Estimate Part Capacity for Barrel Tumbling & Vibratory Finishing

One of the most often asked finishing questions is how to estimate capacity. Given a specific size tumbling machine or vibratory machine, it is necessary to determine the number or ratio of parts that can be finished at one time. Conversely, if production requirements are known, barrel tumbler or vibratory tumbler size must be determined. In either case, the number of parts that occupy one cubic foot as well as the length of the finishing cycle must be known. With this information, all capacity problems can be solved.

Calculating Parts Per Cubic Foot

Multiple Length x Width x Height=Parts size in cubic inches
Divide 1728 by your parts size (1728 is the # of cubic inches in a foot 12in x12in x 12in)

EXAMPLE: Part size=3 in x 3 in x .5 in=4.5 inches
1728/4.5=384 parts per cubic ft

Media to Parts Ration

A few tests can establish the cycle time; however, it is more difficult to estimate the volumetric count since a small error in the measured quantity is magnified when it is multiplied out to actual machine size. With all measurements and calculations carefully made, it may happen that a machine twice the size of another can handle more than twice the number of parts. This phenomenon occurs because the larger barrel (or vibrator) allows more room for the larger parts to rotate past one another. The result is a change in the effective media to parts ratio.

A large part in a small barrel may require a 5:1 media to parts ratio. Put the same part in a larger machine and this ratio may drop to 4:1 or even 3:1. In such a case, the actual ratio would be higher than necessary. This can be used as an advantage. We recommend a minimum ratio of 3:1 for most parts.

Determining the Load

Total barrel volume is generally used to determine the load for a tumbling barrel. Half the total volume is considered to be the useable volume, since barrels are usually run 50% full. Ideally, three times more media (if media is used) than parts should be present in the barrel. This provides a proper cushion to protect the parts. Using these proportions, the rule of thumb is that the parts should comprise 1/8 of the total barrel volume. However, the media to parts ratio can be smaller when using barrels of 15 cubic feet and larger. A typical ratio for large barrels is 2 1/2:1.

Vibratory machines are usually run 90 to 95% full with a media to parts ratio of 3:1. Here again, the larger machines allow closer ratios. A rule of thumb for vibratory finishing_equipment capacity is to divide the total volume by four to obtain the volume of parts that can be processed. Use water sparingly since too much water will stop the action in the machine.

Caution: Many vibratory bowl OEM will specify their machine volume by total volume if machine is filled to the upper rim. You must consider the reduction in capacity created when/if a screen deck is installed which lessens the usable capacity. Always ask actual usable capacity of the bowl!

When trying to select a machine to fit a production requirement, first establish the daily requirement of finished parts in cubic feet. Determine the cycle time and then add 10-15 minutes for handling (Floor to floor time). Divide this time into an eight-hour shift (taking into account coffee and lunch breaks) to obtain the number of runs possible per day. Divide the daily requirement by the number of runs possible to determine the volume of the parts to be processed in each machine. Multiply the volume of parts to be processed by each machine by eight for a barrel tumbler or by four for a vibratory tumbler to determine the machine size needed.

Example: If you have a 20 cubic foot (usable capacity) vibratory bowl and you want to run a 3 to one ration (From Example above: 4.5-inch part or 384 parts per cubic foot). You will have 15 cubic feet of media and 5 cubic feet of parts or in this case you can load 1920 parts. If the parts are more delicate, you may consider a 4 to 1 ratio so in this case 16 cubic feet of media and 4 cubic feet of parts.