



## **TIPS TO HELP YOU CHOOSE - RIBBON, VERTICAL or TUMBLE BLENDERS:**

Solid-solid product formulations are mixed to meet a variety of objectives. These include blending of ingredients (such as in the preparation of animal feeds, fertilizer, glass batches, food products, etc), heating/cooling/drying (like in the processing of metal powders and plastics) and coating of solid particles with small amounts of liquid (similar to the manufacture of pigments, pharmaceuticals and chemical blends).

Three basic blenders can achieve the above objectives. These are small-scale random motion (diffusion), large-scale random motion (convection) and shear. Diffusion occurs readily for free-flowing powders. But for most rapid mixing, in addition to diffusive movement, large groups of particles should be able to intermix as well.

Among solid-solid blending systems, the three most common types are the horizontal ribbon blender, the cone screw vertical blender and the tumble blender. Of these three, the ribbon blender particularly demonstrates convective high speed mixing.

A ribbon blender consists of a U-shaped horizontal trough and an agitator made up of inner and outer helical ribbons that move material in opposite directions. The ribbons rotate up to approximately 300 fpm, and move materials both radially and laterally. The rotating element can also be replaced with a paddle design agitator.

The blending action of the vertical blender's slow turning screw is far gentler than that of a horizontal blender. The blending screw orbits a conical vessel wall while it turns and gently lifts material upward. The materials are then thrust at the upper most batch level

towards the center of the vessel, and then move slowly back down the center, while mixing with materials being moved upward by the orbiting screw.

Products that require low-impact blending are indeed best handled in a vertical blender or a tumble blender. The latter is a rotating blender that comes in interchangeable double-cone and vee-shaped configurations. Asymmetric vessels designed to reduce blend times and improve uniformity are also available. Generally, tumble blenders operate at a speed of 5 to 25 revolutions per minute. With this type of blender, diffusion is the main mechanism for mixing.

Aside from level of shear or ‘gentleness’, other factors help determine which type of blender will work most efficiently in a certain application. Below are some useful guide questions:

1. How much room is available on your plant floor? If floor space is tight, you may have to go up - with a vertical blender - since a vertical blender requires a much smaller footprint. If overhead space is limited, you may be forced to use a horizontal ribbon blender, which allows you to use a low-profile loading system. A multi-level operation is generally unnecessary. A tumble blender of a similar blend capacity will occupy the most space.
2. Does the friability of your product require gentle blending? If so, you will probably need a tumble blender or vertical cone screw blender. Also, in these blenders, attrition will be minimal when blending abrasive materials.
3. Is complete discharge essential? The cone screw blender and tumble blender give virtually 100% discharge.
4. Lumping problems? All blenders can be installed with lump breakers or choppers to deagglomerate components that would not break down easily with just the main agitator. But due to its ribbons that rotate at relatively high speeds, the ribbon blender offers the greatest chance for a lump-free blend in less time.
5. Is your product heat sensitive? The blending action of a ribbon can generate slightly more heat than that of a mixing screw or tumbling blender. In a cone screw blender, heat is easily removed with thermal jacketing.

6. Will you always operate with the blender at least half full? If you need the flexibility to operate with smaller batches, choose the cone screw blender or tumble blender. Because of their geometries, these blenders can operate efficiently with batches as small as 10% of the rated capacity. The ribbon blender normally requires a minimum of 40-50% capacity.
7. Is contamination a critical risk? With a packing gland in the product zone, the ribbon blender always poses a threat of contamination. A tumble blender with an intensifier bar also requires installation of a seal in the product zone. New seal designs have reduced the risk dramatically, but if your application requires the best protection available, you will have to switch to a cone screw blender.
8. How much are you willing to spend? Compared to other solids mixing equipment, the ribbon blender is typically more cost-effective.
9. Are you concerned about blending accuracy? The ribbon blender and cone screw blender both produce a well-blended product. Tumble Blenders are also well known for their blending accuracy.
10. Will you need complete cleaning between batches? The cone screw blender is easier to clean, especially since you will never have to disassemble a packing gland or seal in the product zone. Just make sure that the cone screw blender you select does not require a bearing at the lower end of the screw. A screw supported entirely from the top end will give you faster, more thorough discharge, easier cleaning, and fewer maintenance headaches.

In an ideal world, engineers and managers will always have enough time to shop for and test run process equipment. Budget is set aside for the purchase and a reasonable schedule is developed. This ideal scenario is what we strive for but unavoidably there comes a time when on-the-fly judgments have to be made. Whether it's an unforeseen spike in demand or a critical short-term test program that has to happen a mere week from now, businesses find it increasingly important that an equipment manufacturer can deliver the right product at the right time. Take your honest answers to the questions above to a reliable blender manufacturer with a well-stocked inventory and beat that deadline!