

# Electronics Design Philosophy

Most people like Ice Cream. I think that my favorite is Vanilla. My second choice is Strawberry. You know... the kind with the real strawberries in it?

What is your favorite flavor of ice cream?

Our sense of taste is very similar to our sense of hearing in that different people like different kinds of music – or none at all. Then there are sub-sets of taste. Do you like chocolate chips in the ice cream or some syrup on it... maybe butterscotch topping?

Then there is the kind of chocolate used for the chips. What's your choice, dark or milk chocolate?

I hope you are beginning to see where I am going with all this. You see, music and its sounds are a very subjective topic. Many people are very passionate about their particular tastes.

## ~Distortion~

What is distortion? Distortion is: **any** change made to the signal. More simply put; subtract the input (original signal) from the output (processed signal) and what you have left over is distortion.

Most people will agree that distortion is a bad thing.

Is it?

In my honest opinion, bad distortion is bad and good distortion is good. -- We all like that rock guitar played through a nice tube Marshall amplifier.

But what about that rich and warm vocal that just moves your soul? – It was recorded with a microphone that has a frequency response that is very far from flat, through a microphone preamplifier with an 'imperfect' transformer on the input and leaky electrolytic capacitors in the circuit, and recorded on an analog tape machine with Dolby SR encoding. Absolutely **nothing** in that signal chain is distortion free.

## But we like it.

This is what I call good distortion. Most people wouldn't call it distortion at all (because distortion is 'bad'). Instead, they use words like rich, warm, thick, bright, full, big, fat, etc.

Face it. It is distortion.... and we like it.

It is the magic that we seek. It is bigger than life. It helps create what we, as music producers and engineers, try to create.

If you want a very quiet, distortion-free mic pre you should try the Mackie VLZ Pro. I have used this little board on audiophile sessions with great success. It is a really clean and quiet preamplifier.

Don't use the EQ though. But if you want to record some good rock drums with these pres, you will have to process them quite a bit to get what you want. Why? - Because the micpre doesn't add anything. It doesn't do anything but gain. I think you can get 16 channels for around \$800. good buy – Of course, that's **my** opinion and some will disagree. That's ok.

## Noise

In today's digital world, hiss and hum in an audio recording is inexcusable. And with current semiconductor design bringing us close to the lowest theoretically possible noise floor, I wonder why designers today still design noisy hi impedance circuits before a gain stage.

I also do not understand why a designer would put an input gain **and** an output gain on any piece of gear. If you change the **output** gain to anything other than unity, you are adding noise. Like the make-up gain on a compressor. It adds noise, so be careful how much compression you use.

Circuits should be designed for the lowest noise possible by 'getting straight to the functional point'. If it is an Equalizer, eq the signal and get outta there! Mic pre, gain up to the working level and get outta there!

## Designing the Best Pro-Audio Electronics

Here we go again with another **subjective** term. The best... Well, it depends on who you are and what you do and what you like.

My priorities are:

- 1) Must have professional level input and output – at least to +24dbm.
- 2) Must be able to drive a low impedance (less than 600 ohms) load without additional distortion.
- 3) Capacitors must be eliminated in the signal path to reduce phase shift.
- 4) Frequency response must be from 2Hz – 180kHz where possible.
- 5) All designs are low impedance (impedance < 10K ohms) where possible.
- 6) Low noise components must be used throughout. ie; resistors = 1% MOF

I will use impedance balancing for my outputs unless the output is guaranteed to drive a true differential input and needs the extra 6db boost of a differential output.

I also love to use discreet transistors. I personally think they sound much better than OpAmp outputs. But, it depends on what they are driving. When higher currents are involved in the amplification process, certain things happen to the signal. To me, it just sounds better. I use the word BIG. I like that. (But it is distortion... the kind we like.) It's a very subtle thing and not easily measured on test equipment or in a SPICE simulation.

When I design something new, I always listen to each section during the process and make changes to the design as necessary. I design the unit so that I can get different flavors out of the signal.

Have you ever heard about a piece of gear being ruined by upgrading the capacitors? Many an old Neve module has been subjectively ruined by installing better capacitors or resistors.

It is usually those leaky caps and saturated transformers that give you that special sound. That is why professionals have so many different kinds of preamps in their racks. -- They all do different things.

When it comes to sonic magic, one size does **not** fill all. Most microphone preamps, EQs, and compressors available will work better on one thing than another. – Or they will work ok on everything. Guess which ones are lower distortion? Answer: The ones that only work '**ok**' on everything.

So... Which flavor of Ice Cream do **YOU** prefer?

-- JH Brandt