

Why are tube amps louder than their solid state brothers?

Tube amps, facilitated by their output transformers, drive their speakers by a method known as CONSTANT CURRENT. That is a good thing for tone! However, with older design solid state amps, until fairly recently, most have employed the CONSTANT VOLTAGE method. Which, as guitarists have accurately detected, has quite a different aural outcome.

This is all controlled by a mainly ignored fact, that a speaker's impedance changes with frequency. It is not a constant parameter as most assume. This is why speakers are quoted as having a NOMINAL impedance... meaning "it's not always this quoted 8 or 16 Ohms impedance." It can even go as high as 120 Ohms or more.

Solid State Amps - Where the voltage across the speaker is CONSTANT regardless of frequency, it should soon become apparent that as the speaker's impedance changes then the power output (and acoustic output) will change dramatically too. In fact, most output power is produced only for a narrow band of frequencies... from about 150Hz to approximately 1500Hz. This is why old fashioned design SS amps are said to sound 'cold and flat' and sometimes 'lifeless'.

There is another disadvantage to the CONSTANT VOLTAGE drive method... that is, that the power circuitry has what is called 'a low output impedance'. Without going too deeply into this, unfortunately it has the added effect of heavily 'damping' the speaker's cone movements... like attaching an automotive 'shock absorber' to it. The result is that the amplifier does not sound as loud as it could. This is in addition to the cold & flat tones mentioned earlier. So yes, the older solid state guitar amps do sound and behave differently. And, believe it or not, some pretty BIG NAMED solid state amp brands are STILL made like this... adding greatly to solid state guitar amp's poor reputation, which is very sad as it does not need to be this way.

Tube Amps - OK, so TUBE amps drive their speakers by the opposite CONSTANT CURRENT method. This takes account of the speaker's changing impedance by keeping the current flowing through the speaker continual and thereby, ensuring that the power output (and acoustic output) remains the same at all frequencies. It has an entirely different sonic presentation. It's brighter (chime), there's more bass output when the speaker is at its ~80Hz resonance... so, hence it's warmer!

Another advantage of TUBE powered amps is that the speaker is NOT heavily damped by the electronics. This allows their much less restricted speaker cones to behave differently from how they would if installed in the 'old type' SS amps. As the cone 'jostles, stretches and quashes' around in it's suspension, it adds mechanically created distortion overtones to the sound WHICH DO NOT come from the amplifier or its tubes... but from the speaker alone! The designers at Celestion would call them 'cone breakup modes.' But for us, these are the sounds we all love and call "THE TUBE AMP TONE."

Because the amplifier's speaker is less restricted and able to vibrate much more freely, then this further adds greatly to the apparent loudness of the amplifier. And yes, it does seem much louder than the 'old style' SS amps that most players are used to hearing and speak of.

Modern Solid State, So What's Changed Then?

An old style SS guitar amp did struggle to keep up volume-wise. But at the end of the day 50 Watts is 50 Watts, be it TUBE or SS generated! Now, better educated designers are taking advantage of this by using those FACTS to turn SS amplifiers into TUBE-LOUD amps! We now have CONSTANT CURRENT SS guitar amps available which are able to do EXACTLY what only a tube amp was formerly thought able to do... low end 'warmth' with that, so called, 'chime'. But most importantly, with TUBE AMP LOUDNESS.

SESSION's new 'Audacity Class' SS amps do what most players consider impossible. They have analogue TUBE amp signal paths, simple power supplies, classic TUBE amp tone stacks and equipped with CONSTANT CURRENT speaker drive as well. Our design ability has managed it without a single tube anywhere. These amps are different and match what most players truly want!

Try our 22W or 45W 5E3-EXTRA combo. Debuts July 2020.

Stewart Ward

Guitar amp designer since 1967 - Tube & SS.

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