

“Made in the U.S.A.” Audio Component Pioneer Redesigns Efficiency



Elastomeric Polymer-Based Surface Enhancement Coating From Magnaplate Doubles Coil Winding Efficiency And Reduces Rejects 75% For Pyle Industries.

Huntington, Indiana’s Pyle Industries has long been a pioneer in the development and manufacture of “Made in the U.S.A.” sound systems for cars, trucks and the home. The first mobile high-power woofers came from Pyle. The first true high-power, multi-element car stereo speakers were perfected by Pyle in the 1970s. In the decades that followed, Pyle expanded its product lines into home theaters, professional DJ equipment and more. Today, they remain an acknowledged industry leader in audio products.

Behind every advance in sound amplification technology achieved by Pyle lies well thought-out manufacturing processes that are re-engineered, whenever necessary, to ensure consistent quality, efficiency and productivity. A case in point is the company’s vital speaker component, the high-temperature poly-thermal polyimide film voice coil.



Coils are Wound Wet on Aluminum Arbors

The manufacturing process works like this: The polyimide film (a thermoplastic sheet of three or five mils thickness) foundation of the voice coil is wrapped around a 6061-T6 aluminum arbor, which ranges in size from 3/4" up to 3". Insulated magnet wire coated with a proprietary adhesive system is then wound wet on the arbor. When the winding is completed, it is aligned and reinforcing tape added to the coil.



The coils are baked at about 400°F for 40 minutes. Following the baking, the coil lead wires are chemically stripped and solder tinned. At this point the coils are removed from the arbors and the arbors recycled back to the beginning of the wet winding process.

That was precisely the way the process worked at first: with virtually no production glitches. As so often happens, though, problems began to crop up as the arbors continued to be reused.

Coils and Arbors Were Often Damaged During Removal

The basic problem encountered was the adherence of the adhesive to the aluminum arbors. Following baking, Pyle's workers discovered that the coils were adhering tenaciously to the arbors, and the company had to develop a method of forcibly removing the coils.

A manager at Pyle described the dilemma: "At first we could do the separation by hand, but eventually we found it necessary to set up a pneumatic cylinder with a tooling arrangement that allowed us to step on a pedal and physically drive the arbor right out of the coil. That worked fine for a while."

As the arbors were reused repeatedly, however, adhesive residues began to build up. He found that his people had to exert more and more force during the separation process, and the ends of the arbors began to get damaged. The damage in turn made the coils and arbors more difficult to separate. Some of the arbors became so severely damaged that they wouldn't fit the tooling on the winders. The cost of replacement arbors began to mount as "the problems continued to snowball," the manager said.

Pyle had to find solutions, and at first he thought they had: "We used to wash the arbors in acetone to try and clean off the adhesive. We had some initial success with that, but the problems were not solved by any means. We also tried applying a mold release lubricant to the arbors prior to winding. That, too, was successful for a short time, but the removal problems returned. We also tried anodizing the arbors, but removal continued as a serious problem."

It was at this point they discovered a specialized surface enhancement coating applied by General Magnaplate – LECTROFLUOR®. This multi-step elastomeric polymer-based treatment process lends superior non-stick properties to multiple metals – including the 6061-T6 aluminum of the arbors. One of a series of treatments in the LECTROFLUOR family, this surface enhancement process creates metal surfaces with superior mold release characteristics unaffected by high or low temperatures (from -400°F to 550°F), U/V exposure, or chemicals. It also creates surfaces with superior wear and abrasion resistance and excellent non-wetting characteristics.



How the Treated Arbors Performed For Pyle Industries

Interested in Magnaplate's background and evident capabilities, Pyle's manager sent the company several arbors to enhance. Then he ran a simple test in-plant: "We took the adhesive we use, put some on an arbor, placed it in our test oven and baked it for about the same amount of time we use in production. When it had cooled, I could take my finger and just flick the glue off. So we wound the coils using the LECTROFLUOR-treated arbors and we had no problems with them. When we were finished, the coils just slid off the arbors. We could again do the separation by hand."

Since so many of the old, untreated arbors were badly damaged, Pyle had all new arbors made and has had all of them enhanced by General Magnaplate.

And the savings? "By eliminating the forceful pneumatic separation process, we expect to avoid at least 75% of the arbor damage, even after extended usage. In addition, we expect to at least double the number of coils we can separate from arbors in a given time."