Process Evolution Prepares S&C Electric for Growth

S&C Electric Company of Chicago, Illinois, is a leading supplier of high-voltage fuses and switches throughout the world. Polymer Products Division (PPD) recently reached the threshold at which a fundamental change in production was required to allow faster growth in OEM Sales.

Mission: Boost production capacity without dedicating more floor space to mixing

Although PPD was in an excellent competitive position, the business had physically run out of room to grow. Floor space was limited in the plant, and production was maxed out. Producing a high performance epoxy-based insulating material, operators handled 5 resin and 5 hardener mixes a day, and 30 minutes were lost cleaning the mixers between every batch. Overall, 10 man-hours were dedicated each day to cleaning the equipment.

The company turned to Charles Ross & Son Company for support. For PPD, the answer was to reorganize the mixing and conveying processes in its plant, upgrade its mixing equipment, and make the plant more productive. The PPD engineering team conducted trials with a variety of mixing, blending and vacuum drying equipment in the Ross Test & Development Lab.

New VersaMix "VMC" Models with Series III Design

The Ross family of VersaMix multi-agitator mixers now features the sleek Series III design that Ross introduced with its family of planetary mixers. While the new design retains all of the engineering strengths that made the VersaMix the world’s most versatile multi-shaft mixer, the new VMC models are even more efficient, easier to clean and maintain, and easier to handle on the plant floor.

Fully enclosed motors, drives and wiring

In the new VersaMix VMC models, controls and auxiliary equipment are all enclosed in an integrated mixer housing. All electrical connections are made at a central junction box in the base. Electrical and air connections between the base and the overhead drive system are fully enclosed in a bellows, along with a powerful air-over-oil lift cylinder. The lift is controlled with a simple push-button interface.

Introducing the VersaMix VMC family

The new VersaMix VMC models are available in standard sizes from 1 to 200 gallons, with a choice of single-, double-, and triple-shaft agitation.

Laboratory models, with stainless steel wetted surfaces and many design options, are ideal for R&D. With excellent design continuity in the product line, scale-up is highly predictable and reliable.

In sizes from 1 to 4 gallons, lab models feature a can lift design instead of an agitator lift. This lift design allows you to make hard pipe connections for vacuum and charging. The lab model shown here also...
Center. The system they chose includes a pair of tandem production lines, one for resin and one for hardener. Each line is comprised of a Vertical Blender equipped for vacuum drying and a VersaMix multi-agitator vacuum mixer. The end-product is transferred directly from the mixers to injection molding equipment.

**Transforming the business**

When the transformation was finished, PPD’s manufacturing process had evolved from a labor-intensive, batch mixing process into a smooth, semi-continuous operation. Plant capacity had doubled. Safety on the plant floor had improved. Labor costs were cut substantially.

Although PPD is now producing more on every shift, the real breakthrough came in its capacity for future growth. The company has reinvented the way it manufactures its products – and it is prepared for the next stage in the company’s growth.

**New VersaMix ”VMC” Models**

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features the new helical anchor agitator, which generates excellent axial flow throughout the batch. Other options include vacuum and jacketing to control batch temperature.

**VersaMix Sanitary Model VMC-10**

The Ross VersaMix Model VMC-10 is well-suited for process development, pilot plants and small-volume production applications. The one shown here is equipped for sanitary operation – sheathed in stainless steel, with all interior and exterior surfaces polished to a pharmaceutical finish. The unit features three independently-driven agitators – with no agitator seals located below the product level. A floor-mounted control console and multiple mix vessels allow highly-automated, semi-continuous operation.

**VersaMix Model VMC-100**

The three agitators most often included in the VersaMix are a High Shear Rotor/Stator Mixer, a High Speed Disperser, and a three-wing Anchor. The rotor/stator generator is ideal for products that require very fine dispersion and emulsification, while the High Speed Disperser quickly disperses solids into viscous liquids. With Ross’s unique high-flow design, the three-wing Anchor agitator efficiently removes material from the vessel walls and bottom, and moves them toward the two high speed agitators.

In the Model VMC-100 VersaMix, drives, shafts and bearings are engineered to handle an exceptionally wide range of viscosities.

New literature available

A new color brochure presents the complete line of Ross Multi-Shaft Mixers. Call Ken Langhorn, Product Manager: 1-800-243-ROSS.
A dilution system, used to dilute a slurry or mixture to the proper concentration, is a common component on process lines in many industries. In the last stage of production, many slurries or mixtures must be diluted with a filler or dilution media before they are packaged. Manual systems are common, but with the addition of a simple PLC-based control, they can be made far more consistent and efficient – leading to a significant improvement in overall production.

How does it work?

In this example, the raw material is a water-based solution. The final product has a specific gravity that is 35% lower than that of the raw material solution. While cycling the raw solution through the system, water or dilution media is introduced to the flow. The operation of the system is based on the raw material flow rate.

Scale-up: The hidden value in a well-conceived family of mixers

In most cases, when you buy a mixer or blender, you really aren’t buying just one piece of equipment. You are actually acquiring a process, and this particular unit is only your first step. As your production requirements grow, you will need to adapt. Your ability to shift gears smoothly, quickly and efficiently is critical, because it can make the difference between an economical transition and a financial disaster.

Every experienced process engineer knows that scale-up is a complex and challenging process. In fact, many process engineers have answered the call for greater capacity by avoiding scale-up entirely! Instead of scaling up, they simply added more mixers identical to the ones they had already.

This strategy for growth can certainly increase production, but it misses an opportunity to capture many economies of scale. It also leads to unnecessarily high plant costs. Maintenance, energy, training, inventory, labor...and all the costs associated with every square foot of floor space in your plant go up when you operate with numerous small mixers instead of a larger version.

This is why we place such a high priority on scalability in managing our mixer and blender product lines. We can’t foresee what your process needs will be three, five or ten years from now – any more than you can! Our job is to make sure that you will have options available for scale-up, whenever you need them.

Three Ross plants in the USA team up to deliver three 400-gallon mixers

When the time for scale-up arrives, a large-capacity mixer can give you the power to boost production and capture a tremendous savings in process efficiency. But success depends upon your ability to choose the right manufacturer – the manufacturer with the right combination of resources necessary to build your mixer on spec and on schedule.

A large mixer, like the 400-gallon Double Planetary mixers shown here, presents many special challenges in engineering and fabrication. When several large mixers and lots of supporting equipment are involved, the project is even more challenging. Be sure to pick an equipment supplier who can demonstrate extensive experience building mixers and auxiliary equipment on this scale.

This project, recently completed by the Ross engineering and fabrication teams in New York, Savannah and Port St. Lucie, Florida, included three 400-gallon Double Planetary mixers, three automated discharge systems, 11 interchangeable mix cans, and three control systems. With extensive resources to apply to the job, Ross was able to maintain stringent quality control – and deliver fast. From the final approval of detailed drawings to shipment, the process required only 14 weeks. This is far less time than most other manufacturers would need to complete only one of these mixers!
On the Process Line
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Scale-up basics
Textbooks tell us that scalability relies on geometric, kinematic and dynamic similarity - which can be defined in terms of dozens of process, material and machine variables. But virtually all of the classic equations and ratios are based on simple, low-viscosity liquid-mixing applications involving a single agitator.

Most of the applications that we see every day are far more complex. We find that in the course of a single mixing cycle, viscosity often varies significantly and reaches high levels. Multi-agitator mixer designs are common, and the agitators are often run in various combinations as the batch proceeds through a series of stages. So, in most applications, the traditional academic analysis provides only a starting point. From there, we rely on our collective experience and our ability to identify and control the most important variables at work in each application.

The factors that affect scalability vary greatly according to the type of machine you are looking at (a high-speed in-line rotor/stator mixer versus a slow-speed double planetary mixer, for example), but the overall principles are consistent. As we advance from one machine size to the next, we consider how much mixing or blending “action” we are applying to batches or in-line flows of various volumes and flow rates. Narrowing our focus, we look at such variables as shear requirements, power input, blade or ribbon area and speed, drive requirements, heat generated, and batch turnover rates.

Real world experience and built-in scalability
In the real world, where fluids are imperfect and relationships are nonlinear, we concentrate on results. Starting with geometric similarity and the calculations that help us ballpark such key parameters as power input and agitator speed, we manipulate the key process variables until we achieve process similarity.

This is where strong experience and information management are critical. Experience tells us how to manage the variables associated with multiple agitators in a multi-step process. Strong information management enables us to tap into the results of countless laboratory tests in similar applications.

But perhaps the most important factor influencing scalability in a mixing system is the continuity, controlled evolution, and long-term stability inherent in the mixer product line. Design continuity is the relationship that links all the models in the line and promotes predictable scale-up from laboratory sizes upward through pilot and production models. As the product line evolves, it must be managed carefully to make sure that each new addition relates properly to the others in the line. As this process is managed over many years, it ensures that you will still have scale-up options years from now – whenever scale-up becomes necessary.

You may never need it. But just in case...
Think of reliable scale-up as an insurance policy. Better yet, think of it as a wise investment. One day, it is likely to pay off handsomely – when your business requires a fast change in production and you have the problem solved in advance. It’s intelligent equipment design. And it’s smart business.