

# Talking Amps with... Sergio Hamernik: Rusty Transformers

by David Jung

It's truly amazing that half-century-old amplifiers are still out there, churning out more ear candy on a daily basis. But perhaps even more amazing is what you see if you peer inside the back panels of these warhorses. Some look so weathered, dusty, and rusty; you wonder how the hell they still work! Even more impressive is that most of these amps, with very little service, sound as good or better than the day they rolled off the production line.

How is that possible? Well, we know speakers get better with age and use, and old tubes are *da* proverbial "bomb." Some might go

so far as to say aged wood in a speaker cabinet adds flavor to an amp's tone. But when you look at a rusty old transformer—pitted, flaking, and by all appearances a fire hazard—you get nervous

because that transformer's just gotta be on its last leg, right? Like, any instant now, there'll be nothin' coming out of it.

That perception inspired *Mercury Magnetics'* Sergio Hamernik to devise an experiment to see whether rust affects the transformer in a guitar amp. His results might surprise you....

**VG:** So, is rust bad for a transformer?

**SH:** I can understand how one

might think that. After all, rust is bad, right? But in a transformer, the opposite happens to be true.

**VG:** You're kidding....

**SH:** No. With a transformer, each lamination—the stacked metal plates that make up the transformer's core—must be insulated from the others. And rust actually *adds* insulation. So, generally, rust on a transformer's laminations works in its favor by increasing resistance between those laminations.

**VG:** So, rust actually makes for a more effective transformer?

**SH:** Yup. Simply put, there are losses within the transformer that

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A rusty transformer can be a badge of honor.



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can be tone-sucking in nature. One of the obstacles to getting the best tone out of transformers is to minimize those losses.

**VG:** So, are all transformers prone to rust, or is rust a sign that a transformer was cheap or poorly made?

**SH:** Rust can actually be a mark of quality on a transformer, because better grades of iron rust fairly easily.

**VG:** So, how did your experiment work?

**SH:** We did an A/B comparison on identical transformers. One was left outdoors for seven years, exposed to the weather, cobwebs... you name it! The second one, from the same production—same machine winder, etc.—was put away pristine, without a speck of rust, for the same seven years.

We put both on the bench and subjected them to a battery of true A/B tests, showing them the same input voltages. And we intentionally left the output leads unconnected so we could measure each transformer's performance without outside influences.

**VG:** The result?

**SH:** The rusty transformer ran at a lower temperature because it drew less power. Bear in mind that each transformer started life drawing the same power! At the very least, the results show that rust didn't harm the performance of the transformer. And they imply it actually helped a little. So, if you're worried about rust affecting the performance of the transformer in any of your amps, don't. If you simply don't like the way it looks, don't sand it off! Instead, seal it with varnish, but make sure the varnish is completely

dry before powering up the amp.

**VG:** Does the change rust causes in a transformer's efficiency change the sound of the amp? Or does it just make for a more efficient transformer?

**SH:** If there's any shift at all, it shifts toward helping the tone, not hurting it. The same holds true for output transformers. We've had more than a few rusty output transformers in amps with the most amazing tone.

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*David Jung is a professional writer/screenwriter and vintage guitar enthusiast living in Los Angeles, where he hangs with some of the best amp techs and collectors in town.*



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**Mercury Magnetics**

Chatsworth, CA 91311

(818) 998-7791

[www.MercuryMagnetics.com](http://www.MercuryMagnetics.com)

The ohmmeters show the rusty transformer actually insulates better than its preserved twin.

