

Application Example Batch Weigh Vacuum Receivers in Food Production

Background

Whether produced by batch or continuous processes, many food products require the precise combination of several major and minor ingredients. Typically, major raw materials need to be conveyed from remote bulk storage and accurately weighed prior to an initial mixing operation. Often, at least some minor ingredients such as flavors or colors must also be weighed and introduced at this stage. These operations must be performed in a scrupulously clean and a dust-free processing environment.

Able to sequentially accommodate multiple ingredients, the batch weigh vacuum receiver combines the operations of conveying and weighing, and is thus uniquely suited to handling major food product ingredients. A dust-free processing environment is assured by the weigh receiver's vacuum-based operation. Because of their criticality and low batch weight most minor ingredients are dispensed by dedicated loss-in-weight feeders prior to initial mixing.

Principle

The vacuum receiving hopper is mounted on load cells so that the increasing weight can be continuously monitored by the PLC control system. The control system allows the operator to enter and store recipes made up of several different ingredients; each ingredient is conveyed by vacuum from its storage vessel into the vacuum receiver. As the individual target weight is achieved the select valve closes and the next valve in the sequence is opened until all individual ingredients have been accumulated in the hopper.

This batch is now held ready until a request is received from the mixer below. On receipt of this signal the accurately

weighed batch is deposited into the mixer and a signal is given to confirm the weigher has fully discharged its batch. As the batch discharges, the reverse jet filter is pulsed so that the filter is cleaned ready for the next batch.

All individual weighments are recorded and various alarms are incorporated such as slow weigh, under or over weigh, failure to complete discharge, etc. This degree of sophistication allows quality control procedures to be adhered to.

Application Profile

Typical Major Ingredients (20kg to 1,500kg): Corn grits, corn meal, farina, potato granules, potato powder, rice cones, etc.

Typical Minor Ingredients (250g to 10kg): Salt, sugar, flavours, colors, preservatives, dicalcium phosphate, bicarbonate, etc.

Typical Range of Batch Sizes: From 100kg @ 3/hr to 1,500kg @ 3/hr

Typical Required Batch Accuracies: Major ingredients $\pm 0.5\%$ of full scale via batch weigh vacuum receiver, Minor ingredients $\pm 0.1\%$ of full scale via loss-in-weight feeder

Benefits

- Combines bulk ingredient conveying and gravimetric batch weighing into one compact unit



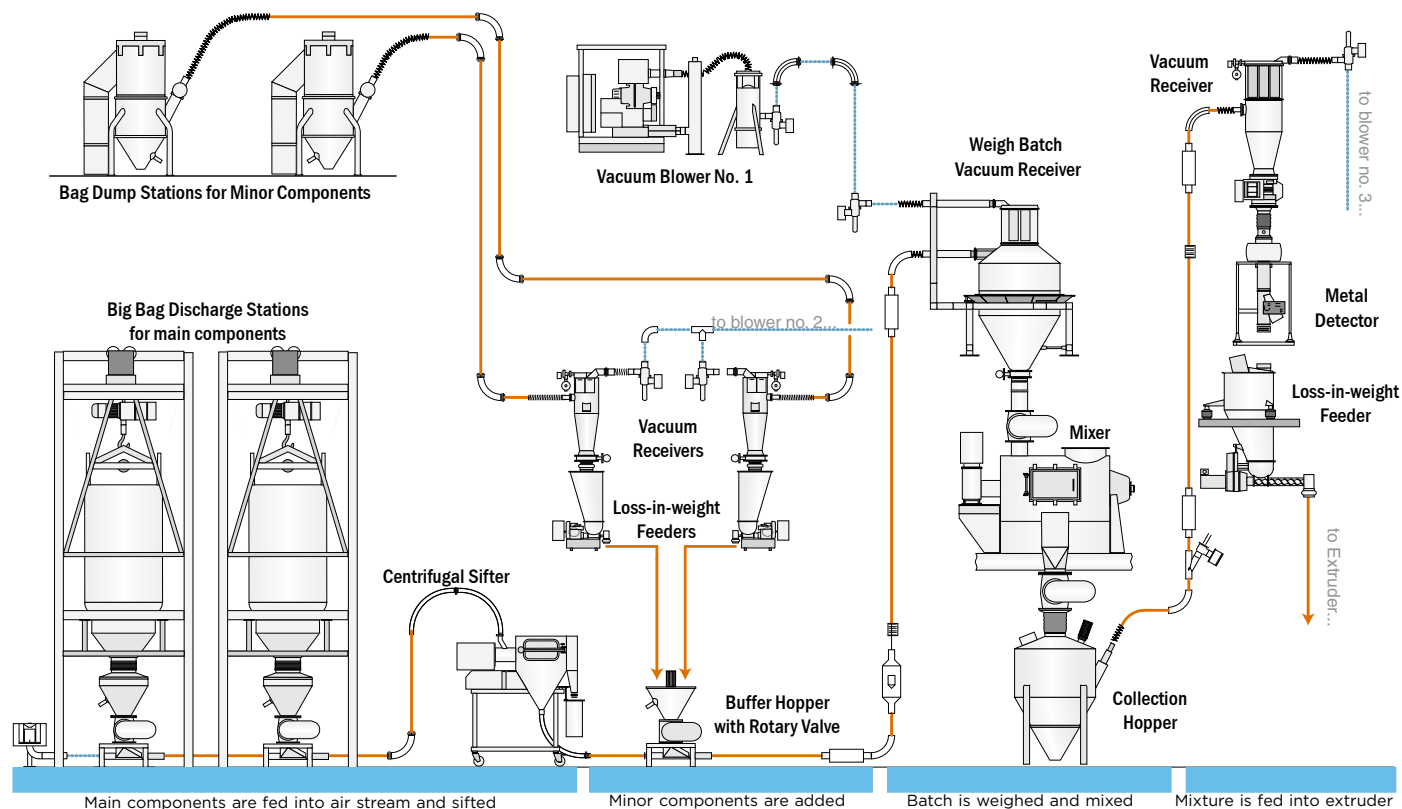
P100 batch weigh receiver
in a batching application

- Vacuum conveying contributes to a dust-free processing environment
- Integrating loss-in-weight feeders facilitates the ability to accurately batch minor ingredients
- In-house software design offers processors the flexibility to use their preferred make of PLC
- Many existing installations have provided a wealth of full-scale production experience
- All equipment is designed for 24/7 operation
- Systems can be customized to specific client requirements
- Readily expandable
- Bead blast, satin and mirror surface finishes
- Control PLC can use Allen Bradley, Siemens, Mitsubishi, Omron, or FDS so control can be part of the plant's existing control software
- Fail-safe valve on receiver outlet
- All vacuum receivers utilize large area reverse jet filters with steep-sided cones to ensure full discharge
- Optional flow aids are available such as fully fluidized cones, vibrators and aeration pads
- Vacuum pumps are positive displacement with <78 dBA acoustic enclosures

Specifications

- Up to 8 individual ingredients
- All contact parts 316 stainless steel

Batch Weigh Vacuum Receivers in Food Production



Process Description

In this example the aim is to create a pre-mix consisting of two different kinds of flour as the main ingredients and two additional minor ingredients. A charge accuracy better than 0.5% is required and it must be ensured that no external substances contaminate the flour. The flour pre-mix must be conveyed carefully and with no danger of de-mixing to the loss-in-weight feeder above the extruder.

Rotary valves dose the flours in sequence from buffer containers under the Big Bag emptying stations into the conveying air stream. This part of the pneumatic conveying process is typi-

cally dilute phase. On the way to the batch weigh receiver, the flour passes a centrifugal sieve integrated into the conveying tube. It is used for control screening and separating out extraneous parts.

The various flours and minor ingredients are conveyed in sequence as specified by the recipe. Due to their very small percentage proportions in the total recipe, minor ingredients such as sugar and salt can not be measured by the batch weigh receiver to the required absolute accuracy tolerance in grams. This job is performed reliably and with high accuracy by loss-in-weight feeders. They

are automatically refilled from vacuum receivers that convey the material from bulk bags.

After all ingredients have been conveyed onto the batch weigh receiver, they are emptied into the mixer. During the actual mixing process, the next charge is already being weighed in the batch weigh receiver. The mixture can then be emptied into the buffer hopper. This container accommodates 1.5 times the volume of the mixer and forms the connecting link between the discontinuous batch mixing process and the continuous feeding into the extruder.

When the flour mixture is conveyed from the buffer hopper to the vacuum receiver above the feeder, no de-mixing must take place. This is done by high material loading of the conveying air whose density prevents individual fractions from precipitating and separating.

The vacuum receiver above the feeder is equipped with a rotary valve to discharge the product. A metal detector mounted in the downpipe ensures that downstream equipment is protected from any stray metal items.

