Technical Service Bulletin

317 N. Mechanic Street, Jackson, MI 49201
Voice: 517-783-4776 ♦ Facsimile: 517-783-5875
E-mail: sales@mechanicalplating.com
www.mechanicalplating.com

Zinc Dust for Mechanical Plating and Galvanizing

Zinc dust for Mechanical Plating and Galvanizing is produced by a distillation process in which molten zinc is vaporized and then condensed in a spherical shape in the 3 to 15 micron range.

Obviously, the particle size of the zinc has a significant effect on the characteristics of the mechanically plated or galvanized deposit. For lighter parts, often smaller particle-sized zinc is used, providing a smooth deposit. For heavier parts, often larger particle-sized zinc is used to enhance efficiency, because with larger particle sizes, there is less surface area to be attacked by the acid medium in which plating/galvanizing is conducted; this, however, will only work if the parts themselves have more energy to be utilized in the plating/galvanizing process. (For nails, because of their tendency to "jackstraw" in the plating barrel, the particle size doesn't make much difference, so usually smaller particles are used.)

Not so obviously, the composition of the zinc makes a significant difference. Some zinc has substantial quantities of lead, and the presence of lead, even in small quantities, has an adverse effect on plating/galvanizing efficiency. The process by which the efficiency of the mechanical deposition process is reduced can be described as follows: in the mechanical plating or galvanizing process, zinc is continually removed from the surface of the plating particles in order to provide a clean surface which is absolutely necessary for the mechanical deposition process to occur. If there is a significant amount of lead in the particle, a process called "dezincification" occurs. This process is a particular form of, and is also known as, "dealloying" or "parting. [See, for example, "Dealloyinq", by Ann Chidester Van Orden, Chapter 24 of Corrosion Tests and Standards, by Robert Baboian (ASTM, 1995).] As the zinc is removed from the surface, the surface becomes "lead-rich." In almost all mechanical deposition processes, the plating is conducted in a solution which is about 5% sulfuric acid; the sulfuric acid reacts with the lead on the surface of the particle forming a lead sulfate coating on the surface of the particle. This lead sulfate coating on the surface of the plating particles interferes with the intimate metal-to-metal contact that (with mechanical energy) "cold-welds" the metal particles to the substrate. While it is possible to conduct the plating in an environment in which sulfuric acid is not used (e.g. citric-acid based or hydrochloric acid-based processes), it is usually preferable to use a low-lead zinc. For this reason, PS&T recommends the use of low-lead zinc dust for the mechanical plating and galvanizing processes.

Low-lead zinc dust is available from Purity Zinc Metals, Clarksville, TN (Phone: 931-552-8080 and Website: purityzinc.com). The two (2) most common sizes are UP-6G and M515. Another source for low-lead zinc dust is EverZinc USA, Raleigh, NC (Phone: 450-774-9151 and Website: everzinc.com). The most common size is 4P64.