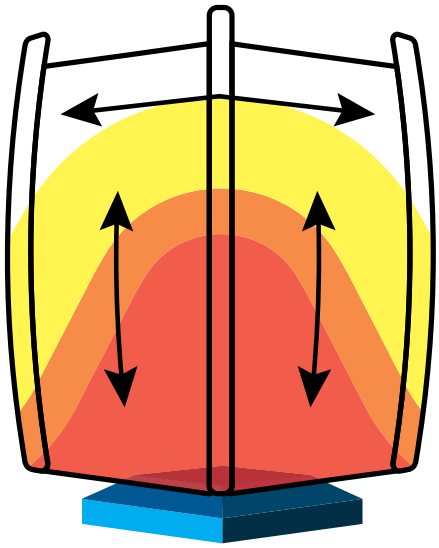
Spiroflow
by AKONA



The Complete Bulk Bag Filler Customization Guide

A step-by-step guide to selecting bulk bag filler components

In the market to upgrade or extend your bulk bag filling line? Not all FIBC bulk bag fillers are created equal.

Need help selecting bulk bag filling equipment?

Dan Chellew from Akona Process Solutions walks us through some of the variations and customizations available in today's bulk bag filling market. From standalone, simple frame designs to high-volume semi-automated filling systems with densifying vibration tables, bulk bagging systems can be custom built to meet a wide range of budget and filling requirements.

Step 1:

Narrow Selection: Bulk Bag Filler Frame or Station

First, narrow the equipment selection to one of the following: a simple, stand-alone bulk bag filler frame or a more sophisticated filling system.

SIMPLE FILLING FRAMES

Low Cost, Volumetric Filling

Bulk bag filling frames are ideal for very low-rate applications (10 or fewer bulk bags per hour) that do not require weighing or densification. This economical choice should only be considered in cases where an operator will continuously monitor the fill progress, the material de-aerates well, and volumetric filling is acceptable.

Frames typically consist of a base plate with two vertical legs on which the horizontal loop support arms can be vertically adjusted. Mounted above the two loop arms is a frame that supports the filling nozzle, if included. The two sliding sections should come with locking pins for positive location. Filled bags are removed by deflating the inflatable collar and pulling the neck manually from the filling spout, lifting the pallet and filled bag a few inches with a forklift or pallet jack and backing the bag out of the filler.

BAG FILLING LINES OR SYSTEMS

Medium to High Volume Filling

Bulk bag filling stations are used for medium to high volume applications where filling by weight is a requirement or a higher output is desired. Filled bags can be removed with a forklift or semi-automatically via a motorized conveyor system. Unlike basic frames, a complete filling station may include a load cell weighing system (either hang weighing or base mounted) and can also include vibration capabilities for product densification (deaeration). Accurate weighing reduces the amount of overfill thereby minimizing the amount of product that is given away for free.

Bulk bag stations include the supporting frame or structure, bag support arms, fill head, dust extraction system, weighing system (load cells or platform scale) vibration table and, in the case of a semi-automatic filling station, a bag removal system. There are also many customizations available on bulk bag filling stations to meet specific application requirements such as a range of automated inbound or outbound conveyor systems to allow for automatic pallet feeding, shrink wrapping or bag labeling.

Step 2:

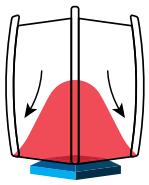
Define Bulk Bag Filling Requirements

Before starting to specify the filler type, options, and customizations, first consider the material, process needs and bag requirements .

2a. MATERIAL

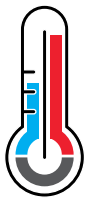
Bulk Density

A good indication of whether a material will benefit from densification during the bulk bag filling process is the difference between its tamped and un-tamped bulk density. Understanding the bulk density will help to determine whether and what type of densification system may be needed in the filling process. A difference between the tamped and un-tamped densities of 10% or more can indicate that maximum densification is required to achieve a safe and stable bulk bag. The bulk density of the product in the filled bag should be as near as possible to its tamped bulk density.



Flow Characteristics

How the material behaves when conveyed or filled will determine the best type of feed system (eg. gravity, vibratory, metered) and whether additional flow aides are necessary to ensure consistent flow of material into the bag. Consistent flow of material into the bag can be critical in achieving consistent weighing accuracy from bag to bag. Very cohesive products may require densification despite a relatively low difference between tamped and un-tamped bulk densities. Materials that are easily fluidized, like some types of silica and titanium dioxide, may also require maximum densification.



Temperature

The process material temperature and ambient facility temperature will all impact how a bulk powder material behaves as it is processed, and thus, the final condition of the filled bag. Many bulk solid materials behave differently when their temperature is elevated as it comes off the process. For example, hot material may exhibit a much larger difference between its tamped and un-tamped bulk densities as compared to its cooled characteristics. In that case, maximum densification may be required to achieve the filled bag target weight whereas if it was filled at ambient temperature, minimum or no densification may be all that is required. Keep this in mind when assessing a bulk bag filling station and particularly if the equipment manufacturer will perform testing prior to purchase. Accurately simulating the application may require testing on site as the product comes off the process at its elevated temperature.

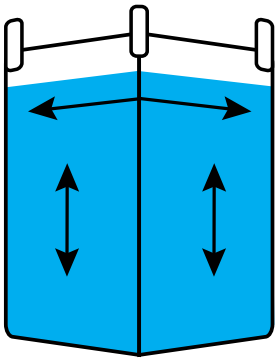
Fragile/Friable

Fragile or friable products can be easily degraded during bulk bag filling without equipment customization. To prevent degradation, the bottom of the bag can be raised up to the filling head to reduce the drop height and then be gradually lowered as the bag fills.

Perishable

Perishable dry bulk products (eg. food and ingredients such as nuts) may require a bulk bag filling solution that extends product life in the filled bag. In the filling process, bulk bags are typically first inflated with air to expand the bag and prepare it for filling. However, bacteria feeds on oxygen, and trapped oxygen in the bulk bag can cause the product to degrade faster. Perishable products can benefit from a nitrogen purging solution - which fills the bag with nitrogen, eliminating residual oxygen – thus extending the bagged prod uct's life during transportation and storage.

2b. BAG TYPE



Dimensions

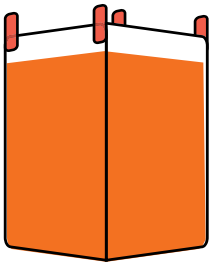
Bag height and volume requirements are typically the first consideration when selecting a bag type. Bulk bags are specified using their empty dimensions which can vary greatly. Typically, base seam dimensions are no larger than 41″ to ensure that filled bags can be loaded two across in a typical trailer or shipping container. Bag heights can be as tall as 90″+ for very low bulk density materials. When selecting bag dimensions, the final amount of product needed in the bag, pallet size and method of shipping must be evaluated and considered.

Style & Shape

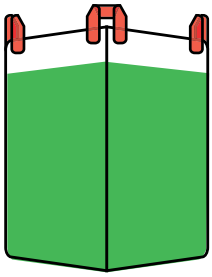
Both the bag manufacturer and equipment manufacturer should be consulted to de - termine the bag style. The bag will need to be optimized for safe storage and transport. Filled FIBCs will round out in their mid-section to some degree. Circular woven bags with no internal baffles will round out the most. U panel or four panel bags will round out to a lesser degree. Bags with internal baffles sewn across each of the four corners and extending from top to bottom round out the least and are typically used when shipping in sea containers to maximize the shipping weight. The amount of round out vs. the width of the shipping trailer/container should direct the method of bag construction.

Lifting Loops

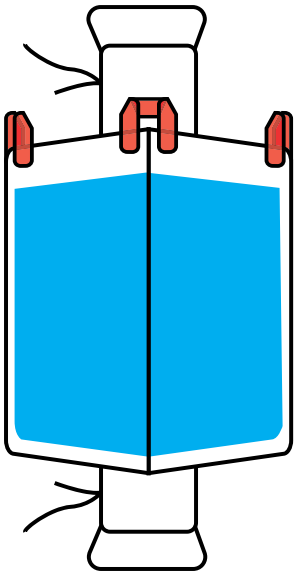
There are two main styles of FIBC lifting loops: lay flat and cross corner.



Lay flat loops: Lay flat loops are found in U style and 4 panel bulk bags that feature stitched, vertical seams at the corners of the bag. The loop is stitched into the vertical seam and then doubled back on itself and stitched again. This style of loop ensures the forces are maintained vertically down the multi-stitched vertical seams when lifted by its loops for stability and strength.



Cross-Corner loops: Typically found in circular woven bags where the sides of the bag are a single cylinder of fabric and therefore there are no vertical seams in the bag. Lay flat loops cannot be used with this style of bag. Cross corner loops are also used, with any style bag, if the bag is lifted by inserting forklift tines into the loops. The cross corner configuration helps to keep the loops extended so that the tines can be easily driven through the loops. In some cases when only the forklift operator is available, inserts can be sewn into the cross corner loops to extend them into a fully open position making it even easier to drive the tines through them.



Liner/Sealing Requirements

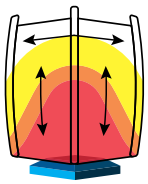
Bulk bag liners are used to prevent the ingress of foreign materials or moisture into a bulk bag and/or prevent the egress of very fine powders through the stitching and weave of the bulk bag. They may be a requirement to prevent leakage or moisture ingress. Unlined bags with a coating extruded on the interior of panels of the bag can also be effective in some situations. Liners for special applications, such as transportation and storage of edible materials, milk powders, etc. or liners requiring conductive properties for use with substances that may create danger via electrostatic discharge, may be requested from the bulk bag manufacturer.

Liner types include:

Form fit: The liner is constructed with sides, top and bottom that mimic the bulk bag. They can be loose inside the bulk bag or glued or stitched into the bag. Typically, nothing must be done with the filling equipment to handle this type of liner.

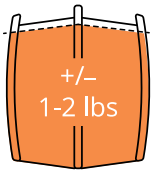
Loose tubular: The liner is a cylinder of polyethylene (typically) that must be inflated prior to filling so that it takes the shape of the bulk bag. The bulk bag filler filling spout must be able to allow the liner to slip somewhat as material enters the bag/liner to allow the loose liner to conform exactly with the bulk bag as it is filled.

2c. PROCESS



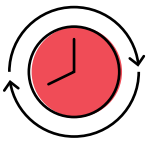
Rate

The bagging rate, how many bags must be filled per hour, the target weight of material in the bag and amount of densification required to produce a safe and stable package must all be taken into account to select an appropriate bulk bag filling system and the upstream system that feeds material to the filler. As the bagging rate increases, options such as automatic loop release, retractable loop hooks and automatic bag removal should be considered. Applications with bagging rates over 20 bags per hour should be carefully assessed to determine the proper densification method needed to produce safe and stable filled bags. As the bagging rate exceeds 20 bags/hr, pre-weighing the material in a hopper above the filler can be considered. Pre-weighing the 'shot' of material while a bag is being densified and removed from the system and the next bag is rigged, significantly increases the bagging rate. Pre-weigh systems are capable of filling 40+ bulk bags per hour with a single bulk bag filler.



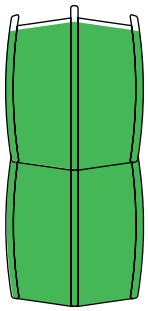
Weighing Accuracy

Weighing accuracy is essential to prevent overfilling bags and unnecessary product 'giveaway' and also potential penalties associated with selling underweight bags. Depending on the bagging rate, material characteristics, upstream system design and the weighing system on the bulk bag filler can result in weighing accuracy of +/- 1 lb. Most systems are capable of achieving +/- 2 lb (1 Kg) weighing accuracy. Weighing accuracy is critically dependent on how well suited the metering device is to the application. A simple, two position gate valve may provide adequate accuracy when filling bulk bags with reasonably low bulk density product at a slow rate. On the other hand, high bagging rate applications may require a different metering device, a second dribble feed device or a surge hopper with a fast-acting gate valve for accurate filling.



Duty Cycle/Shifts

Consider how often your bulk bag filling equipment will need to be on and running to meet productivity requirements. For extremely demanding applications and operating environments, filling systems should be designed to ensure extended duty cycles can be met without damaging equipment or introducing safety risks to operators.



Space/Storage

Properly filled bulk bags are more stable and safer to stack two high. Stacking saves space and storage costs. Specialized bulk bag systems can even stack bags two high in the filler. This reduces the amount of forklift handling and time required to construct a two-high stack. Safety note: bulk bags should never be stacked without the input of the bulk bag and the bulk bag equipment manufacturers. Maximum densification is required when stacking any bulk bag. Testing prior to system implementation is critical to ensure safe operation.

Step 3:

Select Bulk Bag Filling Station Components

Based on your requirements definition, start to select each component of your bulk bag filling station.

3a. SUPPORT FRAME

2 Post, C frame Design

Two vertical tubes attached to a steel base frame provides a stable structure and easy access to three sides of the machine. Horizontal loop support arms can be vertically adjusted. A frame mounted above the two loop arms supports the filling nozzle. When filling by weight the lower steel frame can be mounted on four load cells or a platform scale.

Single Post, C frame Design

A single steel post main support structure can provide unmatched access to bag spout and hanging loops. The bag hanger arms & fill head assembly are attached to the mast and can incorporate a base mounted scale or hang weigh system.

Low Loading

For low headroom. Facilities with limited headroom need a low loading bulk bag filler to minimize the filler's height and/or to allow removal of the bag with a pallet jack.

3b. BAG SUPPORT

Automatic Loop Release

For semi-automatic bag removal using roller conveyors to move the filled bag from the bulk bag filler. When the target weight has been reached, the bag hooks simultaneously open to release the bag loops from the filler.

Hang filling

The bulk bag is suspended in the air via its loops during filling and is periodically lowered onto a vibrating cone table for densification. Hang filling and cone table densification results in more stable bulk bags and typically increases the amount of weight that can be filled into a given size bag or allows the use of a smaller bag to contain the target weight.

Bottom support – flat plate

The bulk bag sits directly on the pallet, which rests on the flat base plate attached to the frame of the bulk bag filler.

Bottom support – roller conveyor

The bulk bag sits on the pallet, which rests on the rollers of a roller conveyor that is attached to the base frame of the filler. This allows filled bags to be semi-automatically removed from the filler.

3c. FILLING NOZZLE/FILLHEAD

Tilting Fillhead

For improved ergonomics. A tilting fillhead tilts the fillhead towards the operator, reducing the reach required to pull the bulk bag inlet spout over the fill head.

Twin Tube/Dust Extraction

For dust containment during filling. Displaced air is extracted from the bulk bag via a dust collection system as it is filled via a dust vent in the outer tube of the fill head.

Filling Head Spinner

For optimal product dispersion during filling. A spinner head can be used to disperse product into the baffle to ensure the corners of the bag are properly filled. Select this option where vibration alone cannot remove the material's angle of repose, which prevents the top corners from filling completely.

Bag Liner Inflation System

For optimally filled bags. A fan or compressed air venturi inflates the bag with air (or nitrogen) before it is filled, eliminating fabric creases and ensuring maximum fill capacity.

3d. WEIGHING / SCALE TYPE

Base-Weigh

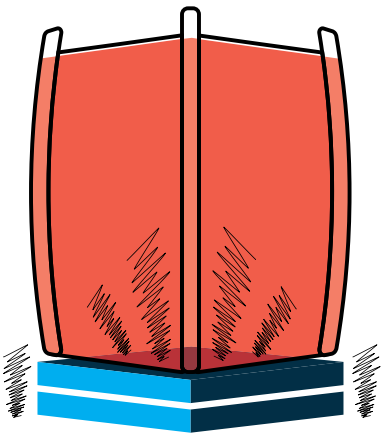
Entire bulk bag filler and product in the bag are weighed during filling.

Hang-Weigh

Bulk bag fillers that feature hang filling use a hang weigh system. Only the weigh frame, fill head, hanger arms and bulk bag are weighed during filling when the bag is suspended from its loops. This arrange - ment significantly reduces the dead load seen by the load cells which results in a higher resolution weighing system for more accurate, consistent weighing.

3e. VIBRATION COMPACTION/DEAERATION

Vibration of the material during filling densifies the product in the bag for a more stable, safe bag.



Cone table

Vibration energy is injected directly into the material in the bag by periodically lowering the bag onto a vibrating cone table. This method provides maximum densification which is particularly useful when filling difficult to deaerate materials and, because cone table densification densifies any material more quickly than through-pallet fillers, when the bag filling rate must be maximized.

Through Pallet

Vibration energy is applied through the pallet into the bag.

Finger Style

Vibrating bars or fingers are raised through the in-filler roller conveyor to allow for through pallet densification of bags sitting on a pallet.

Step 4:

Customize Bulk Bag Filling Station with Additional Options

Explosion Proof (Static Monitoring/Grounding)

For explosion risk applications. If the area poses an explosion risk, static dissipative or groundable bags may be needed together with a suitable static monitoring system.

Mobile Options

For manufacturers that need to move their filler to different fill locations. Wheeled, mobile base units are available utilizing 2 rigid casters, 2 swivel lockable casters & pneumatic cylinders to isolate the load cells during movement.

Control Systems Integration

Automatic gain-in-weight filler - Bag is weighed as it is filled until it reaches the target weight. The system can be programmed to automatically fill the bag to the target while densifying the bag according to a pre-programmed sequence.

Weight display - For manual filling to a target weight. The operator initiates filling and monitors the weight display. When the display approaches the target weight the operator manually stops the filling process.

Pre-weigh - For achieving maximum fill rates while maintaining accuracy. Material is measured and weighed in a dedicated hopper before being quickly transferred to the bag.

Nitrogen Purging

To extend the storage life of perishable materials. The bulk bag is filled with nitrogen, purging the bag of oxygen, before and during filling. Bacteria feed on oxygen, so by removing it, products will last longer during storage and transportation.

Heat Sealing

To extend storage life. Combined with nitrogen purging, heat-sealing can significantly extend stored product life.

Automatic Height Adjustment

An option that allows the operator to quickly adjust the height between filling cycles to accommodate different bag sizes.

Hygienic Requirements

Stainless steel product contact surfaces, food grade finishes and bag inflation with HEPA filters may be required to meet Good Manufacturing Practices in the food and beverage industry.

Access Platforms

The bulk bag filler design, bag height and the integration of roller conveyors to automatically remove filled bags may require the operator to be elevated above floor level to allow rigging of the bulk bag.

Step 5:

Test, Test, Test

Before purchasing bulk bag filling equipment, it is recommended to first run the material on the equipment in the bulk bag equipment manufacturer's test lab. Replicating the filling conditions allows analysis of specific characteristics to avoid production challenges later.

C Series Standard Bulk Bag Filler

Built for low to medium volume requirements

Cone Table Elite (CTE) High Vibration Bulk Bag Filler

Maximum bulk bag densifica tion, stability, and throughput vol ume requirements

Base Model Bulk Bag Filler

Simple frame for low volume filling of non hazardous materials

Ready to start designing your bulk bag filling system?

Contact sales@akonasolutions.com to talk with our team of engineers.