CLEVELAND VIBRATOR COMPANY

clevelandvibrator.com
4544 Hinckley Industrial Pkwy.
Cleveland, OH 44109

216-241-7157
800-221-3298
Fax 216-241-3480

WHITE PAPER

Effective Use & Maintenance of Rotary Electric Vibrators

Improving Material Flow Through Bins, Hoppers, Feeders & Screeners

INTRODUCTION TO ROTARY ELECTRIC VIBRATORS

High-performance, continuous-duty rotary electric vibrators are used to power vibratory equipment such as feeders, conveyors, screeners and tables and also used as flow aids on bins and hoppers. Rotary electric vibrators are used in foundry, food, agriculture, concrete, mining, recycling and powder bulk industries.

Rotary electric vibrators can be used for a variety of applications or environments. The rugged design and construction of the rotary electric vibrators offer multiple features for cost-efficient performance across a range of heavy-duty industrial uses.

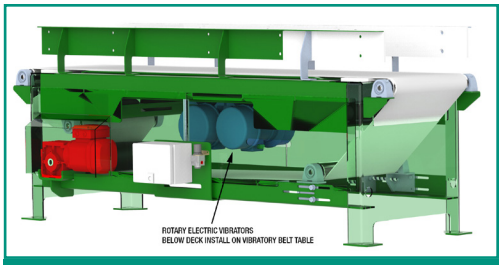
- Quiet performance, even at higher vibratory frequencies and amplitudes, contributes toward a more comfortable work environment
- Extreme durability enables continuous operation at 100% force output, while enhancing long operating life in heavy-duty applications
- Energy-efficient, low-maintenance design helps keep downtime and operating costs low
- Operating frequencies range from a very low rate of 900 rpm up to moderate frequency rates of 3600 rpm; because there are five different series of rotary electric models available--single phase up to 8-pole--it's easy to narrow down selection based on type of vibration required.
- Maximum output forces ranging from 30 lbs. to more than 46,000 lbs. include relatively broad ranges within each model type. Each can be adjusted between 0-100% of the listed force in 10% increments.
- All rotary electric vibrators come with pre-installed anti-vibration lead cable and Grade 5 mounting fasteners for quick installation.

The proper installation and operation of rotary electric vibrators will ensure that they provide peak performance and longer service life.
Verifying Proper Counter-Rotation

White Paper: Rotary Electric Vibrators

PROPER INSTALLATION, SETUP AND OPERATION OF TWIN ROTARY ELECTRIC VIBRATORS WHEN USED ON EQUIPMENT

Counter rotation and synchronization are the primary factors to understand when installing and operating a pair of rotary electric vibrators on fabricated equipment. These units contain a through shaft motor with bearings on each end of the shaft. On each end of the shaft, outside of the bearings, are two eccentric weights that produce an “unbalanced” condition when the motor runs. This unbalanced condition produces vibration used to convey, screen or compact a variety of products.



BT Vibratory Belt Table

Most of the vibratory equipment manufactured by Cleveland Vibrator uses two rotary electric vibrators to produce linear vibration. Vibratory tables, vibratory grid tables, electromechanical screeners and electromechanical feeders are all designed for the vibrators to counter rotate.

PROPER VS. IMPROPER OPERATION

Proper setup requires that the two vibrators run together at the same speed and counter-rotate, or run in opposite directions. The counter-rotation in the vibrators is what produces the linear motion necessary for proper performance.

There are some easily identifiable indicators that the vibrators are both running the in the same (improper) direction:

- Slow movement of the material from the inlet end to the discharge end.
- Material will tend to move to one side of the unit on vibratory screeners or feeders. With counter-rotating vibrators, material will stay in its “lane” as it travels the length of a piece of equipment. Where the material lands on the vibrating surface, it will tend to stay in that location relative to the sides as it moves down the screener or feeder.
- When the vibrators run in the same direction, the material will move to one side of the unit.
- When viewed from the infeed or discharge end, there will be some side-to-side motion in the equipment. With properly installed rotary electric vibrators, there is no side-to-side motion in a feeder or screener. The only motion is end to end.

PROPER INSTALLATION OF ROTARY ELECTRIC VIBRATORS ON VIBRATORY EQUIPMENT


Rotary Electric Vibrators positioned on a vibratory feeder, volumetric vibratory feeder and vibratory screener

White Paper: Rotary Electric Vibrators

VERIFYING PROPER COUNTER-ROTATION

One sure way to verify proper counter-rotation is to remove one weight cover on the same end of each vibrator and observe rotation on start up. With the equipment OFF, remove the four bolts that hold the weight cover in place, then remove the weight cover. Repeat for the second vibrator.

With the weight covers removed, the direction of rotation of the vibrator's weights can be easily observed. Depending on the location of the unit controller, it may be best to have one person start the unit and a second person observes the direction of rotation during startup.

Once the outer weights are set the same and the rotation has been checked to confirm counter rotation, the vibrators can be checked again for synchronization. This simply means the vibrators are running at the same speed in opposite directions and thereby producing the correct amount of linear vibration.

Typical controls supplied by Cleveland Vibrator are either a magnetic starter or a variable frequency drive (VFD). It's important to note that regardless of the starter device, the two vibrators must start together and be controlled by one starter device.

ADJUSTING THE ECCENTRIC WEIGHT

Rotary electric vibrators are not designed to operate with unequal weight settings end-to-end. This configuration will reduce the productive life of the vibrator and may produce destructive forces within a piece of equipment. Likewise, on a single piece of equipment, both vibrators need to be set in the same manner. All weights on both vibrators must be in the same orientation relative to each other.

Rotary Electric Vibrator shown at 40% weight setting.

Here are the basic steps to adjust the eccentric weight:

1. **Power Off**—Disconnect the power supply to the vibrator to prevent unintended or unexpected starting of the vibrator while adjusting the weights.
2. **De-Bolt**—Using the appropriate-sized wrench, remove the four bolts that hold the vibrator's weight cover in place. Repeat on the opposite end of the vibrator.
3. **Adjust Weights**—To adjust the force output, only adjust the position of the outer weight. Do not adjust or move the inner weight. Loosen the bolt that clamps the weight to the shaft. Once the bolt is loosened, the weight can be rotated around the shaft to a new position. Use the punch mark as a guide.
4. **Retighten Weight Bolt**—After rotating the outer weight to its new location, retighten the weight bolt, clamping the weight securely to the vibrator shaft. After tightening the weight clamp bolt, double check to make sure the weight did not move while being tightened onto the shaft.
5. **Repeat**—Repeat the adjustment procedure on the opposite end of the vibrator. It is very important that the outer weight on each end of the vibrator is set to the same position as indicated on the scale plate. For example, if one outer weight is set to 80% then the other weight must be set to the same position.
6. **Replace Weight Covers**—Replace the weight covers on the vibrator. Ensure that all weight cover bolts are used and tightened in place.
7. **Repeat Process**—Repeat the steps on the second rotary electric vibrator. Both vibrators must have identical weight settings on both ends of both vibrators.
8. **Record and Return**—Record the new weight settings for future reference and return the vibrator to service.

White Paper: Rotary Electric Vibrators

STEPS FOR PROPER VIBRATOR SYNCHRONIZATION

When properly set up and running, the rotary electric vibrators will “sense” each other and will synchronize, or run at the same speed. Vibrators that are not properly synchronized can generate destructive forces to the piece of equipment. This condition can reduce the working life of the equipment and its performance.

Here are some steps to ensure proper synchronization of the rotary electric vibrators:

1. Controls for the unit should be appropriately sized so that both vibrators can be started simultaneously with one controller.
2. If using a Variable Frequency Drive *VFD), the acceleration ramp-up should be as quick as possible. Slow ramp-ups to the final to the final desired speed for the unit is not advised and not beneficial to the proper operation of the piece of equipment.
3. “Soft start” types of controllers/motor starters should not be used with vibrator equipment, which uses two rotary electric vibrators.

USING A STROBE TACHOMETER

The best way to check for vibrator synchronization is with a strobe tachometer. Follow these easy steps:

1. Remove one weight cover on the same end of both vibrators. You need to see the eccentric weights on the end of each vibrator.
2. Ensure all loose objects do not strike or catch on anything.
3. Keep all personnel clear of the vibrators.
4. Bring the unit up to full operating speed.
5. Turn on the strobe tachometer and adjust the speed of the strobe light to match the rated speed of the vibrator.
6. As the speed of the strobe approaches the speed of the vibrators, the technician will observe a “slowing” of the rotating weights. The strobe frequency should match the frequency of the vibrators. At this point, it will appear as though the vibrators’ weights have stopped rotating.
7. With properly synchronized vibrators, the rotating weights will appear to stop at the same strobe speed. If one vibrator’s weights appear to “stop” and the other vibrator’s weights continue to rotate, the vibrators are not running at the same speed.
8. When the vibrators are properly synchronized, the rotating weights on the two units will appear to stop together. The position of the weights, vibrator to vibrator, will appear to be a mirror of each other.

TROUBLESHOOTING/MAINTENANCE

What does it mean if the vibrators are not running together in synchronous operation? This could possibly indicate a problem with one of the vibrators, perhaps an early indication of a bearing failure or lack of grease on vibrators with grease fittings.

Refer to your Cleveland Vibrator Operation Manual for the recommended maintenance schedule for grease application, both quantity and type of lubrication. Some of the smaller rotary electric vibrators are permanently lubricated and don’t need maintenance of this type. Another option is to double check the tightness of the vibrator mounting bolts. Loose bolts can prevent proper operation and synchronization of the two vibrators.

White Paper: Rotary Electric Vibrators

REPAIR AND RECONDITIONING

Rotary electric vibrators, once installed and set up properly, have a relatively long operating life and do not require frequent maintenance. Here are some common areas to check to make sure the vibrators are working properly.

Cleveland Vibrator maintains its own repair department, staffed by experienced and quality personnel. Reconditioning of rotary electric vibrators involves rewinding, dipping and baking the stator, re-insulating the windings, and replacing bearings, power cord, leads power terminal block, etc. The cost of reconditioning generally runs approximately 50%-60% of the cost of a new unit and is covered by the same warranty, if the unit was originally purchased from Cleveland Vibrator.

Cleveland Vibrator provides ongoing support and training for its rotary electric vibrators. If you need assistance or have any questions about proper operation, contact Cleveland Vibrator at 800-221-3298.

ABOUT CLEVELAND VIBRATOR COMPANY

The Cleveland Vibrator Company has been driving innovations in materials handling since 1923. From its corporate headquarters in Cleveland, Ohio, and in partnership with HK Technologies in Salem, Ohio, the organization has met the challenges of more than 15,000 customers around the globe in a vast array of industries. Cleveland Vibrator Company's 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 conveyors and vibratory tables used for light, medium and heavy-duty industrial applications.

FOR MORE INFORMATION

Call: Sales at 800-221-3298

Email: sales@clevelandvibrator.com

Buy Online: www.clevelandvibrator.com