

Choosing the Proper Vibratory Table Enhances Product Compaction and Cost Savings for Numerous Bulk Handling Applications



For Compaction, Settling & Densification Applications

Significant advancements have been made in bulk packaging systems that can handle numerous types of bags, pouches, bins and crates. During the packaging and filling process, the settling and compaction of product into these various containers relies on a series of vibratory tables designed to handle numerous dry bulk materials.

Vibratory tables handle difficult material challenges, such as condensing, settling, densifying, de-airing and packing. They are used by a host of companies, especially those that produce and sell spices, almonds, pet foods, plastic or biomass pellets, feed or grain materials and even cement, sand and fertilizer. A range of light, medium and heavy-duty vibratory tables are available, depending upon the specific material, application and processing facility.

The following are typical applications to include a vibratory table in a processing line:

- Flattening the cone or pile of material made from the filling station discharging into the center of the tote, box, Gaylord or similar type packaging container.
- Compacting and stabilizing bulk bags, flexible intermediate bulk containers (FIBCs) or super sacks for easier stacking and handling prior to storage or shipment.
- Fully or semi automating packaging lines by integrating with roller sections, gravity or chain driven live roller (CDLR), or belt conveyors.
- Filling, weighing and compacting material.
- Removing air bubbles in molds and casted products for improved structural and surface finish.
- Lowering labor hours and costs for packaging and processing lines.

Choosing the Proper Vibratory Table

Technical Article

There are multiple ways product compaction reduces operating costs at any facility. Typically, bulk material will compact down by 20% of its aerated state. Materials that normally fill five containers, for example, can be reduced to only four, saving on container and storage costs.

Materials shipped or stored in an aerated state will eventually compact because of gravity or vibration in transit. The result is dead space in the container. Compacting the material beforehand prevents container breakage, product loss and/or contamination.

Also, when shipping on a cubic foot basis, vibrating compaction provides full utilization of container capacity. This allows for more product to be shipped in the same amount of space, saving money for the producer and customers.

Some materials can achieve 25% to 30% compaction if the vibration is applied correctly and the vibratory table is designed and sized correctly. What does this mean for a company using 10,000 Gaylords annually at a typical price of \$30 a box? Packaging the same amount of product into 20% less boxes translates into an annual savings of \$60,000.

CHOOSING THE PROPER VIBRATORY TABLE

Basically, a table is designed to vibrate linearly in the vertical direction. From this very basic concept there is a variety of table designs and variables to accomplish a customer's goal, regardless of how simple or complex the objective. Here are the most popular vibratory tables on the market:



Flat-Deck Vibratory Table is the most widely used in compaction and densification applications. The flat deck model is typically used to settle materials in cartons, kegs, bulk bags or Gaylords, but other applications include setting castable refractories into molds and eliminating voids and air bubbles from the final molded product.

Variations to this design include the flat deck low profile vibratory table where lift height requirements are at a minimum. Also available is a flat deck vibratory weigh table where digital scales can weigh and control vibration automatically. This type table with digital scales uses set points to control the start and stop of the fill device, as well as the vibration sequence.

Grid Top (or Grid Deck) Vibratory Table is used in automatic and semi-automatic packaging and filling lines in concert with roller conveyor systems. This table is installed under a hopper-type net weigher or bulk filling station.



The empty box, carton or drum is rolled into position over the grid top which is in the lowered position. Upon starting, the grid deck is raised by inflating air mounts and the load is elevated off the roller conveyor surface. The contents are then compacted or settled inside the container. Upon completion of the vibrating cycle, the container is lowered back onto the conveyor and advanced to the next operation.

Like its flat deck cousin, the grid top also is available in two other designs: the grid top low profile design saves space in compact areas, while the grid top vibratory weigh table features digital scale instruments that use set points to control the start and stop of the fill device and the vibration sequence.

The Vibratory Belt Table simultaneously settles and packs the product before conveying to a closing or sealing machine. Gentle vibration along the belt ensures efficient removal of voids and air pockets in containers, molds or packaging without product damage. This belt table can also flatten bags before palletizing, without damaging the bags or its contents.



There are two other vibratory tables mostly used in heavy industrial settings. The Foundry Shake Out Table is a low-profile unit that handles extremely heavy loads. The open bottom construction allows sand or other debris to pass through unobstructed. This heavy-duty table can handle up to 12,000 pounds and is mainly used in the foundry or mining industry.

Finally, the Live Beam Vibratory Table is used for the consolidation of concrete in large forms and molds or for uniform vibration of large containers such as shipping vessels. Beams are spaced apart to handle long and narrow, yet heavy loads. Each beam is mounted onto a series of heavy duty rubber-in-compression molds for good stability and vibration isolation.

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POWERING THE VIBRATORY TABLE

Practically every vibratory table on the market operates through linear vibration. Material placed on the table should vibrate straight up and down, provided the table is level, so the material does not 'walk' or move significantly from side to side. The proper selection of vibrators helps to keep the material centered on the table top and limits possible movement.

Heavier material responds best to high frequency vibration and the resulting smaller stroke high frequency vibrators produce. Lighter material or discrete parts often compact best with lower frequency vibration and the larger stroke they produce.

Manufacturers can build vibratory tables with air-cushioned pneumatic vibrators, rotary electric vibrators or even electro-magnetic vibrators that best suit the frequency and force requirements. Companies like Cleveland Vibrator offer more than 50 different rotary electric vibrator units, ranging from 900 vibrations per minute (VPM) to 1200, 1800 and 3600 VPM. Force outputs can range as low as 110 pounds of force (lbf) up to 40,700 lbf.

Air-cushioned piston vibrators can be used to address safety issues when working within hazardous environments. The vibrational direction is inherently linear and provides powerful vibration while using low air consumption during operation. Force outputs of air-cushioned models can range as low as 150 pounds of force (lbf) up to 7,500 lbf.

Cleveland Vibrator uses an in-house testing lab as the basis for selecting the optimum combination of force and frequency. Material is sent to the lab so CVC technicians can determine compaction rates and process outcomes before deciding which vibratory table is needed.

This article was written by Jack Steinbuch, equipment sales engineer, and Craig Macklin, CEO for Cleveland Vibrator Company, Cleveland, OH. For more information about Vibratory Tables, visit www.clevelandvibrator.com.

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The Cleveland Vibrator Company has been driving innovations in materials handling since 1923. From our corporate headquarters in Cleveland, Ohio, and in partnership with HK Technologies located in Salem, Ohio, we've met

the challenges of more than 15,000 customers all around the globe in a vast array of industries. Our comprehensive product line includes air-piston, rotary electric, electromagnetic, turbine and ball vibrators, as well as a wide variety

of fabricated feeders, vibratory screeners, ultrasonic screeners, vibratory conveyers and vibratory tables used for light, medium and heavy-duty industrial applications.