
Subject: Combining New With Old?

Posted by [Kingfish](#) on Wed, 30 Oct 2019 17:56:41 GMT

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There is an old stereo set-up I mentioned earlier in the month. (I promise I'll get the pics into Source soon) So, not to get too ahead of myself, do you think it's possible to fashion some LED lighting into the old system when I get around to that part of it? As I'm typing on my laptop, the keys are lighted. I was thinking about integrating something like that into that old stereo to give it a modern touch.

What do you think?

Subject: Re: Combining New With Old?

Posted by [Wayne Parham](#) on Thu, 31 Oct 2019 16:00:49 GMT

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Gotta love it. Kinda steampunk!

Back in the 1970s, when I was a teenager, I had a mentor named Mike McNatt that I met in church. He was an Electrical Engineer and he got me my first job at an OEM for Data General called Global Data Systems. They made measurement systems that logged and processed data using in-house designed z80 microcomputer based data-collection boards connected to Data General Nova IV minicomputers for data processing. It was really cool stuff at the time.

Anyway - too late to make a long story short - he gave me a present for my 16th birthday: An old vacuum tube with an IC chip glued onto the metal plate cap on top. It was pressed onto a walnut base to make a sort of trophy, with a label on the base that said, "Microprocessor controlled tube." It was a funny joke, and I loved it. An odd marriage of old and new.

But what made that even funnier to me was to set the clock forward about twenty years, to a time when we started seeing tube amplifiers with digital front ends, and DACs with tube outputs. I couldn't help but remember the tongue-in-cheek gift I got from my old mentor, Mike.

Subject: Re: Combining New With Old?

Posted by [Rusty](#) on Thu, 31 Oct 2019 17:20:14 GMT

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Don't count em out yet for computing. The nano tube, or vacuum channel transistor is being explored. Interesting stuff.

<https://phys.org/news/2017-04-vacuum-channel-transistor-combines-semiconductors.html>

Subject: Re: Combining New With Old?
Posted by [Wayne Parham](#) on Thu, 31 Oct 2019 20:38:36 GMT
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That's so cool, isn't it?!!

Subject: Re: Combining New With Old?
Posted by [Rusty](#) on Fri, 01 Nov 2019 14:38:14 GMT
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It makes your artifact seem a prophetic guide to the future. I worked in healthcare as a radiography tech. The x-ray tube has not been eclipsed yet. Maybe some future technology combining the properties like this for some useful beneficial devices can be realized.

Subject: Re: Combining New With Old?
Posted by [Wayne Parham](#) on Fri, 01 Nov 2019 20:26:44 GMT
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To your point, many people are surprised to learn about the actual benefits of vacuum tubes. I was one of them.

When I was young, microprocessors were just on the horizon. In my teenage years, that was what was brand-new. Integrated circuits and computers on a chip were the latest technologies in the 1970s. Vacuum tubes were like horse and buggy stuff to me.

When I would hear guitar players talking about how much better they liked tubes, I just thought they were creating an artificial bias, sort of inventing an idea. Or that they were just full of shit. And to some degree, that was true.

Some of my musician buddies would talk about "tube watts" being more powerful than "solid state watts." I would explain to them that was really just because of "soft clipping." I knew at least that much about tubes, and I was right when I explained why their 30 watt tube amps seemed to be just as loud as 100 watt solid state amps.

But sometimes I would run into people that thought their tube amps were qualitatively better than solid state amps, and I dismissed their ideas as nostalgia or just nonsense. I assumed that bipolar transistors were more linear and distorted less.

The only advantage I could see that tubes might offer was better resistance to electrostatic discharge and EMF pulses. It stood to reason that after the discharge stopped - provided the metal hadn't pitted excessively from internal arcing - a vacuum tube would probably still work.

Other than that, I assumed that transistors were superior to tubes. It wasn't until the late 1990s

that someone with technical background mentioned to me that the linearity of some tubes was better than the linearity of bipolar devices of similar power levels. The distortion-causing non-linearity is actually lower in many tubes than it is in solid state devices. That surprised me, and in fact, I doubted it.

So I looked it up for myself, and sure enough, I found that the actual active devices aren't what make modern solid state amplifiers have lower distortion than older tube amps. The reason modern amps have such low distortion is they employ a lot of gain stages and use more negative feedback. This reduces distortion by topology. A designer could do the same thing in a tube amplifier, but it would be huge because it would take so many tubes. If you build a minimal system with just a few gain stages and no negative feedback, the tube amp will probably outperform the transistor amp.

So this then brings into question whether or not a complicated design using negative feedback is better than a minimalist design without feedback, or with only local feedback like unbypassed cathode or emitter resistors.

Complex topologies that employ negative feedback can get distortion down to almost zero. They do this by sacrificing gain, but make it up using more gain stages. But they also can potentially suffer from reduced stability, especially as they enter clipping in one or more gain stages. They can produce strange artifacts when pushed to their limits. At the very least, the distortion rises from almost zero to very high and with high-order harmonics that are most objectionable.

Minimalist designs tend to have higher low-order harmonics, mostly second and third. And they often have them in more pleasant ratios, with second being higher than third. So the harmonics tend to be inaudible, or possibly "warm" sounding. The "soft" clipping of tubes sort of adds to this characteristic, in that the tops of the waveforms are rounded rather than hard-edged, so harmonics stay in the low-orders. It just doesn't sound ragged. That's the old "tube watts" thing expressed a different way, but it does play hand-in-hand with the fact that the minimalist systems tend to have low-order harmonics to begin with.

All that to say there's more to it than just a pure tubes-versus-transistors discussion. There is also a topology discussion and those are separate things. If one were to compare a tube to a transistor and not consider anything else, they would find that the tube was often times a more linear device.

A Taste of Tubes

Subject: Re: Combining New With Old?

Posted by [Rusty](#) on Fri, 01 Nov 2019 21:14:25 GMT

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I've been using one of Bruce Rozenblit's early OTL designs for close to 20 years now. He has said that the output transformer more so than the tubes are a major factor in tube sound. Adding the warmth described to tube sound. Quoting from an article, "The warmth is created by a large component of second-order distortion, and the slow rise time of the output transformer causes a coloration that I would describe as a smoothing effect...the transformer is a nonlinear element that

causes alterations of the signal in the time and frequency domains, thereby altering the sound." Without the output transformer, OTL's have a more transistor type of sound, but with a kind of uncanny holographic, I like to describe, aspect. Like you can look into the soundstage and focus on different aspects going on. Really good bass too. Getting a little far off from the original post, but, those led lights are perfectly compatible with a classic stereo rig. Really ought to showcase the rig.

Subject: Re: Combining New With Old?

Posted by [Wayne Parham](#) on Fri, 01 Nov 2019 21:22:23 GMT

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Yeah, you're right - we did get a little bit off on a tangent - that the original post was about adding LED ighting to an old vintage stereo system.

Personally, I think everything looks better with cool blue LED highlighting. But it has to be subtle. I like it when it looks stock. So I'd bury the LEDs inside, maybe where they give the front panel a soft blue glow.

Subject: Re: Combining New With Old?

Posted by [gofar99](#) on Sun, 03 Nov 2019 02:03:53 GMT

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Hi, Seems like a great project. Not my style though. I do tubes :roll: . There is very little sand in my gear. Nearly no NFB and many folks like the sound. Sorry Wayne for the OT.

Subject: Re: Combining New With Old?

Posted by [Wayne Parham](#) on Sun, 03 Nov 2019 14:49:52 GMT

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Doesn't look to me like you went as off-topic as Rusty and me! So but while we're off topic, did you set your clocks back last night? You gonna go to LSAF next June? And to bring it back on-topic, have you ever thought of highlighting tubes with colored LEDs? I've seen some really attractive tube amps that highlighted their warm tube glow with colored LEDs. It might seem kind of cheesy, but it really looks great. It actually looks really tasteful and high-end.

Subject: Re: Combining New With Old?

Posted by [Rusty](#) on Sun, 03 Nov 2019 16:12:02 GMT

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Shucks, let me just kick at that wobbly LED topic leg holding up the table. LED, Let's-End-Daylight, (savings). What if a compromise were made, like all the political hacks say. Come springtime, instead of spring ahead one hour. Make it 30 minutes. And hitherto dispense with and forget about this idiotic teeter tottering back and forth twice a year. Jacking with our sleep and clocks. An old concept that could use a new ending.

Subject: Re: Combining New With Old?
Posted by [Miami](#) on Fri, 15 Nov 2019 15:22:18 GMT
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Now, to me, that really sounds like combining the old with the new. It would only look cheesy to those who don't appreciate the "combining of the ages" as it were.

I think that is a fantastic idea.
