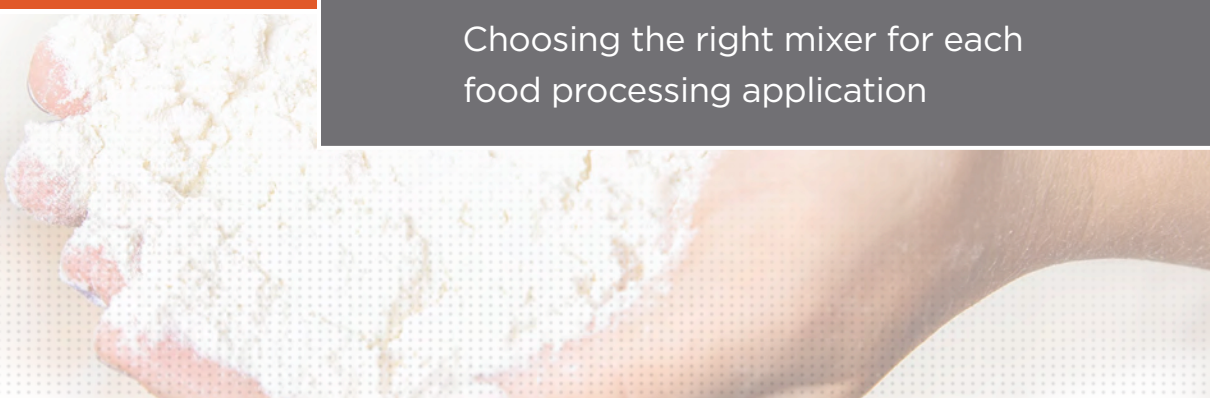




Industrial Food Mixing Application Guide

Choosing the right mixer for each
food processing application



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Food, Glorious Food!

At Marion Process Solutions, we work with hundreds of food processors worldwide to fit the right mixer to their application. Sanitation is always the most important factor when it comes to food processing, but within that, each food processing application is unique. Processing of perishables is different than processing of powders. We'll go through the sanitation basics and then discuss four of the most common applications of food mixing technology and detail what to look for in a mixer for each one of these applications.

While there are hundreds of applications with their own customizations, the following four give a good overview of the breadth of this industry and the different requirements you may come across as you search for the perfect mixer:



- Bakery Goods
- Coffee
- Nutraceuticals
- Ready-to-Eat



For the following deep dive on each area, keep in mind the reasons for customizing a mixer. While many mixers may do a “good-enough” job, customizing the mixer saves money in the long term through reduced operational costs, easier sanitation and reduced cleaning time, higher consistency mixes, reduced material loss and easier maintenance. With food, precision is essential. A tiny imprecision in the mix can lead to a product that doesn’t have the right taste or nutritional value and needs to be discarded. Custom machines will ensure that every mix turns out perfect every time.

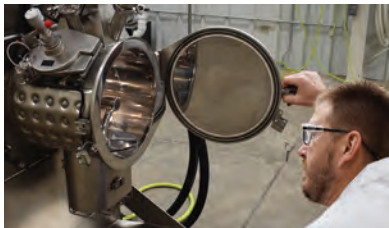
The first area to cover with food is the sanitation basics needed for every food-grade mixer. Afterwards, we dive into details of how to choose the right mixer for the bakery, coffee, nutraceutical and ready-to-eat verticals.

Sanitation Basics

For food processing, mixers must be absolutely clean to avoid contamination and potential for bacteria growth. Food manufacturers clean the machines regularly, but if the mixer isn't well-designed, cleaning can be time-consuming or incomplete. Following are the major requirements for a food-grade sanitary mixer:



Smooth, welded finish on all parts, inside and out. The trough, paddles, inflow and outflow areas and seal shafts should be completely smooth with a high polished finish. There should be no bolts or crevices where food might get lodged.



Easy to access and easy to view surfaces. Cleaning and inspection crews should be able to do a quick visual check to see every area of the mixer. Hidden corners or the back sides of paddles need to be easily visible and easy to access when cleaning. It shouldn't take intensive training for someone to learn how to thoroughly clean the mixer.



Airtight gaskets and seals. Powders shouldn't be able to escape, and gaskets and seals should be easy to replace as they wear.



Removable parts for easy cleaning. Gaskets, grates, outflow valves, choppers, load cells and other parts should be removable for cleaning in food applications.



3-A Authorization. It is important to note – a “3-A compliant” mixer is nothing more than a play on words. Equipment is either 3-A Authorized or it's not. Be sure you understand this fact when considering your sanitary requirements.

The above sanitary requirements apply to all kinds of food applications. In the next sections we'll go into the specific needs of a number of verticals within the food industry.



Bakery

Bakery blends involve powders, and in many production facilities the sanitation of the mixer room becomes a problem because they are not using mixer equipment with proper seals and gaskets. With today's technology, processors should not tolerate powder escaping into the room. Marion's mixer doors feature an O-ring gasket design that provides a complete seal. The fully removable gasket can be cleaned between batches. Many customers maintain extra sets of gaskets, so they can clean one set while the other set is running the next mix. This kind of removable and cleanable gasket keeps the area clean, reduces cleaning and maintenance costs and ensures that the machines keep running for optimal throughput.

Mixers for bakery goods come in a wide range of sizes, so the first decision is how much throughput you'll need, which determines the size of the trough. Generally, the regular U-shaped trough is appropriate for bakery mixes.

One of the essentials for creating rich bakery mixes is getting enough fat in the mix. When you purchase a pre-made cake mix, the box is heavier than most people would expect for the size. The reason for the weight is that the mix includes fats, usually in the form of shortening, blended into the ingredients. Getting a smooth blend with shortening and flour together is the tricky part when it comes to creating great-tasting mixes with appealing texture for consumers.



In order to mix shortening, mixing is typically performed in temperature-controlled environments. Processing equipment includes ports along the belly of the mixer, and each port is fixed with an injection nozzle that injects the shortening along with CO₂ (carbon dioxide) to keep the shortening cool. This prevents tempering of the fats and ensures that the shortening maintains its quality during the mixing.

To get a consistent product texture, near the ports for the shortening, the mixer should have high-speed choppers that blend the flour mix with the shortening to prevent clumping. High-speed choppers generally reach 3,600 revolutions per minute, which is sufficient for maintaining a consistent mix with the desirable texture. Again, keeping the area cool is essential, because with high-speed chopping, the friction can cause heating of the shortening, and if there is no cooling mechanism, the fats tend to liquefy and smear. Cooling jackets with liquid coolant or the CO₂ injection mentioned above are the recommendations for cooling with large-scale mixers.

Bakery (cont.)

The entire manifold with nozzles can be removed for cleaning, allowing manufacturers to maintain a spare manifold that is immediately placed in use while the nozzles are cleaned and sanitized. Because it can take longer to clean these precision parts than to clean the trough, having spare parts on hand means that mixing can continue quickly without an extra wait for parts to be cleaned.

Cleaning practices vary depending on the manufacturing facilities. Some facilities have different rooms for allergen-free or gluten-free products. Other facilities may want to clean in between mixes. As described above, having removable gaskets is extremely important. Paddles should be food-grade stainless steel with a minimum of 120 grit finish for easy cleaning. Also, because there may be a thin layer of dust on bakery applications, it's a good idea to do a white glove test on surfaces in addition to visual inspections.



Covers are also essential for general safety. Grain dust in the air is highly explosive. In addition to hermetic seals and gaskets, work with your vendor to prepare the room to adhere to best practices when working with any type of flammable or potentially explosive materials.

Last but not least, ensuring that every batch comes out with the exact amount of ingredients for the perfect flavor, the right automation makes it easy. Load cells on the hoppers weigh the materials as they go into the mixer, and an automated control system ensures that the correct proportion of additional ingredients get added to the flour or other base material. Weighing every load as it goes into the mixer ensures that processors get repeatable results with precision flavor and consistency on every single batch.





Coffee

Consumers demand high-quality coffee in terms of taste, aesthetics and aroma. Mixing applications for coffee can involve the combining of different beans or adding flavoring to ground or whole coffee roasts. Coffee processing involves gentle handling of the beans, with precision in the flavoring additives.

Many coffee system vendors offer turnkey systems with full machinery for everything coffee processors need—from loading through packaging. The illustration below shows a fully-equipped system that unloads the bags on the far right and conveys them into the load cells above the mixer. Because bulk coffee bags can have some leeway in the exact amount of coffee beans or ground coffee in the bag, the load cells are suspended on a scale for weighing the precise amount of the coffee before loading into the mixer.



The load cells communicate the precise weight to the control panel, which in turn gives the signal to the flavoring containers, pictured in blue above. Based on the controller signalling, the right amount of flavoring is pumped into the mixer through nozzles on a manifold that runs along the length of the mixer, similar to the bakery configuration described above. The nozzles make sure that the amount of flavoring is even along the trough, and the entire liquid manifold can be removed for cleaning and sanitation.

Coffee (cont.)

Unlike other food products, coffee doesn't have any difficult-to-clean materials involved such as fats or powders. For that reason, 80 grit finish for paddles and troughs is sufficient to get pristine cleaning for coffee manufacturing. To gently mix the coffee, all coffee applications use a paddle agitator. For sanitation purposes, the paddle is always welded and never bolted.



The main difference between coffee beans and ground coffee is the need to preserve the aesthetic of the shell of the whole beans. Consumers don't want scratched beans. The semi-cylindrical trough creates a better mixing environment to preserve the beans' exterior. For ground beans, typically a regular U-trough suffices. At the discharge area, using a flush hinge contour valve allows configuration of the trough to eliminate a valve pocket that could otherwise become a source of damage to the coffee beans.



As shown in the image above, the coffee coming out of the machine usually loads into a bin below the mixer for loading onto a slower conveyor or packaging machines. Like most consumer foods, coffee is packed into small packages or single-use capsules in a separate process. It's impractical to slow the outflow of the industrial mixer for the packaging stage of the process.



Nutraceuticals

Nutraceutical processing companies pay attention to precision mixes and pristine sanitation. One characteristic that is specific to nutraceuticals is that they often create mixes where the active ingredients are a very small percentage of the mix. A drink mix might have 98% flavoring and only 2% active ingredients to give the desired nutritional effect. From that perspective, getting every mix correct is extremely important. Like the configurations above, carefully weighing the input and having computerized controls ensures the right amount of material in every mix.



Nutraceuticals are less susceptible to damage during processing as the formulations are from powders through slurries. For that reason, most manufacturers will choose a ribbon agitator for the uninterrupted flow and elimination of pockets or clumping. The double ribbon is ideal for low density, free-flowing materials that are of like size and shape. The inner and outer ribbons move ingredients from end-to-end in opposite directions, and the blending action occurs by rolling material back and forth. For contract manufacturers who encounter blends consisting of various densities and sizes, a paddle agitator is better suited. The paddle mixing action of scooping and folding allows the heavier density products to be integrated back into the batch. In addition, the paddle allows for a greater working capacity range of 25% to 100% which allows greater flexibility and ability to pick up contracts. If shear is necessary, choppers may be added to help break up those tough protein powders with flavoring additives.

Often, the nutraceutical industry will be looking for a horizontal blender for ongoing throughput. In those cases, the only 3-A Authorized blender on the market comes from Marion Process Solutions. We have a variety of customizations available on the blender for specific applications in the industry.



Nutraceuticals (cont.)

Precision sanitation is of primary importance here, because even a tiny bit of powder left over from a previous batch can influence the activation level of a mix. For that reason, nutraceutical processors will choose systems that are efficient to clean and can be cleaned thoroughly. A core value for nutraceuticals is keeping people out of the machine as much as possible.



One of the features that is popular with nutraceutical mixers is to have a welded cover instead of a cover that is bolted. The welded cover allows easy washing in the door area, with no bolts where materials could get stuck in the crevices. Similar to all the other designs in the food area, every surface needs to be welded.

The precision of mixes for nutraceuticals demands the minimum-pocket discharge area. Typically, mixers for nutraceuticals utilize the spherical disk valve, eliminating the pocket where material can get stuck and result in some uneven mixing. Agitators and surfaces adhere to the food-quality standard 120 grit surface quality for easy cleaning.

Another technique to prevent people from touching the mixers is to implement wet washes and rinse-in-place. Using rinse-in-place is generally the better alternative to clean-in-place because it requires the staff to be certain that every area gets scrubbed. The design of the mixers generally includes lift-assist doors with full access without any bolted sections.





Ready-to-Eat, Salads and Refrigerated Foods

The ready-to-eat category includes refrigerated goods like guacamole, potato salads and other types of ready-to-eat foods. This category includes some of the most sensitive mixes in terms of the perishable nature of the materials being handled, and in terms of the preservation of the integrity and consistency of the ingredients. Too much mixing can make the consistency unappealing or damage the elements that are supposed to be chunky in the mix.

Having 3-A Authorization is an absolute must for this industry, and the need for an even more granular surface is recommended. Generally, ready-to-eat paddles and troughs use a minimum 150 grit polished metallic surface. The smoother finish means that product is less likely to stick to the surface, and it's easy to clean and inspect. As the grit is finer, the finish is also more brilliant so any residue would be obvious at a glance. All troughs need to be designed to be super smooth and have no surfaces where water could pool.



Ready-to-Eat, Salads and Refrigerated Foods (cont.)

Salad processing facilities wash the mixer after every batch. Look for a mixer that is carefully crafted with sloped surfaces for complete drainage. Even a minor flaw in the design or tooling will cause untold hours in making sure that some small pocket or area is clean. Inevitably, there will be a day where someone is just a bit tired or negligent—it's absolutely essential that the design of the entire machine makes it foolproof for cleaning and inspection, especially in cases like this where the mixer is cleaned multiple times within a 24-hour cycle. Often facilities will include power-washing equipment and spray-washing, so the drainage angles must be precise.

Typically, ready-to-eat applications will choose the J-trough or the semi-cylindrical trough. These configurations allow the paddle to come in close contact with the wall of the trough so that no material gets pinched or squished during mixing. Semi-cylindrical shape allows the paddle to meet the trough before it meets the product, pushing the mix gently in the mixer.

In these types of applications, 3-A Authorization is essential for every piece of equipment in the process: conveyors, storage bins, everything. Often, these applications don't have a door to close the top at all, using a grate instead. No door means one less item to clean. Of course, if there is no door, it is essential that the mix processing takes place in a clean room. Because ready-to-eat foods don't get powdery, the option of having an open aperture at the top eases cleaning without making any additional mess in the room.



THE TRICKS OF THE MIX

Food mixing is a precision-based science. Whether it's coffee flavoring, soup, spice or health products, even the tiniest degree of error can cause inconsistency in the aroma, taste or nutritional value. When mixing just one or two ingredients, the mixer simply needs load cells and a computerized flavoring unit to make sure the mix turns out right. However, some mixes can have as many as 30 different ingredients in a batch. Getting the loading just right in these types of applications requires implementation of several special methodologies. While we can't list all of that information here, it is sufficient to say that if you are working with the right mixer manufacturer, their technology that can ensure the right mix, no matter how many ingredients are involved.



CONCLUSION

Food processing is a huge niche for industrial mixers, and no two applications are alike. Customization of the mixers is even more important as every batch needs to be precise and the cleaning costs can become significant if the design doesn't take into account the specifics of the application and the site where the mixer is installed. Though we've covered only four main areas here, Marion Process Solution has engineered and deployed hundreds of custom mixers and systems around the globe. **Learn more about customizing the right mixer for your processing needs in the next section.**

Industrial Mixers:

Processing with Precision
for Every Application

Considerations, customizations and efficiency:
Choose the right mixer confidently.

Given the cost and lifetime of industrial mixers, most food processors want to get a detailed education on their options before making a purchase. This part of the guide is designed to walk you through the major considerations when choosing a mixer in general, and also walks through other verticals. You'll also learn about the categories for customization along with an illustration of the parts you can customize for each mixer. We'll then discuss how to think about the inflow and outflow for mixers and give an overview of continuous versus batch mixing.

Expanding or Replacing Industrial Mixers:

A Long-term Investment

As you dive into this section of the handbook, it's important to remember that the time spent learning about industrial mixers is small compared to the amount of time you can waste by making the wrong choice. Industrial mixers can last 20 to 30 years on a factory floor, so by the time it comes around to replacing them, the knowledge that went into that initial choice may be outdated. Plus, if the mixer has been working well all those years, why make a change?

The answer should be obvious. If that next mixer is going to last you a few more decades, even a small improvement in efficiency will pay off tremendously. The kinds of improvements you should be looking for include:

- Power and throughput efficiency.
- Easier and lower-cost maintenance.
- Lower sanitation costs for both the equipment itself and of the surroundings (replaceable gaskets, for example).
- Features that prevent waste due to incorrect mixtures, overheating and air pressure faults.
- Compliance and sanitation requirements.
- Customizable agitator paddles, fixed or replaceable.
- Factory floor footprint.
- Flexibility for changes over time—ability to adapt as the business grows and changes.

Customizing mixing equipment for your specific application may cost a bit more up front, but in the long term the efficiencies add up to lower operational costs as well as better quality product. Vendors who have been in business over the decades recognize the importance of continuous improvement of the equipment and will offer you a variety of custom options with different types of agitators, input and output options, gaskets, seals, etc. Precision selection of custom options lead to a more durable solution that serves your needs best.



Top Considerations for Choosing Industrial Mixers

When choosing a mixer, use the following as the baseline criteria to consider in making a choice. On top of that, add any specific requirements for your application:

- Feeders into and out of the machine. The speed and loading techniques of the inflow and outflow influence the type of machine and throughput appropriate.
- Composition of the materials being mixed: viscosity, density and granularity of materials.
- Changes in material characteristics during the process (chemical processes).
- Multi-purpose or dedicated production lines, that is, whether you'll be mixing different recipes and cleaning the machine frequently between batches.
- Site requirements. Safety, floor space, surrounding machines and other physical requirements and/or limitations influence the choice of mixing equipment.
- Sanitation of the machines, manual or automated cleaning, frequency, and level of sterility needed. Impact of dust or particles escaping or leaking: Is it merely an inconvenience or will you be handling pharmaceuticals, explosive or other potentially harmful materials?
- Durability and precision. Accelerated wear and tear, short- and long-term maintenance requirements, and the potential for diminishing quality are all results of not having customized mixers appropriately from the outset.
- Future trajectory of your business. Manufacturers in many industries need to consider changes in formulation, chemical and materials technology advancement and company growth.

In addition to the general considerations described here, the next pages go deeper into specific verticals, and the considerations that apply to each of the major applications of industrial mixers.



Industry Verticals:

Major Considerations and Differences

FOOD

Consumers and regulators have upped the game when it comes to sanitary design and processing of foods. Manufacturers simply cannot afford the blow to their reputation associated with product recall or litigation. Choosing 3-A Authorized equipment is the right way to go. If it says “compliant” or “certified” you can be pretty sure it’s not authorized. **Marion has the only 3-A Authorized horizontal mixer on the market today.**



Going deeper into sanitation, the underlying questions are:

- How easy is it to clean the mixer?
- How easy is it to know that it’s clean with a visual inspection?

People who do the cleaning shouldn’t need mechanical or technical backgrounds to competently clean and inspect a machine. Anyone in the facility should be able to inspect the mixer without much training. Basically, that means the mixer shouldn’t have any hidden niches or points where residue can accumulate unseen.

Mixers can include a variety of features that contribute to better sanitation, including:

- Ergonomic doors for easy access to the mixer with wands and brushes.
- Parts that can be removed for cleaning, such as gaskets, seals and valves.
- Welded paddles and parts (not bolted) to prevent residue and increase visibility of the paddles.
- Safety grate for inspection, protecting personnel as they bend over to investigate the mixer.
- Large doors for easy access.
- Weighted doors for easy opening and protection of personnel.
- Easy access to all surfaces for wipe-down access.



Options for Clean-in-Place and Rinse-in-Place.

When it comes to Clean-in-Place (CIP) options, most factory floors simply don’t have the appropriate drainage and waste disposal facilities for the output of the detergent and residue. Rinse water with food residue can harbor bacteria, so for most locations, CIP is impractical or more expensive than manual cleaning. Typically, it’s better to use manual cleaning, possibly with an option for rinse-in-place if the drainage is available.

PHARMACEUTICAL AND NUTRACEUTICAL

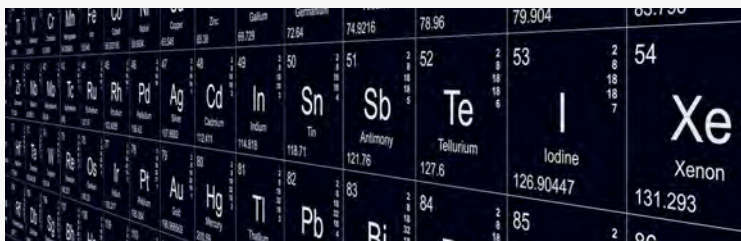
Precision is the name of the game when it comes to pharmaceuticals. Every single mix must be precisely the same with absolutely no room for error. Batch mixing is the only way to go for precision formulations. Experienced vendors can help with different techniques around the order of the batch mixing and ensuring the inflow, outflow and mixing times are optimized for the specific ingredients and materials being handled.



Furthermore, as with foods, sanitation is key to prevent any types of contamination and to allow manufacturers to use one mixer for different mixes. Anything consumable needs to adhere to 3-A Sanitary Standards, so you'll want to review the details in the Food section of this manual and make sure any mixer you choose has all of the appropriate options for sanitation.

CHEMICAL

Chemical mixes are varied and can require a variety of temperature and sanitation precautions. Similar to pharmaceuticals, working with the right vendor will allow you to achieve a high level of precision and accuracy in the mixes for the specific chemical materials being processed. With chemical reactions, it's important to have a high level of control around the temperature of the mix. For exothermic reactions, cooling jackets should be installed to control the temperature of the drum. Conversely heating jackets or mechanisms provide control in chemical reactions that need to stay within a warmer temperature range.



An important factor when handling chemicals is the safety of the environment around the mixer. Classified processes and materials require explosion-proof electrical parts, valves, motors and safety switches. It's extremely important to make sure the environment is safe and that there is no escape of fumes that could endanger people in the facility. Often, reactionary or classified materials require an isolated mixing room. Vendors with extensive experience in setting up safety rooms can help with the site specifications and installations, so that you ensure the highest level of safety at your facility.



PLASTICS

Plastics can include powders, pellets, flakes and coatings, and consistency is the key here. Considerations for plastics tend to vary depending on the applications, so consider different types of agitators depending on the need. For



recycled plastics, a bolted agitator is best, but in medical applications, food-grade paddles are necessary. Anything that might be used for laboratories or medical procedures must adhere to all the sanitary requirements outlined in the Foods section of this handbook. Plastics today are used for everything from implants to surgical equipment, so anything that's going to be inside someone's body requires the same level of sterility as pharmaceuticals and consumables.

Because of the nature of plastics, they tend to leave residue in the mixing chamber, which can affect the consistency of the next batch in the line. Often there's a micro-dust that's hard to see with the naked eye but is quickly detectable with the white-glove test. For that reason, it's important to consider the ease of cleaning the mixers to prevent these types of problems. Delays in sanitation mean slower throughput. Easy sanitation increases the number of batches you can cycle per day.

BIOMASS

Biomass covers a huge range of applications, so customization is key here. Continuous mixers provide rapid throughput, so it's important to work through the specifications for the conveyors both for feeding the mixer



and for the outflow. Applications such as colored mulch and waste recovery can use continuous mixers because the applications don't require high consistency of the output. If there is a variation tolerance of 5% or more for the output mixture, continuous mixing is probably the way to go.

On the other hand, with mixes that demand extremely consistent precision in the percentage of the mix, continuous mixing might not provide the best output. Finally, some biomass products are quite sensitive, or need both drying and mixing. Marion provides a large variety of machines to customize for this demanding market.

MINERAL

Abrasion tends to be a central issue in handling mineral mixes. It's important to choose a mixer that has features such as replaceable paddles and replaceable trough liners to extend the lifetime of the mixer. Any mixer

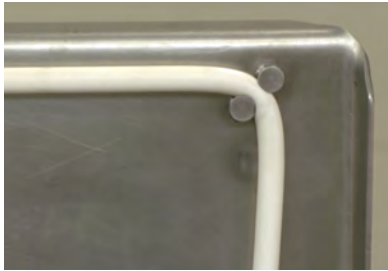


without these kinds of replaceable parts will have to go out of service prematurely. Materials such as glass, sand, cement, concrete, aggregates, soil reclamation, pastes, epoxy, adhesives, gypsum, fiberglass and resins, and wood compounds can take their toll on machinery so make sure to choose a mixer that features easy replacement of any parts that come in contact with the mix. While some manufacturers may calculate that it's cheaper to replace the mixer every few years than purchase replacement parts, often these calculations neglect the cost of teardown and disposal of the machine, as well as transport, site preparation and installation of a new machine.

Customization:

Top Three Benefits

Customization makes the difference when it comes to precision mixes, long-term equipment reliability and operational costs for production lines. Choose options that fit the sanitation, materials handling and durability requirements for your applications.



Sanitation: Depending on the application, cleanability is a major concern to prevent carryover and/or avoid contamination. Sanitation of the equipment involves a range of features, from replaceable gaskets to protect the environment from being dirtied with powders, through having easy-to-reach doors and internal mechanisms for your sanitation crew. If you are working in an environment where there's no room for error when it comes to the cleanliness of your mixers, choose a 3-A Authorized mixer, not a "compliant" or "compatible" mixer. To date, Marion Process Solutions is the only 3-A Authorized manufacturer of horizontal mixers.



Materials Handling: Depending on the application, mixers can be customized for precise measurement, quality checks and appropriate mixing for the viscosity and granularity of the raw materials. Many manufacturers feature only one type of agitator, limiting the customization they can offer. Agitators vary in their abilities to handle different sizes, shapes, densities and potential viscosities of materials. Paddle agitators provide a gentler blending motion, while ribbons are needed to introduce shear or scrubbing action into the mix. Choppers are an option for applications where materials tend to agglomerate or where the material requires aggressive dispersion or size reduction.



Durability: A variety of options can compensate for accelerated wear and tear as well as address short- and long-term maintenance requirements. Replaceable seals, gaskets and paddles can keep the machinery running at top performance over the years. One of the simple customizations is ensuring the air supply manifold is at eye level, to prevent unnecessary wear on seals and other components.



Closing the Gap

Mixers are all about moving parts, which puts a focus on how to ensure durability over a long machine lifetime. Marion Process Solutions puts a heavy focus on gaskets, seals and agitator shafts that stand out from the rest. One element of creating durability is determining the parts most likely to wear out and making it easy and cost effective to replace those parts. Acquiring a comprehensive maintenance plan takes the burden off of your staff and ensures a longer lifetime for the equipment.

Marion has developed advanced lip seal technology that outperforms the typical stuffing box seals design, is more cost effective than mechanical seals and can rapidly be disassembled, cleaned and re-installed. For powder materials, the design is multiple double lip seals with air purge, while liquids, slurries and 3-A Authorized sanitary applications, utilize a single lip seal. The seals can operate for years with minimal maintenance required, and then be replaced for a fraction of the cost of traditional seals.



Gaskets maintain the hermetic seal on the doors of mixers. Anyone who has toured different facilities has seen production floors dusted with flour or other similar materials because of poorly fitting door seals or worn out gaskets that are the wrong material, haven't been properly maintained or have been removed altogether. Marion has developed a patented O-Ring technology that ensures a perfect seal for door gaskets and makes it simple to remove, clean and replace regularly to prevent such issues. Anywhere that leaks occur can be a source of health or compliance problems, so it's worthwhile to invest in customized gaskets, seals, doors and dust collection ventilation. Using the right seals and gaskets keeps your factory environment clean.

How to **Customize Your** Industrial Mixer

COUNTERWEIGHTED DOORS

- Ergonomic assist for easy access
- Solid weight (no hollow tubes)



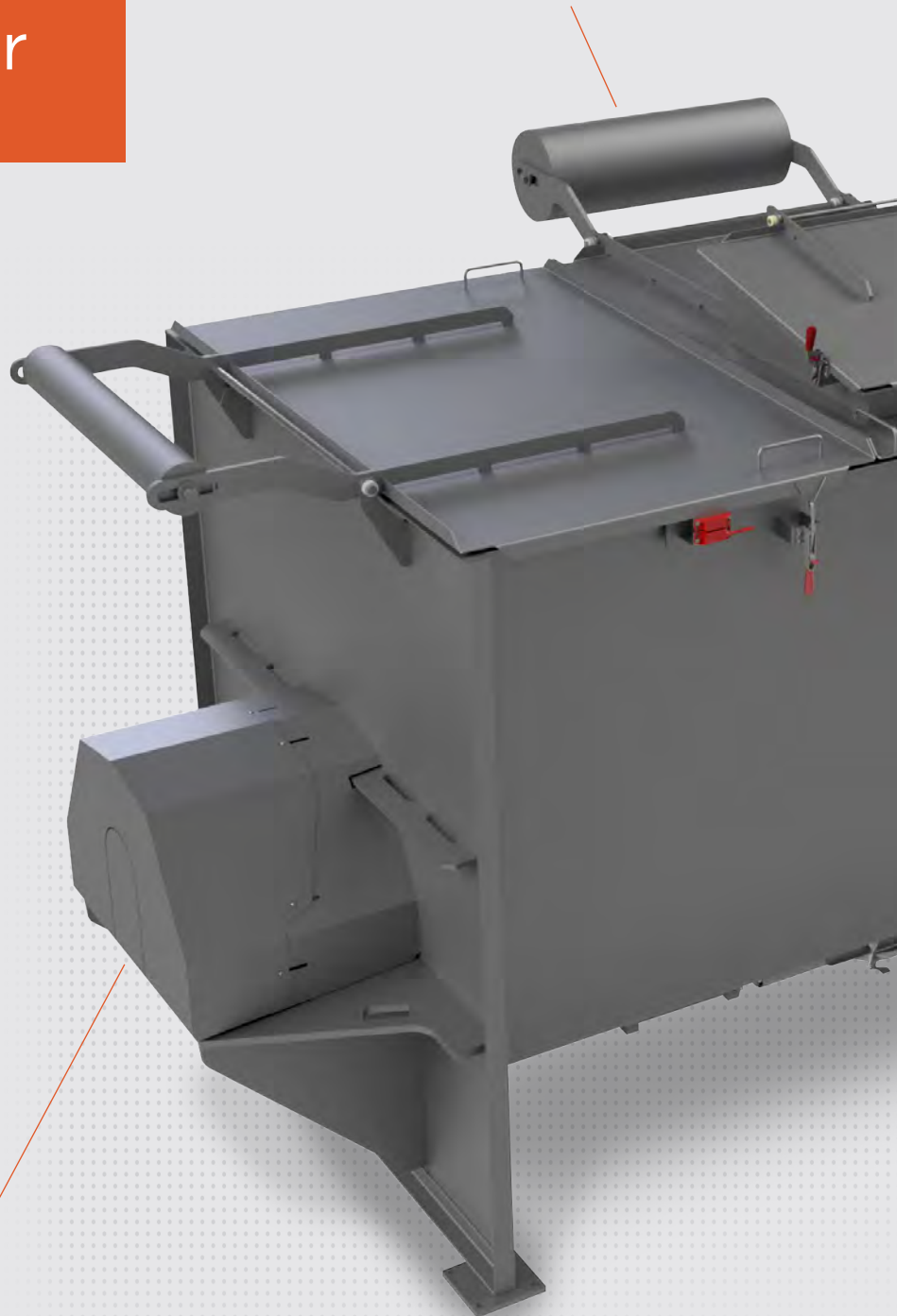
CHOPPER

- Intense cutting action to assist in blending
- 3,600 rpm
- Tulip, knife blade or hybrid tulip/knife choices



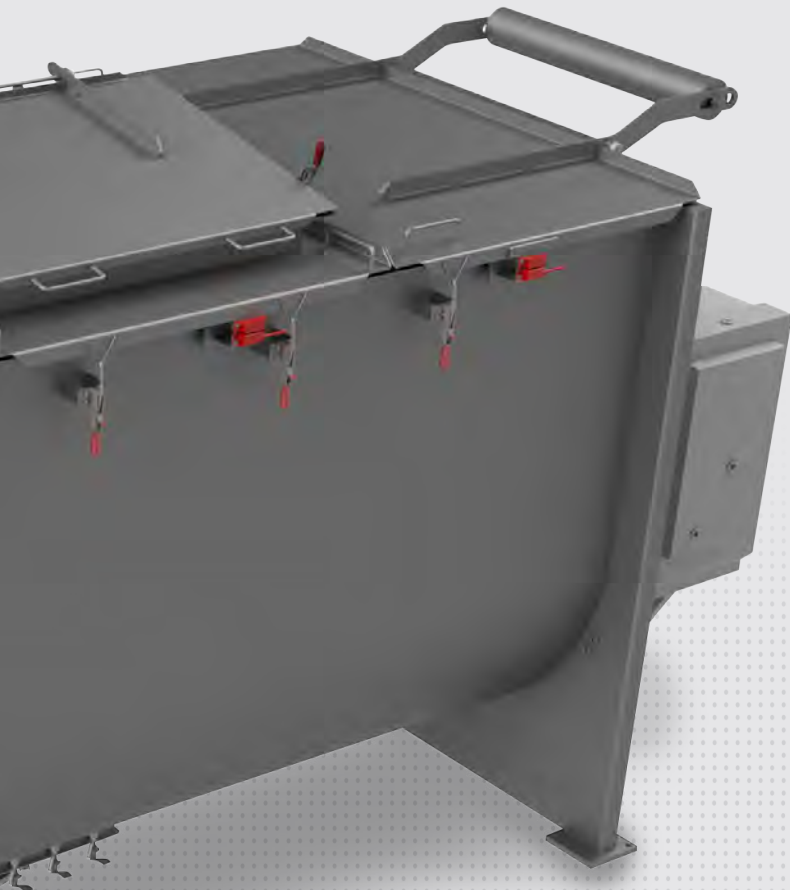
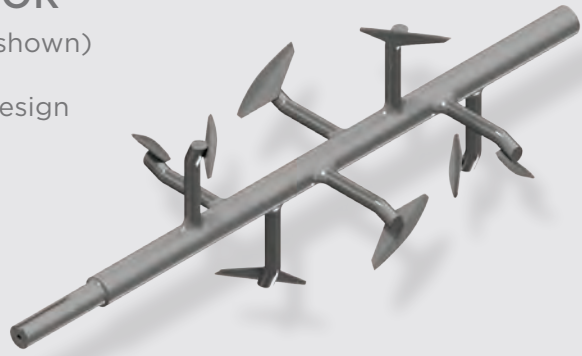
MAINSHAFT SEALS

- Stuffing box (shown)
- Split design
- Mechanical



AGITATOR

- Paddle (shown)
- Ribbon
- Hybrid design



SPRAY

- Spray or inject designs
- Sanitary and removable for cleaning available

ADDITIONAL FEATURES

- Drives specifically selected
- Controls
- Load cells
- Sifting
- Elevated work platforms
- Smart Air (mainshaft seals)
- 3-A Authorized design
- Integral dimpled jackets
- Hoppers (stationary or agitated)

DISCHARGE

- Hinged contour (shown)
- Knife
- Roller gate
- Flush hinged
- Drop-bottom



The Ins and Outs

Upstream and downstream flows are major factors in determining the types and configurations of mixers that are most appropriate for a company. Production lines have clear throughput goals, based on demand, and the mixers need to stand up to the demand. Careful assessment of the impact of the upstream and downstream flows leads to optimal choices in mixer configuration and quantity.

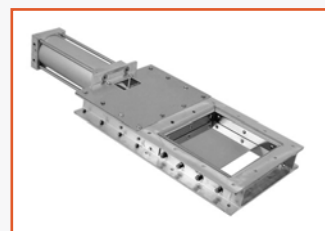
Loading of the mixers can end up as the limiting factor when it comes to determining cycle time. A mixer may need a 15-minute cycle for processing, resulting in four cycles per hour. However, if loading takes an extra 5 minutes, that limits the mixer to three cycles per hour. If a mixer is being hand loaded, mixers should be configured for easy loading to reduce the chance of injury. Bulk bag unloaders or feeders require headspace or conveyor space, so it's important to do a site survey and account for those needs.

Downstream, slow output may also be a choke point when it comes to the throughput of the mixer. Configurations for rapid discharge can choose options such as a knife gate or roller side gate. However, if the unloading is onto a conveyor, the system needs to use a control valve that meters out the mix at a rate dictated by the conveyor. A variety of metered valves are available, including ball valves, butterfly valves, knife gate valves, and iris valves.

Finally, when considering the right discharge valve, some applications require removable valves for pristine sanitation. When working with degradable materials, pharmaceuticals or foods, manufacturers will want to be able to remove and thoroughly clean the valves on a daily basis or when switching from one mix to another.



Knife Gate Valve



Roller Slide Gate Valve



Ball Valve



Orifice Slide Gate Valve



Butterfly Valve



Iris Valve

Continuous versus Batch Mixing

The choice between continuous and batch mixing is a key decision when choosing an industrial mixer. The three main factors are **throughput, precision and inflow/outflow** from the mixer. For some applications, manufacturers also need to take factors into consideration such as the need for thermal processing and coating or specific regulatory or sanitation requirements.

- **Continuous mixing is typically relevant when there are fewer than three ingredients and precision is not a priority. The benefits are high throughput and low energy use, as well as a smaller footprint.**
- **Batch mixing is appropriate for mixes with three or more ingredients, and where the precision of the mix determines the quality. Almost any type of consumable product falls into this category.**

While most manufacturers understand the difference between continuous and batch mixing, there can be some confusion when it comes to continuous process batch control mixing.

Continuous process batch control mixing is a batch process that improves the speed of batch mixers. In continuous process batch control, the hoppers are filled while the mix is in the mixer, and then as soon as the mixer is emptied, the next batch is immediately fed into the mixer. This process combines the precision of batch with some of the speed of continuous mixing. Continuous process batch control mixing is repeatable, consistent and maintains mix quality.



LIFECYCLE SUPPORT

Mixing isn't just about the mixer; it's the beginning of a long-term relationship with the equipment vendor. As you're vetting the equipment, you'll get a sense of how it is to work with that vendor. Are they trustworthy? How long have they been in business? Are they able to provide a test lab facility so you can try out different mixtures and configurations before making a purchase or changing a formula? Your needs will change over time, so make sure you are choosing a vendor that provides services such as:

- Engineering support during the pre-sales process for customization.
- Site inspection and specifications.
- Test labs for proving the effectiveness of their equipment.
- Configurations for your specific needs.
- Process improvement.
- On-site installation support.
- Routine maintenance schedules.
- Replacement parts, both new and refurbished.
- FAT, SAT, commissioning and training services.
- Engineering support for any issues that arise in the manufacturing process, inflow and outflow, energy and sanitation requirements, etc.
- Pre-scheduled site visits to assess and optimize performance.
- Needs assessments, configuration and optimization for growth, new products and line improvements.
- Processing expertise in similar fields, and the ability to apply that expertise to your production lines.
- Suggestions and updates, based on industry trends, laboratory tests, and knowledge gained from industry best practices.

AFTERMARKET SERVICE AND SUPPORT

Marion Performance Group (MPG) provides the aftermarket services that give our clients the best performance over the lifetime of their equipment. MPG relationship will begin before your mixer ships. Our team will reach out discuss recommendations as to what parts should kept on hand. We will discuss on site support and maintenance plans. We will be here for your continued support.

Leveraging our experience ensures you'll receive far more than a solid return on your investment...you will create a competitive advantage in your industry. It's simple really: When you're proud of your work, you sign your name to it. You'll find it on everything we build.

CONNECT WITH US

Think of the last time you were delighted by a company. They asked the right questions, listened with eyes and ears, stayed engaged throughout the process, applied their unique expertise, provided you with a spot-on recommendation, and then delivered more than they promised—right? We call this experience “Full Engagement” and it’s standard practice at Marion Process Solutions.

So let’s engage, start the dialogue, and see where this goes.

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