This article discusses the benefits of using product-specific slats on solid dosage bottle-filling machines, including increasing fill accuracy and rate, decreasing product loss, and speeding the bottling process.

Some companies operating slat fillers try to use one set of slats for many different products. However, slats should generally be product specific. Just as optimal equipment performance requires proper maintenance, achieving the best possible results on your slat filler requires proper change parts. This applies whether you are a contract manufacturer of many different drug products on the same packaging line or a brand owner.

Most companies have a different set of slats for each size drug product they run on a slat filler. If the tablet or capsule product size is the same, they use the same slats. However, some companies prefer to have a dedicated set of slats for each product to ensure accuracy.

Slat manufacturers are experts in designing slats that maximize fill rate and speed, and drug products that seem similar to the naked eye may actually have differences that could influence performance on a slat filler. Working
with a slat manufacturer to design custom slats for your products, while an added cost at first, could save you money in the long run.

**Basic slat filler layout**

A basic slat filler (Photo 1) has a frame and two side panels with gear-driven chains and channels called slat guides. A series of slats are mounted on pins sticking out from each chain link so the slats move through slat guides as the chains rotate. A hopper at the back of the machine holds the drug product to be bottled, and as the slats pass under the hopper, the product falls into cavities in the slats.

A brush at the top of the machine ensures that no extra drug product carries over. Carryover occurs when the drug product sits above the cavity but below the brush depth, and the brush is unable to remove it. Because the brush can miss drug product, most slat fillers also use vibration and thumpers, which shake the slats to ensure that the drug product moves freely into and out of the cavities.

**Slat design**

When designing slats, the slat manufacturer uses the drug product’s largest dimension as the basis for the cavity size. If the cavity is too tight, the product won’t fall into it properly. If the cavity is too large, double filling might occur. Occasionally, a manufacturer will design slats for more than one drug product, but the products’ dimensions must be almost identical. Whether the product will be coated or uncoated and the amount of dust that will be present on the product can also affect cavity design.

It’s vital to maintain consistency in your drug product’s size. If the equipment manufacturer bases the slat cavity on samples that you have provided, but the actual product falls outside those tolerances, the slats won’t work well. If each tablet or capsule differs even slightly, using the slats can result in decreased accuracy and a slower fill rate. Size variations can also affect tablet flow and could lead to empty cavities and carryover. Even a difference in size of as little as 0.50 millimeter can require a different cavity for your slats. This applies equally whether the slat opening is oversized or undersized for the product.

**Cost**

Generally, slats can vary in length from 16 to 39 inches, and costs can run from $45 to $150 per slat, depending on characteristics such as the material or cradle. Some manufacturers want a stainless-steel cradle on the back of their slats, which prevents the slats from bending and warping but increases the cost of the slat set.

Most machines use 72 slats, but a few use 30 or 48 slats. A full set of slats for a small machine with 72 slats averages $4,800 per set, while slats for a large machine with 72 slats averages around $7,200 per set.

Although cost can be an issue in purchasing slats for each drug product, you might not be saving money by using one set of slats for numerous products. The cost to purchase a new set of customized slats can be more than offset by the loss of product, time, and labor when you use inappropriate slats.

If your fill rate drops 20 percent due to the use of incorrect slats, you will need longer runs. If your production line can run 100 bottles per minute at a 100 count of drug product per bottle, but your slats allow you to fill only 80 bottles per minute, you’re filling 1,200 fewer bottles per hour than you could be if you were using slats customized to the product. Filling 10,000 bottles at an 80 percent fill rate would take 125 minutes, while at a 99.5 percent fill rate, the same 10,000 bottles would take 100 minutes. You would be paying labor, machine time, and utilities for those extra 25 minutes.

If each bottle costs $1, new slats would pay for themselves in a day, not including the savings gained by eliminating the need to have an operator drop tablets into bottles to make up for empty cavities. Also, if incorrect slats cause drug product to come out of the slats unintentionally and fall on the conveyor or floor, this product must be discarded, which is a costly process.

Changing a set of slats between products usually takes a machine operator or maintenance personnel 1 to 2 hours, which is generally less costly than using inappropriate slats. Slat manufacturers make most slats out of high-density polyethylene (HDPE), although some are also made from cryo akrylite, another type of plastic material. While these plastic materials are robust, they can still prematurely wear and break if not handled properly. Be sure to handle and store slats carefully when not in use, as mishandling can damage them and hinder their performance.

**Photo 1:** Slat fillers that feature an open-frame design allow for quick changeover, which is especially useful when using product-specific slats.

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