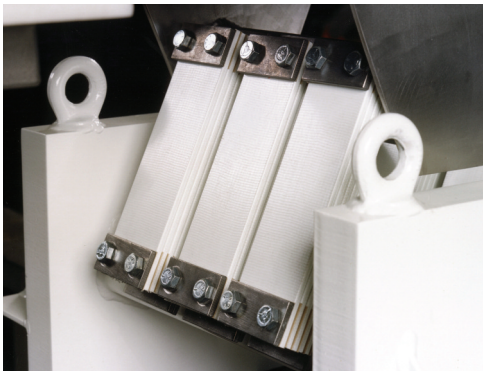
Vibratory Feeders

How to select and maintain proper units to meet your processing needs

By Rob Yandrick, Product Manager, Vibratory/Screening, ERIEZ

Vibratory feeding equipment has been used in various processing industries for several decades to efficiently move fine and coarse materials that often pack, cake, smear, break apart or fluidize. In processing plants throughout the world, vibratory feeders are used to meter precise amounts of product from hoppers and to gently deposit them on a conveyor or a packaging machine. Vibratory equipment is used for many types of screening, including size separating, scalping or removing oversized product and conglomerates and dedusting or fines removal. Choosing the right vibratory feeder involves two criteria that together provide optimum metering of product: material consideration and equipment design.



Fiberglass springs (or boards) are the most popular spring configuration for light- and medium-duty applications.

Material Considerations

Fine Material: Materials from -50 mesh to -400 mesh do not feed well on traditional electromagnetic feeders as the materials tend to fluidize and flush. The only way to effectively handle these types of material is to use a high-deflection electromagnetic (3/16" amplitude x 30 Hz) feeder for low capacities or a mechanical (1/4 to 7/16" amplitude x 20 Hz) feeder for larger capacities.

Midsize Material: Materials ranging from 50 mesh to 2 to 3" (50.8 to 76.2 mm) in size feed very well on traditional electromagnetic (0.45 to .060" amplitude x 60 Hz) or mechanical feeders. An electromagnetic feeder will offer the most precise control and a mechanical feeder or high-deflection electromagnetic feeder will offer the greatest capacity.

Coarse Material: Materials in the 2" to 12" (50.8 to 304.8 mm) range are best fed on mechanical feeders, especially at greater capacities due to the small amount of surface contact.

Moisture Content: Moisture may cause severe feeding problems, especially on electromagnetic feeders because moisture increases the surface tension and material tends to build up on the tray surface.

Bulk Density: The weight or bulk density of a material greatly affects its feeding characteristics. Light (less than ten pounds) materials, particularly those that are very fine (-50 mesh) do not have as much mass and feed more slowly than heavier materials. High-deflection electromagnetic or mechanical feeders handle these lightweight products quite well.

Material Flexibility: Rigid or solid material feeds better on an electromagnetic feeder. Material that is more flexible can be fed more successfully on high deflection or mechanical feeders.

Material Durability: Fragile materials are best fed on a high-deflection feeder unit. These types of feeders produce substantially less g-force than full-cycle electromagnetic feeders. Less g-force means less product damage.

Equipment Considerations

Some new developments in vibratory feeders are helping today's processing plants reach greater product purity, save on energy costs, decrease equipment maintenance expense and streamline their manufacturing operations.

High-Deflection: This generation of vibratory equipment efficiently feeds fine powders and leafy and fluffy material. High deflection feeders feature feed rates of up to 80 feet-per-minute (24 m/min) and can handle material with a bulk density less than 10 lb/ft³ (.16 gm/cc). After years of research, HD feeders now offer high-deflection of up to 3/16-inch (4.8 mm) and lower frequency (30 cycles-per-minute) to handle finer product such as long-stranded chopped fiberglass, talc or flour.

Electromagnetic Drives: Newer AC electromagnetic drive systems typically consume up to 65 percent less energy than their DC counterparts. These units have no sliding or rotating parts to wear-out and require very little power to operate. Conversely, DC-operated electromagnetic drives produce the same vibratory action as AC units but are not as energy-efficient.

Mechanical Drives: Still popular are mechanical drives that are used in a variety of feeding and conveying applications. One example of a newer unit is a non-vibratory, eccentric shaft mechanical drive. This uses a set of weights powered by a motor that is alternately in-phase and out-of-phase, which creates a slow motion

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Eriez' HD Series Feeders are designed to handle fine powders and leafy products that normally could not be fed successfully on an electromagnetic feeder.

in one direction and a fast motion in the opposite direction. This action causes the tray to slide underneath the material. This unit is used mainly for fragile materials that can be damaged from the normal vibratory motion.

Tray Designs are Limitless: Every configuration of flat, curved, v-channel and tubular tray designs are available. Trays are typically fabricated from mild steel or stainless steel, with the latter often used in food and pharmaceutical processing applications and the former for general purpose processing. Trays can be lined with abrasion resistant steel, stainless urethane, rubber and other coatings. Trays can be designed for fast removal and cleanout to avoid cross-contamination of materials and decreased production line downtime. Many trays have quick-release clamps that allow the tray and cover to be removed without tools. The tray is simply lifted and disconnected from the frame for easy cleaning.

Over-Deflection Monitor: This piece of equipment detects changes in tray deflection because of material accumulation on the tray surface. As material accumulates on the tray surface, it adds weight to the tray, affecting performance and possibly damaging the feeder. The monitor alerts, warns or shuts the feeder down so the tray can be cleaned to improve performance and reduce costly downtime.

Spring Systems: Like trays, springs come in a variety of materials, sizes and configurations depending upon the application.

• Fiberglass springs are the most popular configuration for light and medium duty applications. Small electromagnetic feeders, light- to medium-duty conveyors and most high precision vibratory equipment use fiberglass or multiple pieces of fiberglass as their primary spring action material.

• Steel coil springs are commonly used on heavy-duty and high-temperature applications. These coils are effective in ambient temperatures up to 300 degrees F.

• Dense rubber springs are typically used on heavy-duty feeders and conveyors to provide stability and motion control between the drive and tray. However, rubber springs are limited to use in environments below 120 degrees F.

Performance Issues

As with any piece of operating equipment, parts can fail, fasteners can loosen, material characteristics or process conditions can change. Here are some common issues with feeders and how to deal with them.

Springs out of tune: In a feeder with a factory-installed tray, the spring system is typically tuned at the manufacturer's facility before delivery. Replacing or altering the original tray will require tuning the spring system to achieve the right vibration displacement for the new or modified tray. The tuning—which varies with the tray's size, shape and weight—requires changing the stiffness of the 'tuning' springs. The tuning springs are typically under the tray's receiving end. Changing their stiffness requires increasing or decreasing the number of springs in each stack or increasing or decreasing the spring thickness or both.

Loose spring clamps: Each tuning spring is bolted to flat bars, called spring clamps, that hold the springs in place. If the spring clamps or bolts become loose or lock washers are missing, the result is too much vibrations displacement. Make sure all spring clamps and fasteners are routinely tightened and see that all lock washers are in place.

Eriez® Electromagnetic Vibratory Feeders demonstrating feeding powders: flour, cocoa and powdered drink mix.

Failed electrical coil or motor in drive unit: When this occurs with an electromagnetic drive unit, replace the coil or the coil-and-electrical frame assembly, which can be ordered through the feeder manufacturer. For a mechanical drive, replace the drive motor, also available from the manufacturer.

Variation in power supply voltage or frequency: If the plant operates at a remote site and uses a generator for power, the generator motor's cycling can create frequency (hertz) variations in the feeder's power supply. If necessary, install a hertz regulator between the generator and feeder.

Shock mount deterioration: Shock mounts must be in good condition to adequately isolate the feeder and prevent it from transmitting vibration to or receiving vibration from other equipment. Replace shock mounts if they are deteriorated.

Corroded or worn tray: A tray that has decayed can prevent material from moving across the tray surface as designed. The tray will also be lighter than it was originally, affecting the feeder's vibration displacement.

Replace the tray with one made of special corrosion or abrasion-resistant materials. Consult the feeder manufacturer for help in selecting a tray suited to your material characteristics and make sure that tuning springs are tuned to the new tray.

To ensure top feeding performance, consult your feeder manufacturer as a source of practical information on installing, operating and servicing feeders. Many manufacturers offer free literature to help customers through the selection and maintenance process. Eriez® publishes a guide called *How to Choose & Use Vibratory Feeders and Conveyors*. This free publication can be downloaded by visiting www.eriez.com.

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