

# Choosing the Right Mixer: What to consider

## A guideline for those involved in the selection, specification, and purchase of mixers

Mixing is possibly the oldest and most widely used of all technical processes. It is carried out in virtually every industry handling or processing powders with other ingredients and there are very few products used in everyday life that don't have a mixing process as part of their manufacture. Mixing can therefore be considered as one of the essential technological processes. To avoid problems of poorly or unmixed material, with the associated quality issues and unnecessary operating costs, there are a few factors that should be considered before the purchase of a new mixer.

### Which Mixer?

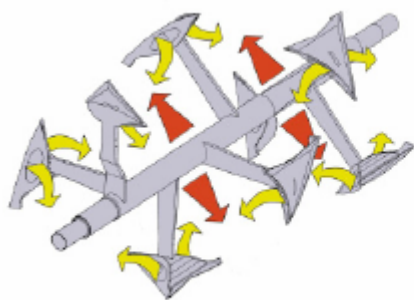
First, and most important, is the material and recipe formulation to be mixed. The mechanical properties of the ingredient parts of the mix, together with their particle size, shape and flow characteristics all have a bearing on the mixer selection process and will help to determine the most appropriate type of machine for the application. The production requirement is also an important fact to consider as this will affect the machine size and type, either batch or continuous. The working capacity of the mixer selected will take account of the total required production capacity together with the desired level of automation and time and labour available for operating the machine. These factors when combined will give a clear indication of the parameters of the new mixer.

It has been said that anything can be mixed in a bucket with a wooden spoon, but this simple expedient may be considered impractical for more than a bucket full of product. So if not a bucket and paddle, then what? There are several different types of mixing machinery on the market and it is quite possible that more than one type of machine will be capable of handling a given application.

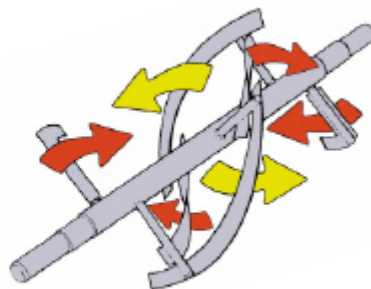
The challenge is to find the machine that is best suited to you, your process and your budget.



Although the dictionary definitions of mixers and blenders are one and the same, the tradition established among the majority of mixer manufacturers is to define a mixer as one which mixes by virtue of a moving mixing element (agitator) within a static vessel and a blender as one that mixes (or blends) by virtue of a tumbling action of the vessel itself. The different types of mixers and blenders on the market include low speed and high speed horizontal mixers with interrupted spiral, paddle, or plough type agitators, vertical mixers, as well as double cone, drum, tumble and 'Y' type blenders, to name but a few. In addition, some horizontal mixers and blenders may also be used as continuous mixing machines. The selection of the type of the machine best suited to your process will in part be guided by the characteristics and requirements of the material to be mixed and for instance, whether it has high or low particle strength.



Plough Agitator



Ribbon Agitator

So what type of machine is the best for you? Very simply it's the one that achieves the desired product quality at a cost that falls within your budget for the purchase of the machine and it's subsequent operational cost.

## Before you decide.....

Occasionally, the mixer supplier will have previous experience of either your process or something similar that will help to determine the right mixer for the application. Where this experience doesn't exist, the importance of testing as part of the selection process cannot be understated. Ideally, tests should be conducted on the largest size of machine available to negate or minimise any possible effects of scale up. The effect of scale up is important for a variety of reasons. If accurate estimations of power requirement, mixing parameters, mix times, etc., are to be achieved, then the closer the test machine is in size and proportion to the actual process requirement, the more accurate will be the end result. Mixing is not an exact science. The evaluation of mix efficiency, mix times, power requirements etc., can only be established practically by actually mixing the components under consideration and by the evaluation of samples taken at specific intervals from a range of locations throughout the mass. Additional samples should be taken from the discharge stream, as these will detect any tendency of the mix to segregate on discharge. It will also detect if any of the minor ingredients have been lost due to the effects of dusting etc. Evaluation of the success of the test procedure is then a matter of assay.

So now you have a clear handle on the materials that you wish to mix and hopefully some positive results from tests carried out by your chosen mixing machinery supplier. What else do you need to consider?

## The Process

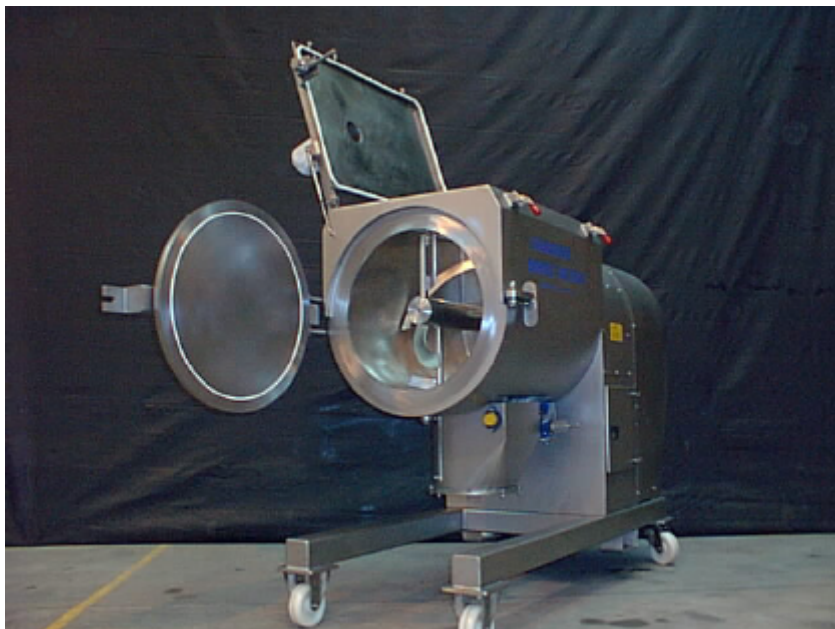
The new mixer will be an integral part of your manufacturing process so it is vital to consider how and where it will fit into your production facility and what it will involve in terms of design features, services and labour requirements.

Safety must be a priority. If the products that you will be handling are in any way hazardous, toxic or explosive, the new machinery will almost certainly require an ATEX rating and this must be established before committing to any new machinery. In conjunction with the mixer supplier, examine and determine the design and construction of the machine to ensure that it complies, not only with current safety legislation, but also satisfies the safe operational requirements of you and your operators. Part of this overall exercise will be to determine whether your product is sensitive to heat or pressure and to ensure that the design of the machine accommodates and / or mitigates these issues.

Consider how you will feed ingredients into the machine and how you will deal with the product after it has been mixed and discharged from the mixer. This may seem unrelated to the selection process for the mixer itself, but is in fact crucial to the design of the mixer and its peripheral features, as well as to the success or failure of the final mixer installation from a production aspect.

The materials of construction, i.e. stainless steel, or mild steel, and the mechanical design features of the mixer itself will, to a great extent be decided by the process. For instance, the machine may be required not only as a pure mixer, but may also need to carry out other processes such as heating, cooling or liquid addition. Depending on the nature of the product and the process, de-agglomeration of the product may be required and in order to accomplish this, a plough type mixer may be specified together with high speed choppers or intensifiers to act as an aid to mixing as well as in some cases reducing particle size.

In some industries and for many applications, mixers will require only infrequent cleaning. However, several



Easy Clean Mixer with hinged and interlocked door

applications, particularly in hygienic or pharmaceutical environments have the need to accomplish an effective and efficient cleaning process that must be evaluated and catered for at the design stage of the machine. Cleaning may range from simple brushing, vacuuming or scraping for dry powder mixes, to more complex validated regimes involving wet washing and / or sanitising with the aid of fixed nozzles or wash water spray devices. Where wet cleaning is employed however, the time and method of subsequent drying must also be considered.

In all cases where efficient cleaning is a requirement, the need to have access to the internal product contact surfaces of the mixer becomes paramount and this may be effected via top or side mounted hinged and safety interlocked doors or covers. Again, this is a feature that will be identified at as early a stage as possible in the mixer selection process.

## Conclusion

In summary, the criteria to be considered when looking for and choosing the right mixer are:

- The products, ingredients, and processes of your desired mix
- The required production capacity
- The Safety, ATEX, and any hazardous aspects of the products or process
- When previous experience of the process is not available, testing is strongly advised
- The mix quality acceptance criteria
- Co-operation with the mixer supplier to determine the mechanical design features of the mixer
- The careful consideration of ingredient infeed and mixed product discharge
- The ease and effectiveness of cleaning

The ideal of one mixer to suit all applications does not exist and the selection of the optimum machine for any given application will only be established following close co-operation between the end user and the equipment supplier. The well known range of Gardner mixing machinery has been in existence for over 160 years. Kek-Gardner's experienced engineers and technical specialists are on hand to assist with the selection, and specification of your new mixer.

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