

TECHNOLOGY BRIEF:

Tumble blenders deliver highly accurate and repeatable mixing of solid-solid and solid-liquid applications. This bulletin presents some helpful techniques and design considerations for maximizing blending efficiency.

Benefits of tumble blending in the food industry



Consider a tumble blender for your process

A tumble blender is a rotating device that comes in a variety of geometries, the most common being the symmetrical V-shaped or double-cone configurations. The vessel is partially loaded with product and rotated at operating speeds in the range of 5 to 25 revolutions per minute. Diffusion is the main mechanism for mixing: batch materials cascade down, distributing particles over a freshly exposed surface as the vessel rotates on a horizontal axis.

One main advantage to tumble blending is that it is very low-impact. This makes it appropriate for processing abrasive solids or highly friable blends. It is also commonly used in making precise blends containing trace components (<1%) or ingredients that are vastly dissimilar in size and density. When designed properly, the tumble blender can handle not only dry solid blends but also low-viscosity slurry-type mixtures.

Another benefit comes from the geometry of the V-shaped and double-cone vessels which allows complete discharge of the blended material. The tumble blender is also easily accessible for cleaning. A smooth finish or mirror polish on all product-contacting surfaces further improves cleanability.

Below are some helpful considerations for maximizing mixing efficiency in a tumble blender.

Some techniques and design considerations

- *Proper charging.* In a V-shaped blender, the batch is continuously being split and recombined. In order to take advantage of this mixing and flow pattern, raw materials are generally loaded to the vessel in layers (on top of each other) rather than side by side.

- *Reduction of lumps.* The gentle blending action of the rotating vessel is not suitable for breaking down tough lumps in the batch. A high speed intensifier bar is required for applications that need sufficient shear to reduce the size of agglomerates. This intensifier bar is installed along the blender's axis of rotation.



- *Solid/liquid mixing.* If the liquid phase is a minor ingredient in the blend, it can be continuously sprayed across the solids as the blender is rotating. To accomplish this, spray nozzles are installed on the high speed intensifier bar designed for liquid addition. For low-viscosity slurry-type applications, all solid and liquid components may be charged through the vessel cover at the beginning of the blend cycle.
- *Drying requirements.* Drying applications often benefit from having a jacketed vessel that is also rated for vacuum. Vacuum drying is an excellent method for drying heat-sensitive products because it requires lower heat to drive off moisture or solvents compared to drying under atmospheric conditions.
- *Controls.* The most basic controls allow you to start, stop and jog the motor. However, a variable frequency drive is typically recommended as it allows soft start under full load conditions. It also enables adjustment of rotation speed so that the contents can slide or cascade to the lower portion of the rotating vessel at a controlled rate. To establish highly repeatable mixing of a particular formulation, the blender can be programmed to rotate at a set speed and shut off automatically after a certain number of revolutions. Sophisticated PLC systems can be integrated to program multiple steps and recipes in more demanding processes.

Sample Application: Spice Blends

At a food manufacturing facility, a Ross Tumble Blender is being used to blend spices and seasonings that are packed into packets for the company's line of instant noodles. The 10-cu.ft. blender is designed to handle bulk densities up to 55 lbs/cu.ft.



In addition to discussing the above design considerations with your blender supplier, make sure to provide accurate product density data for all the formulations you are looking to process in the same tumble blender. This information is critical to selecting the correct model and properly sizing motor horsepower.



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