Vibratory finishing

Vibratory finishing is a type of mass finishing manufacturing process used to deburr, radius, descale, burnish, clean, and brighten a large number of relatively small workpieces.[1]

In this batch-type operation, specially shaped pellets of media and the workpieces are placed into the tub of a vibratory tumbler. The tub of the vibratory tumbler and all of its contents are then vibrated. The vibratory action causes the media to rub against the workpieces which yield the desired result. Depending on the application this can be either a dry or wet process.[1]

Unlike rotary tumbling this process can finish internal features, such as holes. It is also quicker and quieter. The process is performed in an open tub so the operator can easily observe if the required finish has been obtained.[1]

1 Vibratory tumblers

Vibratory tumblers have an action that is similar to filing. An eccentric, rotating weight shakes the tub in a circular path, during which the entire load is lifted up at an angle and then dropped. As the load is falling (but not actually airborne) the tub returns to an upward position, applying an upward and angular force that causes a shearing action where the parts and media rub against each other.[2]

Vibratory finishing systems tend to produce a smooth finish because the media essentially laps the parts. Since the load is moving as a unit, very fragile parts are quite safe in the vibrator. There is no tearing action or unequal forces that tend to bend and distort parts. The larger the parts or media are, the faster the cutting action.[2]

The frequency and amplitude of the machine controls the finish of the parts. The frequencies can vary from 900 to 3600 cycles per minute (CPM)[1] and the amplitude can vary from 0 to $^{3}/_{16}$ in (4.76 mm). High frequencies, 1800 CPM or greater, and small amplitudes are used for fine finishes or delicate parts, whereas large amplitudes are used for heavier cutting. High frequencies and amplitudes can roll burrs and peen edges. The circulation of parts is best at higher frequencies, therefore, heavy pieces are run at these high frequencies with moderate amplitudes of $^{3}/_{32}$ to $^{1}/_{8}$ in (2.38 to 3.18 mm).[2]

Despite the apparent rubbing action of particles against parts, studies [3] show that the primary mechanism of material removal in vibratory finishing is erosion caused by the relatively normal impacts of particles on parts. These impacts occur at the same frequency as the vibration, and at impact velocities of less than 1 m/s.

2 Media

Main article: Mass finishing

3 See also

- Tumble finishing

4 Notes

[1] Degarmo, p. 783.

[2] Choosing the Right System for the Job

[3] "Contact forces and mechanisms in a vibratory finisher". *Wear* **252**: 635–643. doi:10.1016/S0043-1648(02)00016-9.

5 Bibliography

- Degarmo, E. Paul; Black, J T.; Kohser, Ronald A. (2003), *Materials and Processes in Manufacturing* (9th ed.), Wiley, ISBN 0-471-65653-4.

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