Vibratory deburring / polishing rough guidelines

By A F Kenton

Media Selection

The selection of vibratory/tumbling media depends on the machining effect you want to achieve. If you want to remove as much material as possible in the shortest period, then you want the biggest, coarsest, abrasive media that you can fit into your machine. The media must also be compatible with the parts that have to be worked. The is, the media should not bend the parts or get stuck in them. The latter problem is probably the major reason why many companies avoid the use of vibratory finishing equipment.

The lodging problem is the key to media selection. Because of the wide variety of parts most firms make, it is somewhat difficult for companies to maintain all the sizes and shaped of media in stock, without getting stuck.

There is no single "cure-all" media for all parts or jobs, however in most cases, there is a trade-off. All medias will work or do something to workpieces, and there are some recognizable patterns that can produce certain expected results. Here then are some rough guidelines to help narrow down your selection process:

- For rapid removal of large amounts of material... you will need an abrasive ceramic media usually referred to as fast cut or having a high number. This media works fast, but also breaks down quickly. It produces the roughest finish or surface variation known as RMS, and the lower the number, the finer the finish.

- For finer, lower RMS surfaces... plastic or synthetic composition media's work better than ceramics. This is due to their light weight and milder abrasive matrix. Most plastics are used on non-ferrous metals prior to painting or plating.

- For bright finishes know as burnishing... you can use steel or porcelain media's Steel is fastest due to its weight. Ball or sphere is the preferred shape unless the applications involves many recesses or angles. The brightness referred to does not necessarily mean a low RMS surface.

- For the brightest, lowest RMS finish possible... you should consider a dry hard-wood process. This process takes the greatest amount of time since the specific gravity of wood is so light.

The following offers a quick reference for most media's currently in use. There are some variables, so it must be understood that results can sometimes differ from those shown.

Media	**RMS**	**Media**	**RMS**
Course Ceramic	28 to 32	Fine Ceramic	22 to 30
Steel/Porcelain	16 to 24	Coarse Plastic	16 to 20
Fine Plastic	10 to 18	Coarse Wood	6 to 12
Fine Wood	2 to 8		

Media Shape

Normally, you select the shape and size of media for two reasons. One, to deburr parts with rough outer surface features, and two, to deburr parts with both internal and external surfaces.

For reason one, you don't have much of a problem because you are talking about parts that basically have two dimensions and little depth. In this case, use the biggest media possible. The triangle or Tri-Star is usually the preferred shape because of its ability to penetrate without getting stuck and its large surface area and / or leading edge. This flat shape requires more energy to move and creates higher resistant forces that will remove more material in a shorter amount of time.

For reason two, deburring both ID and OD, the cylinder shape lends itself to most applications. It offers greater mobility than a flat configuration and can pass more easily through holes and recesses. If you want to deburr inside holes, select a cylinder just under the size of the smallest hole, but more than half its OD. This will keep two or more pieces from jamming up inside. Most cylinders come in three different angle cuts. The standard angle cut is 22. There is also the 45 and the 60. The angle cutis what works most Ids. Because of these angles, you may not need to select an under-sized cylinder but may work the area from outside or above the hole.

Unfortunately, there is no one size or shape media that can do everything. The closest thing to this is a shape called the wedge tricylinder or the 'V' cut cylinder. This shape excels in its ability to penetrate and its extreme mobility. All medias are geometric in shape and this usually means that center of gravity is located at the center of each media piece. However, center of gravity falls on the outside edge of the 'V' cut shape, making it very unstable and/or mobile. For this reason, it is the best general or universal shape to use when in doubt.

Media composition

There are many grades of media, but normally there are five in standard ceramic and at least three in plastic. The coarsest or fast cut also breaks down the fastest. When referring to coarse media, we are talking about the grain size of the largest material in suspension of the matrix compound. This is usually aluminum oxide, but can also be silicon carbide, silicon, quartz, garnet, or other material. Supposedly, the fastest-cutting and more expensive type is silicon carbide. The least expensive is aluminum oxide. Plastics are generally a little more in cost than ceramic, and steel medias are the most expensive at two to four times the cost of ceramic. Wood media is relatively inexpensive, especially if you take volume into consideration.

The normal time cycle in vibratory equipment for coarse media is usually less than 30 minutes, unless there are big surface variations, or the media is hardened. At the media grain size becomes smaller or finer, the time cycle increases, and RMS improves. When you reach the finest ceramic media which is porcelain, you are no longer removing material or deburring the part, but rolling or lapping the part. Any breakdown or material removal is the result of bending and flexing, and fatigue of the burr. Time cycles of one hour or more are standard. Unlike coarse media's that work better new, porcelain becomes more efficient as it gets older. Plastic or synthetic media's generally take much more time to work than does ceramic. However, they are usually better on non-ferrous brass, aluminum, zinc, etc. This is tied to lighter specific gravity resulting in reduced material removal for a finer and lower RMS. Time cycles can vary from 30 minutes to an hour or greater.

Steel and wood media's do not normally have grades or different compositions. Size and compounds play more a part in the material finishing than does the grit.

Compounds

Almost all deburring media's work better with water and a chemical compound. The compound additive helps to work both the part and the working surfaces of the media. This is done mainly by controlling the Ph of the liquid. The only exception to this is the dry hard-wood processes, but even here, this is possible. The purpose of the compound and the water is to maintain the suspension of the contaminated soils or metal off the parts and media. Otherwise, the cutting oils on the parts and the material will stick to the media and reduce its action. Compounds can also react with the parts being worked to affect finish and influence time cycles. Most chemical compounds are a concentrate that must have water added to them. This is usually accomplished with a compound metering pump that proportions the liquids automatically, or through mixing and re-circulating gravity-fed liquids through the system.

Besides dealing with Ph of chemicals, you are also dealing with different concentrates. Because of this, pricing fluctuates a great deal on chemicals, and you are never sure what you are getting. A good product is usually diluted by at least 8 to 12 parts water to chemical. After some experience on your part, you will probably end up with three or four products- one for ferrous metals, one for non-ferrous, and one for brightening or rust inhibiting.

Equipment

In this discussion, we have not talked too much about equipment. Despite the fact that equipment really determines your time cycles, speed, and productivity, it is the one factor that you are probably locked into by virtue of what you can afford or already have on hand in your shop. Media coarseness and liquid Ph control the factors of surface finish, as well as the equipment, given enough time.

Basically, equipment, media, and compounds are the three main factors that have bearing on surface finish. No one factor dominates the others to the point of selecting one or another, but time is probably the biggest and money is the second.

Centrifugal equipment may save you money in the long run because of time cycles, but there is substantial cost involved up front. Because of shorter time cycles required for -just-in-time- production, the demand is leaning toward smaller and more versatile equipment.

- Nova Finishing Systems Inc., manufactures small, heavy-duty bowl finishers that stack up to most of the big equipment on the market, but cost much less. Nova series vibratory equipment also comes with the same warranties of the larger machines.

For more information on this equipment line, contact:

NOVA Finishing Systems
559 Crook Street
Hampton, TN 37658
980 429-5773 Tel
704 665-5658 Fax
NOVA@LTSmachinery.com