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Tech Views

Output Transformer Bobbins – Is Paper the Real Gold Standard?

I've heard it repeatedly: Paper bobbins on output transformers in tube amps are somehow better than plastic bobbins. Is this version of the adage "They don't make them like they used to" true or false? Or, is it a bit of both?

Transformers used to be wound on cardboard formers, which were hollow "sticks" of glued-up cardboard about three feet long. The hollow within offered just the right dimensions needed to slip the transformer laminations snugly inside.

Winding-machine operators would place the bobbin-forming "sticks" onto big machines and then wind several coils at the same time, spaced out along the stick. Each separate section would be wound with primaries and secondaries, stacked atop one another just the way they would be in the completed transformer.

The finished stick was cut into sections, each section being long enough to hold one set of coils. These sections each became the entire windings for one transformer. That's how the term "stick wound" originated in regard to those transformers. They were literally wound on a stick. Almost all the "golden age" transformers—the good and the bad--were made this way. It was simply the cheapest way to produce transformers in high volumes.

Transformer vendors eventually came up with the concept of using plastic bobbins for the windings. These bobbins formed a protective insulating layer on the ends of the coil, as well as between the coil and the core. They could also be produced on new automated winders at a cost that was even lower than stick-wound transformers. Manufacturers looking to reduce costs jumped onto the plastic bobbin bandwagon and wrung a few more cents out of their transformers.

Critical musicians, however, noticed that the new plastic-bobbin transformers didn't sound as good as the old ones. Not surprisingly, they noticed the plastic bobbin and made the connection: Paper was good, but plastic was bad.

Is that assumption correct? No.

The plain fact is that both cardboard and plastic are completely invisible to magnetic fields, and neither one makes any difference in the functioning of coils that are otherwise identical. The difference in performance is determined by how carefully the windings are designed and done, not which bobbin material is used.

It's possible that sloppy winders adopted plastic bobbins to hide their work, but that has nothing to do with the bobbin. After all, it's also possible to wind coils poorly onto cardboard. If the assembly worker is skillful and patient, then either bobbin material could be used with equal results.

On the other hand, something that really changes a transformer's performance is something you never hear about: whether the transformer is impregnated or not. Impregnating the transformer—or, filling all the voids inside it--will always increase the unit's self-capacitance because the air is replaced by varnish, polyester, urethane, beeswax, etc. A transformer that isn't impregnated will always exhibit better high-end frequency response than an impregnated one that's identical in every other respect. Technically, this is because air has a very low dielectric constant and the impregnating materials all have a higher dielectric constant.

So, is the way Leo did it better because he used paper bobbins? Sorry, but it isn't.

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