



## **Chemical Industry Mixing Challenges:** Considerations For Choosing The Right Equipment

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**Efficiency, consistency, and repeatability. These are qualities the chemical industry strives for in its mixing operations. However, finding the right mixing equipment, and the right mixer manufacturer, for your unique products and operations can be challenging. This article will guide you through what to consider when choosing the chemical mixing equipment and mixer manufacturer for your facility.**

Having the right mixing equipment for your unique processes, products, and operations is critical in two ways. First, the right mixing equipment plays a major role in creating the product exactly to both internal and external specifications. For example, if a company is using mixing equipment that doesn't provide the right amount of shear energy to create an emulsion of exact droplet size, the product may be out-of-spec or have a short shelf life. The right equipment will have the capability to impart the exact energy required for product specifications and longer shelf lives. Secondly, the right equipment can also give a chemical company a competitive edge because the company can make a better product or make the product faster or more efficiently than other companies in the same market. Overall, the right mixing equipment allows a chemical manufacturer to supply product quickly, consistently, and reliably.

## KEY CONSIDERATIONS FOR CHEMICAL MIXER SELECTION

Having the **right size** mixing equipment to meet production needs is essential. While big enough to mix for today's needs may be fine, it may not be adequate for tomorrow. So it's important to consider how your company will grow when purchasing mixing equipment. Mixing equipment isn't disposable, so companies can't be shortsighted in choosing equipment to meet the company's goals. Ideally, the right mixer will be slightly bigger than what current needs require to allow for growth and will have features and controls to accommodate additional and future lines of products. But buying the biggest mixer on the market to satisfy all future needs isn't viable because with most mixer types, there is a range of batch volume at which the mixer will operate well.

Based on existing processes and whether or not a company wants to scale up its volume, vendors will often make a recommendation for mixing equipment size. For example, if a company is using a batch-style mixer – a mixer that can normally accommodate a 1:3 range in product volume – for its products, the recommendation



**Figure 1 - Ross Planetary Dual Dispersers and Discharge Systems for batching high-viscosity sealants.**

would be to at least meet the existing production requirements with that minimum of one-third and leave that extra two-thirds to grow.

*Having well-designed mixing equipment is also critical. Many variables – engineering processes, materials used, craftsmanship, etc. – must be carefully considered and selected to create well-designed mixing equipment. Typically, well-designed mixing equipment contains the following:*

- bearings, shafts, and seals engineered to accommodate the required forces and provide long life.
- blades and agitators easily accessed or raised/lowered from mixing vessels.
- interchangeable mixing vessels that can be dedicated to a formulation.
- Premium quality stainless-steel components to prevent corrosion.
- Proper welds and polish to promote easy cleaning and to prevent potential contamination.



**Figure 2 - Ross X-Series Ultra-High Shear Mixer designed for fine emulsions and dispersions.**

**A holistic approach** should be taken when selecting a mixer because in many chemical mixing processes, the same finished product can be achieved with different mechanisms. Often, chemical companies have preferences on how to achieve high-quality finished products but may have limiting factors – size of mixing equipment, plant layout, upstream/downstream processes, bottling and packaging equipment, etc. Those additional variables should be evaluated, as the decision is not based on mixing alone, but also on understanding the best path to accomplishing the company's goals.

## QUALITIES OF EFFICIENT, CONSISTENT, RELIABLE CHEMICAL MIXING OPERATIONS

A chemical company will know that its mixing operations are efficient by seeing improvements in its bottom line and profit margins. Reduced batch turnover cycle times are also an indication of successful mixing operations.

Batches of final product will become more consistent and reliable in successful mixing operations. Consistency and reliability are both aspects of QA/QC functions where product is meeting the same physical

characteristics or chemical characteristics every time, batch to batch, and can be viewed through two lenses: batch-to-batch repeatability and long-term reliability.

Safety is also critical in chemical manufacturing, especially in today's tumultuous legal landscape. Many safety features don't necessarily reside in the physical pieces of the machines, but rather in their software and controls. Each chemical manufacturer has its own safety guidelines to abide by, and each chemical mixer is designed to meet or exceed those designated standards.

Oftentimes, proof of consistency, repeatability, efficiency, a clean safety record, and bolstered profits are the measuring sticks of success.

## HOW CHEMICAL MIXING EQUIPMENT HAS EVOLVED

There haven't been many big advancements in the physical components of chemical mixers recently. Most advancements for vessel and agitator blades have been small and incremental, evolving toward greater efficiency. While major advancements in those components have been few, the controls, electronics, and user interfaces of chemical mixing equipment have moved forward tremendously. Specifically, software, control systems, and user interfaces have evolved far enough for chemical makers to use recipe- and product-specific software in the manufacturing process.

These features prompt operators on when to add each ingredient into the mixture (whether by hand for small batches or through automatic feeding for large ones) and adjust agitator speeds/mix durations automatically.

Further, adjustments to recipes and products can be made manually or programmed into software on an as-needed basis. For instance, if a company is developing a new product with qualities and characteristics it has not worked with before, a chemical mixer vendor has the capability to visit the facility, assess the current mixing equipment along with the qualities of the new product, and provide recommendations for new equipment or upgrades when needed.

Additionally, the Internet of Things (IoT) and Industry 4.0 have increased the demand for mixing equipment with Wi-Fi access or that are hard-wired to the web. Such functionality helps companies to gather tremendous amounts of production data that can be reviewed and used to improve operations. In an era when documentation is essential, these features have become important to many chemical manufacturers.

## WHAT TO EXPECT FROM THE RIGHT CHEMICAL MIXING EQUIPMENT PARTNER

If it's not clear already, finding the right chemical mixer for your unique processes and products is critical. But just as critical as



Figure 3 - Ross's multimillion dollar inventory of stock mixing equipment includes several Ribbon Blender models of various sizes suitable for fast and efficient processing of free-flowing powders.

finding the right mixing equipment is finding the right manufacturer of that equipment.

It's important to have a good relationship — personal and professional — with a mixing equipment manufacturer. This relationship can set the foundation for a long-term, mutually beneficial partnership. Mixing equipment providers should be willing to make site visits to develop equipment quotes, address end user questions and concerns, and assist with planning and implementation of equipment.

Chemical mixing manufacturers often have testing and development centers where end users can view and evaluate mixing equipment on a small scale. During those visits, technical personnel from R&D and production can learn characteristics of the mixer and how it is operated. This ensures a baseline of efficient operation of the equipment. Additionally, end users should be provided with installation and maintenance instructions. These documents will help keep mixing equipment running seamlessly for years.

Despite superior construction and maintenance of equipment, breakdowns do occur. The right chemical mixing manufacturer will be able to provide recommendations regarding the spare parts, and quantity of them, to have on hand.

In rare occasions, in-house crews won't be able to replace/repair a broken or malfunctioning piece of mixing equipment. In these cases, vendor support is only a phone call away. The vendor should have reasonable hours for over-the-phone end-user support; knowledgeable staff for problem solving; accurate, precise, and detailed corrective actions; and the ability to schedule on-site emergency repairs by a trained technician, if necessary.

## HOW CHARLES ROSS & SON COMPANY CAN HELP

Charles Ross & Son Company is the worldwide leader in mixing and blending equipment. Our full range of chemical mixing equipment is available in either standard or custom designs to meet your specific processing needs. We have a reputation for innovative engineering, superb construction, and fast delivery. In the U.S., we operate five plants and a vigorous R&D program. We also have plants in China and India that serve those regions. Our plants are all fully equipped with advanced engineering and manufacturing tools for the chemical industry. We are uniquely equipped to meet the special needs of every customer, anywhere in the world.

Chemical formulations are highly process-dependent, with mixing operations having a decided influence on whether the final product will have acceptable qualities and be stable for appropriate time frames. We engineer and manufacture mixing equipment for nearly all chemical applications, including: abrasive pastes and slurries, asphalts, catalytic slurries, chlorinated organics, clay dispersions, coal suspensions, epoxy hardeners, fertilizers, floatation reagents, lubrication pastes and oils, metal soap dispersions, optical brighteners, pesticides, polyvinyl alcohol solutions, precious metals, propellants, emulsions, technical polymers, and thermal transfer grease.

## ABOUT THE AUTHOR



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## ABOUT CHARLES ROSS & SON COMPANY

Established in 1842, Charles Ross & Son Company is a manufacturer of specialty mixing, blending, drying, and dispersion equipment for the process industries.