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Subject: Current Drive

Posted by [Rusty](#) on Sat, 26 Jan 2019 17:25:26 GMT

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I found this link on the Transcendent Sound forum. <https://www.current-drive.info/>

It's beyond my scope of technical ability and understanding. But it seems compelling that it could lead to an improvement to our listening pleasure. Our loudspeaker-amplifier audio technology has been around for quite some time with refinement's but not a lot of fundamental change. It would be nice for an advancement in the way hardware could be implemented for better sound rather than how software of digital has predominated these days.

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Subject: Re: Current Drive

Posted by [Wayne Parham](#) on Sat, 26 Jan 2019 17:42:34 GMT

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I don't see any harm in discussing current drive or to bring it to attention. But it isn't a new discussion at all. It is described in many ways, as damping factor, as output impedance and its relation to the varying impedance of the loudspeaker load. It is particularly important to tube amplifier enthusiasts, since tube amps usually have higher output impedance than solid state amps. Vacuum tubes are often described as "voltage amps" while transistors are described as "current amps" because of their different impedance ranges and basic characteristics. But no matter what technologies are employed, the basic physics that describe electronics haven't been somehow misunderstood or overlooked.

Loudspeakers are current devices. The diaphragm moves as a result of current flow that creates a magnetic field. The magnetic field of the voice coil interacts with the magnetic field of the fixed magnet (or the field coil). But if you know the impedance of the driver, then you can know the current through the voice coil if you know the voltage across it.

When voltage is fixed, then current rises as impedance drops. So if the impedance varies, then the current also varies. And I shouldn't say "if the impedance varies" because it does vary with respect to frequency in all loudspeakers. This means the current drive also varies with respect to frequency. Sometimes people talk about "voltage sensitivity," which is a way of describing this.

Long story short - this is a well-understood and oft-discussed topic. It is an important topic, especially for tube amp owners. Sometimes we talk about "tube friendly" speakers for this very reason.

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Subject: Re: Current Drive

Posted by [Rusty](#) on Sat, 26 Jan 2019 18:54:19 GMT

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That is what I've always heard as a distinction between tube and solid state amplification. And that the loudspeaker end was tied to the current side of things. But I don't know if this literature pushes anything towards a greater realization of performance in technology. Maybe he's well meaning towards some revelation that really is not as significant as he perceives.

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Subject: Re: Current Drive

Posted by [Wayne Parham](#) on Sat, 26 Jan 2019 20:43:45 GMT

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You're right.

The closer output impedance comes to zero, the closer the amplifier becomes a pure current source. So most focus on that. It's an obvious requirement for very high-power amplifiers.

Also, some circuits use a feedback signal that modifies voltage output slightly to compensate for any impedance fluctuations in the output circuit. That's another method to achieve the goal, in circuits where output current is more modest. But this can make the circuit vulnerable to instability, especially when the amplifier is driven near its limits. When the output voltage reaches the power supply limit, there is no way for the output signal to be increased, so feedback drives it harder into clipping.

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Subject: Re: Current Drive

Posted by [gofar99](#) on Tue, 29 Jan 2019 17:07:18 GMT

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Hi, As Wayne noted a long history of this concept. In days long past when only feeble tube power amps were available it was undoubtedly a problem and caused sonic issues. Since about the middle 50s or so it is really not a problem. Early amps often had damping factors under 2 to 4 range. This meant that they really could not deliver a consistent current to meet speaker demands. Since then the DF is usually well past 10 and can reach values like 50 or more. Such amps have no problems with driving current loads. The impedance of speakers varies with frequency. Ones I have seen typically vary from a nominal value by +/- 10-20% over a lot of the range they can reproduce. At resonance they can vary quite a bit more. Impedance may shoot up 10 times or more from the nominal value. Good speaker systems account for this and keep individual drivers from responding there. With the nominal variations in speakers modern tube amps have no problems with them. This phenomenon is one I consider as an amplifier designer. Even the lowest power amplifiers of my designs have damping factors over 15. With only the usual variation in load impedance this is quite adequate to handle any current demands. My personal speakers are electrostatic. From the amplifier perspective they look like giant capacitors with an impedance of about 4 ohms in the low to mid band that drops to just over 1 ohm at the high frequency end. The tube amps have absolutely no problems with them.

So, my take on the current issue is that it is no longer an issue with a modern amp of any type (includes class D ones) driving any sort of speaker. I am sure there must be at least one speaker out there that is so far off normal that problems might exist....but none exist to my knowledge.  
YMMV

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Subject: Re: Current Drive

Posted by [Rusty](#) on Wed, 30 Jan 2019 00:51:03 GMT

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My impression from this fellows website is that he seems to feel that current audio is not aligned with whatever he believes he's on to. As he claims in, "The serious flaws of voltage drive:  
Quote:Today, all commercially available audio amplifier and loudspeaker equipment works on voltage drive principle without significant exceptions. This means that the amplifier acts as a voltage source and therefore exhibits low output impedance. Thus, the amplifier as though forces the voltage across the load terminals to follow the applied signal without any regard to what the current through the load will be.

So... as I'm of no judge to know what in heck he's presenting, I defer to wiser minds than mine. There's no shortage of kook's on the internet. He's selling his book only at least, which may be labeled under "fiction".

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Subject: Re: Current Drive

Posted by [Wayne Parham](#) on Wed, 30 Jan 2019 16:27:17 GMT

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Honestly, transistors are current devices. They "multiply" the amount of current flowing from base to emitter by some amount and allow that much current to flow from collector to emitter. The only part that voltage plays is it has to be enough to exceed the forward bias voltage of the semiconductor junction (around 0.3 for germanium and 0.7 for silicon) and then past that, however much voltage is required to push the requisite current. The drive signal doesn't increase the voltage across the junction much at all - It increases the current through it. See the link below:

Transistor Drive Signal

So say you have a silicon transistor with gain of 100 and you present it a signal that flows 0.01 amperes through the base: The current flowing through the collector will be 1.0 amp. It's a current device.

Transistor as Current Amplifier

Of course, Ohm's Law applies so no mater how we discuss things, i.e. "current-centric" or "voltage-centric" we can also look at things the other way. We can talk about the current flow through various parts of the circuit and if we know the resistances in the circuit, we can also know the voltages. Or if we know the voltages across a particular part we can know the resistance it is presenting. It's just different ways of looking at it.

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But the bottom line is the issues in play here are not new and are very well understood. Each designer makes the most of what he or she thinks is important.

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Subject: Re: Current Drive

Posted by [Rusty](#) on Wed, 30 Jan 2019 18:15:35 GMT

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My layman's understanding precluded this initial inquiry. As it conflicted with the rudimentary concepts I've known of and you've embellished on. I appreciate your patience. I was just curious as to what this fellow was getting at. If anything. More than likely whatever the pursuit is this fellow is advocating is worthy of investigation.

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Subject: Re: Current Drive

Posted by [Wayne Parham](#) on Thu, 31 Jan 2019 00:12:08 GMT

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Honestly, I like discussions like this sometimes. They can get a little bit "how many angels can dance on the head of a pin" but I still like to deep-dive into the minutia sometimes. But I do always try to remind myself (and any others in the discussion that care to chat about it) that we're talking about teeny-tiny little stuff that probably isn't particularly significant.

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