



The Complete Guide to Automation for Premix Processing

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Introduction

Whether you are working with food, chemicals, wood pulp, plastics, or other bulk materials, it's essential to mix these ingredients efficiently.

Automation can make powder and bulk material processing easier, help ameliorate effects of labor shortages, reduce waste, improve accuracy, and more. Automation for premix processing also involves considerable investment, so it's important to make sure that your automated equipment is properly suited for your materials and facility.

In this guide, we'll discuss the best automation improvements for the processing industry and how you can find the right fit for your company.



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Bulk Bag Unloaders

Bulk Bag Unloaders

Working with large bulk bags instead of smaller, individual bags is one of the easiest ways to improve efficiency at your material processing facility.

However, it's important that your bulk bag unloader, also known as a super sack unloader, is designed and outfitted properly to suit your materials and facility.

With the right design for your bulk bag unloader, your bulk ingredients will flow smoothly and into the automated system and subsequent processes. A bulk bag unloader can work with all different types of bulk materials, and the design of the unloader will depend on the properties of the ingredients, the volume you're processing, the design of your facility, and more.

Keep the following factors in mind when considering the design of your super sack or bulk bag unloader.

- Facility Space
- Flow Control
- Dust
- Moisture
- Static

Bulk Bag Unloaders: Factors to Consider

Facility Space

Depending on the space available at your facility, you may need special design considerations. For example, if a clear path is not available for a forklift, you may need to use a dedicated hoist. Or, it may be safer to use a bottom lift mechanism to lift the bag into place.

Flow Control

If your ingredients are prone to sticking or clumping, your bulk bag unloader may need additional mechanisms to improve the material flow. You might use spring-loaded, retractable arms to retract as the bag loses tension. Or, you might use pneumatic paddles to push the ingredients out of the bag as it's discharged.

Dust

If the material is dry and light, it's likely to produce dust. You may need a ventilation or vacuum system to prevent dust hazards.

Bulk Bag Unloaders: Factors to Consider

Moisture

If moisture will cause the material to spoil or clump, the bulk bag may need a bag liner. The bulk bag unloader frame should secure the bag liner or it may become lodged in the feeder.

Static

Ingredients, like plastic pellets, are affected by static electricity, especially in dry conditions. This can cause them to stick to the bag, and the static build-up can damage weighing instruments or controls. The bulk bag unloaders must be properly grounded to prevent the build-up of static charge.

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Powder Feeders

Powder Feeders

The right powder feeder in your automation system will meter ingredients quickly and efficiently. This part of the premix processing system is essential—if the powder feeder is slow or inaccurate, it can affect the timing and accuracy of every subsequent process.

Similar to bulk bag unloaders, the powder feeder can be customized to meet the needs of your ingredients and facility. The powder feeder will often come after a bulk bag or another container, and meter ingredients into a mixer, grinder or another process.

When customizing your powder feeder to maximize the efficiency of automation in your premix processing, consider the following:

- Type of Feeder
- Feeder Core
- Flighting

Powder Feeders: Factors to Consider

Type of Feeder

Choosing the right type of feeder is an important first step in optimizing an automated mixing system. An auger feeder uses mechanical force from a spring- or screw-shaped shaft to meter materials. This type of feeder is highly versatile and generally appropriate for most ingredients, though there are some exceptions. A vibratory feeder uses vibration to move materials. This type of feeder can cause parts of the mix to separate if their particle size varies greatly. The vibration can also create noise and interference to weighing instruments.

Feeder Core

The feeder might use a spiral core or shaft core. A spiral core is shaped like a spring and it is hollow inside. A shaft core is solid inside and uses flights around the core to move material. A spiral core can move materials more gently, while a shaft core can help prevent bridging and clumping.

Powder Feeders: Factors to Consider

Flighting

When using a screw auger, there are many ways to customize the flighting on the auger. The spacing between the flights, or the pitch, as well as the size and speed of the auger will determine how much material moves through the feeder. A higher pitch will cause the material to move through the feeder in pulses, while a lower pitch will create more steady movement. Variable pitch or conical-shaped flighting will help to mitigate pressure build-up at one end of the feeder and prevent the drive from overworking.

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Scale Instruments

Scale Instruments

Coordinating the feeder, scale instrument, load cells and controls in the processing system will keep the mix accurate and keep the system working smoothly.

Automating the weighing portion of the premix processing system will save substantial time and free employees for more important tasks. When working with scale instruments, it's important to consider accuracy, speed, and capacity, as well as how the material flows, how many ingredients you're working with, and the rest of the surrounding processes and facility.

- Feeder and Scale
- Load Cell and Scale Accuracy
- Speed and Accuracy

Scale Instruments: Factors to Consider

Feeder and Scale

The capacity of the feeder and the scale must be coordinated. A feeder that delivers too much material too fast might not be weighed properly. Both the feeder and the scale must be able to meter and measure all the ingredients that move through it with the right accuracy. Consider how much material passes through the scale per second, and how long it takes to stop the feeder. If, for example, the feeder can deliver 1 lb of material in one second and it takes at least one second to stop, the smallest amount you can feed will be 1 lb. If your scale is accurate to within .01 lbs, this level of accuracy won't be useful as long as the feeder is too large.

Scale Instruments: Factors to Consider

Load Cell and Scale Accuracy

Both the load cell and scale must also be coordinated. A typical load cell is accurate with 5,000 divisions, which might not be accurate enough for the application. However, a finely-tuned scale instrument can divide by 10,000 or even 20,000. This would allow a 100 lb load cell to show increments of .01 or even .005 lbs, respectively. Though this would not be considered standard, the ingredient or application could call for additional accuracy.

Speed and Accuracy

There are a few ways to increase the speed of the feeder and scale without disrupting the accuracy. In some cases, it may work best to use additional scales, especially when working with ingredients that require different levels of accuracy. Dilution can also help with highly concentrated ingredients; if an ingredient requires accuracy within $+/- .01$ lbs., dilution by ten times will drop the accuracy to $+/- .1$ lbs.

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Micro Ingredient Systems

Micro Ingredient Systems

Micro ingredients require much more accuracy than macro ingredients or bulk ingredients. This can slow down the system or introduce inaccuracies.

Hand-adding micro ingredients takes time and it can be difficult to track. Hand-adding too much of any micro ingredient or missing an ingredient can cause product defects. Automating this process with a micro ingredient system can substantially increase the efficiency of the premix processing system. A specialized micro ingredient system can increase efficiency particularly when there is a significant difference between the amounts and accuracy between highly concentrated ingredients and base ingredients.

When working with a micro ingredient system, consider the following:

- Material Characteristics
- Bin Design
- Feeder Output

Micro Ingredient Systems : Factors to Consider

Material Characteristics

How well the material flows through the micro ingredient system depends on its characteristics, including viscosity, density, cohesion, abrasion, particle size, and more. Be sure to have an accurate assessment of your material characteristics, as well as its usage and accuracy requirements, before designing your micro ingredient system.

Bin Design

Micro ingredient bins without sloped walls, or without an adequate slope, can introduce flow problems. Generally, an angle of 70° is sufficient, but this will also depend on the characteristics of the ingredient. Vibration can also help improve the flow for very thick or cohesive ingredients.

Micro Ingredient Systems : Factors to Consider

Feeder Output

Either auger-type feeders or vibratory feeders can feed micro ingredients through the system. However, the feeder output must match the accuracy and total volume for the system. You'll need to have accurate density measurements, as the material density will affect output calculations by weight. Output may also be affected by flushing if the ingredient is free-flowing. Use a knife gate or butterfly gate to prevent this problem.

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Improve Your Premix Processing System with Automation

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As you consider automation improvements to your premix processing, take a close look at the best opportunities for efficiency improvements. If you're wondering how to improve your premix processing system, we can help. Give us a call to talk to an engineer and improve your system with automation.

Tell us about your system and learn more about efficiency upgrades.



Contact us today!

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