Selecting the best rotor/stator combination for your batch process

Versatile rotor/stator mixers

Batch rotor/stator mixers, also called high shear mixers, are widely used throughout the process industries to accomplish fast solid-liquid and liquid-liquid mixing, homogenization, particle size reduction, solubilization and emulsification. They are installed as stand-alone units or used with low-speed agitators in multi-shaft mixer systems.

The basic high shear mixer consists of a four-blade rotor that turns at high speeds within a stationary stator. Rotor tip speeds between 3,000 to 4,000 ft/min are typical. It is often supplied with a variety of interchangeable stator designs to fine-tune product turnover, peak shear, temperature rise, etc. Newer rotor/stator designs allow for sub-surface powder injection and some are designed to run at higher tip speeds to produce even finer particles or droplets than what traditional high shear mixers can achieve. The guidelines shown below offer insight into popular rotor/stator combinations and their typical applications.
Typical batch rotor/stator combinations

- **Disintegrating stator and four-blade rotor.** In this configuration, product is drawn from below the rotor and expelled centrifugally through large squares or round holes in the stator. It is excellent for general purpose mixing and can quickly break down relatively large soft solids while generating vigorous flow.

- **Slotted stator and four-blade rotor.** This design provides the most popular combination of high shear and efficient flow rates. It is well-suited for most medium-viscosity mixing applications up to around 10,000 centipoise.

- **Fine screen stator and four-blade rotor.** Depending on the size of the mixer and its use, the openings on this type of stator can be made of a reinforced screen or fine holes. The fine screen head is capable of very high peak shear levels and is used for low viscosity emulsions and suspensions.

- **Delta rotor/stator.** This patented set is available on Ross PreMax Batch Ultra-High Shear Mixers. The Delta rotor runs at higher tip speeds (5,000 ft/min) compared to a regular rotor/stator mixer and is specially contoured for higher pumping capacity and shear intensity. Product is drawn from above and below the rotor, and then expelled radially through the V-shaped slots of the Delta stator. The upper and lower vortices allow for extremely efficient powder additions and rapid turnover rates. Very fine particle sizes are achieved while solids are quickly wetted out instead of floating on the liquid surface.

- **Disintegrating or slotted stator and ported four-blade rotor.** When dealing with large amounts of powders or hard-to-disperse solids that take too long to completely incorporate even with turbulent mixing, a high shear mixer equipped for sub-surface powder injection is an ideal solution. One such technology is the **Ross Solids/Liquid Injection Manifold (SLIM) System** which utilizes a unique ported rotor designed to generate a deep vacuum for drawing solids right within the stator assembly where intense mixing takes place. High flow conditions promote optimal performance; hence disintegrating and slotted stator heads are generally used on SLIM mixers. A Delta rotor/stator can also be retrofitted into a SLIM unit.