Technology Trends in Mass Finishing Media by A F Kenton

In an era where computers and clean rooms are getting more news and press coverage as the wave of the future, there is still a need for the rough and dirty methods of getting things done. Mass finishing systems is one of these ways. Economics is a major factor determining the way most R & D develops, but initial methods tend to be costly at introduction or start up.

Just as equipment has progressed from the slow barrel tumbling methods of many years ago, to the vibratory technology of the 50's, to the high energy systems of the late 80's and today, so too has media changed. Early abrasive suppliers have gone through random shapes and sizes of natural aggregate to preformed shapes of formulated compositions.

Design engineers are specifying tougher materials and closer machined tolerances that must fit, form and function. Parts are getting smaller and surface finishes smoother as people learn more about the hazards of microorganisms. Therefore, it is not just a matter of deburring sharp edges but eliminating surface variations that allow foreign matter to reside.

What all of this means is that greater care is required in material surface finishing of parts. It is no longer a situation of just deburring the part. It is the need to know what is required of the part and/or is there any follow up operation or material treatments such as plating.

To accomplish these finishes, most processes use a preform ceramic or synthetic plastic media with water and a chemical additive to keep everything clean. These preform shapes are composed of abrasive grits and binder that hold everything together. It is the binders that have changed most in the last 50 or 60 years that have improved the performance of deburring media. That is, the rate and behavior patterns of the finders has enhanced the ability of the abrasives to be held and allowed to work properly.

Again; there is a need for these inorganics preform shapes to get into smaller areas and be more uniform in size in order to work all the machined surface features. That means that perform shapes are becoming smaller and smaller also. Where this is most notable is in round perform spheres. This has been somewhat common with hard porcelain media, but now there are abrasive compositions that get down in size to 30 and 60 mesh and behave like porcelain in wear characteristics and weight.

Typically, ceramic media is coarse, heavy and used on ferrous metals; whereas, plastic or synthetic bonded media is finer, lighter, and used on non-ferrous materials. If you are not worried about surface finish, ceramics can be used on non-ferrous materials. Recently, there is a relatively new light weight ceramic media that seems to work well on all metals, but it will take a little longer to deburr ferrous metals.

Although chemical additives are important in a wet deburring process, I am not going to go into any detail here, except to say that at one time chemical compounds were formulated to suds to show their strength. This is not the case anymore. Most chemical additives are now low suds and their PH is stronger with a higher dilution rate. Because of environmental concerns and or hazardous factors, one should choose bio-degradable and non-carcinogenic products.

Normally, the more liquid you can get pumped through deburring equipment, the cleaner the parts. However, in barrel systems, most of these operate with a closed sealed door that must be dumped per load. In vibratory systems, the drain can be blocked or restricted either by accident or intentionally. This is sometimes done to slow down or buffer the mechanical action that may damage the parts. High energy systems utilize either or method.

Now, I mentioned that the trend for media is toward smaller and heavier, which is desirable. However, when parts get down to a ½ an inch or smaller, water-based systems have some problems. 'When media and parts get down to this size, water ceases to behave like water and acts like glue. Therefore, dry system media use is on the rise and is always recommended for flat two-dimensional parts up to a size of 3 or 4 inches

If preform inorganic media is used dry, it normally tends to break down very fast. A pretreatment can improve the performance of inorganics in this size range; however, this is not common knowledge and is probably not used by many people. Also, in some cases, this process may affect or discolor parts. Therefore, organic materials seem to be more acceptable in achieving the end results of smoothness and/or working all the areas for surface modification. To improve upon the performance of these dry organics, these materials are usually blended and/or impregnated with liquid additives and/or abrasives.

Because weight is probably the most important factor in speed and/or finishing time, there are some draw backs to using dry organic material. On the other hand, because of equipment advances in speed, these time factors are not as significant as they were early on. Example; say we want to polish a part with a surface finish of around 18 RMS down to a mirror finish of about 8 RMS. This might take a barrel system 48 to 96 hours or more. In a vibratory system, this would be equivalent to around 24 hours and maybe 2 to 4 hours in a high energy system.

Because time is money, you don't want to forget about part separation systems. That is, after all your parts are processed to the surface finish you require, you must then remove your parts from the media. Again, parts under a ½ an inch usually require some additional material handling. In order to speed these processes, you normally select a media smaller than your parts so that a screen system can be used to collect your parts as the media falls through the screen.

There are some costly automated separation systems integrated with some equipment and these work extremely well. For cost and efficiency, the vibratory bowl systems are very good, but probably the simplest and easiest system that is guaranteed to work in less than one minute is a patented device called an "Inseparator" That is found in a small bench top vibratory bowl system called Nova. All these systems work, it's basically a matter of your application and/or needs that determine which way you go.

All mass finishing equipment and supplies have limitations. It is a matter of finding out what these limits are and/or how to get around them that count. You have basically, 4 major factors to consider and they are part size, speed of the equipment, media characteristics, and part separation.

There you have it. Parts are getting smaller, equipment is getting faster, media is getting smaller, heavier, and there is increasing use of dry organics which results in finer surface finishes.

- 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.

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