



TECH NOTE series

Mixing Console Equalization:

EQ Phonetics

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In this article, we will discuss equalization, what it does, and how it can be used to your advantage.

Equalization (EQ) is a term that is widely used to identify a portion of the circuitry in a mixing console that adjusts the tonal quality of the signal. It's also used as a verb when describing this process. We will take a closer look at this process and then take a different approach to some real world applications of it.

The process itself is described as manipulating a signal at certain frequencies. When a signal enters the mixing console through the preamp it is received as a full bandwidth signal. This is how the microphone perceives the signal. The signal typically gets increased at the preamp, but in some cases it may need to be attenuated. Then it goes to the eq section.

Here the operator can "slice and dice" the signal tonally. What I mean is that you can add or subtract bass or treble portions of the signal. What is actually happening is that certain frequency bands are having gain added to or, in the case of attenuation, subtracted from the signal.

As an example, do you remember when the radio in your car had only volume and tone controls? Well, the tone control was essentially a variable band pass filter that boosted a range of frequencies. As you turned the dial clockwise, the range of boosted frequencies got higher and the radio sounded thinner. As you turned the tone control counter-clockwise, the radio sounded boomier. The change in the range of frequencies being boosted is called sweeping.

Nowadays it is very common to find bass, mid and treble controls on a car stereo. This offers a wider variety of tonal adjustment because you can actually cut and/ or boost three ranges of frequencies at one time.

One area that most church audio operators must deal with in connection with eq is the speaker's lapel worn mic. These little devices are very liberating to those who wear them while they can be a real headache for the operator. A typical scenario begins with the speaker stepping up to the podium with the mic ringing all over the place. The operator is sweating and trying to remove the unwanted ring with the eq. The sound is changing with every second that goes by! Finally, the ringing stops but the speaker sounds like a chipmunk or a very quiet chipmunk.

This scenario can be sidestepped if you know what "sound" to target and how to hit that target. We will approach this topic by scrutinizing a speaker's speech and breaking it down to its most fundamental parts: vowels and consonants, and how this ties into eq-ing a lapel mic properly.

Let's start by having an assistant wear the mic and stand at the podium. First, listen to the quality of their voice up close. This is your theoretical target sound. With this in mind, have your assistant pick up a bible or hymnal and start reading. Listen to the tone of their voice as it comes through the p.a.. Does it sound like their voice did when they were speaking to you face to face? It's unlikely that every part of their voice will get amplified useably, but the goal is to get as much of it as possible without feedback.

This is where "slicing and dicing" occurs. As you listen to the person's voice, dissect it in your own mind. Break it down into vowels and consonants. Does the speaker have any pronounced S's or K's in his speech? Does he have rich chest tones? (Chest tones are defined as the parts of one's voice that aren't really coming from the larynx or lips and teeth but rather from the chest cavity. This is more often true for the male voice and almost always deals with vowel sounds in the very low frequency range of about 50-150 Hz).

Most lapel mics are of the omni directional type. This means that the mic picks up equally from every direction. Typically, you must roll off a better portion of the very low frequency range starting at about 150-200 Hz. On many smaller consoles this means the LOW frequency knob in the eq section of the channel strip (100 Hz typical). This automatically eliminates all of the speaker's useable chest tones. There may be a portion of the chest tones left in the signal, but now they're so attenuated that they are no longer present in the same proportion as they were in the un-amplified face to face sound of the voice.

The power present in these chest tones can make the difference in whether or not the speaker's voice will be heard in the p.a. system. They can carry the voice even though the speaker may be speaking softly. With this disadvantage, we must preserve all that we possibly can of the remaining parts of the speaker's voice for amplification.

Keep in mind that power comes through the vowel parts, but articulation comes from consonants. Vowels are produced by the chest and oral cavity (or mouth), and consonants are made by the tongue, teeth and lips. Vowels can span a wide range of low to midrange frequencies anywhere from 100-1000Hz, whereas consonants typically start at about 2000-12,000 Hz.

An exception to this are P's and B's which, although they are consonants, move air in the low frequency range. The higher the frequency – the less power the part will have. An unwritten rule to follow is that vowels should have about twice as much power in dB as consonants do.

Some people have peculiar nuances in their speech. You can learn these nuances by speaking to them face to face before they get on the mic. If you don't have this opportunity then just listen for S's or whistles or heavy P's and B's.

Some folks have harsh K tones. Some people's voices sound mumbled as if their vowels are too loud. In this case you'd subtract some vowels or add more consonants or a combination of the two.

Sometimes consonants or combinations of consonants known as diphthong ("th", "sh", "ch", etc.) can be very pronounced and can cause a smearing effect in the p.a. and on tape. Your treatment of the voice is dependent upon the nuances of the speaker's voice.

It is important to try to keep the person's voice sounding as natural as possible, but your highest priority as the audio operator is to make the speaker's voice heard articulately and comfortably to all of the listeners in the room.

Attenuating vowel sounds from a person's amplified voice is almost always the first step in eq-ing a lapel mic. The main reason for this is the pick-up pattern of the omni directional lapel mic.

Typically, you'll have to deal with a low frequency ring from the very start. (It is unlikely that you can leave the eq flat on the console when using a lapel mic). You can decrease the LOW knob on simple consoles until the offending ring stops. (You'll note that a parametric eq is a more precise tool to work with. A console that only offers a fixed eq will cause you to have to remove more of the signal than you necessarily need to.)

If your console offers a parametric eq, you can start with the low freq. gain knob at - 50% of it's travel while sweeping the frequency knob slowly from low to high. (Remember the tone control on your car radio?) You must listen carefully for an attenuation of the offending frequency. When you hear it start to go away, you have found it. You have to use both controls alternately until you find the place you're targeting.

Go slowly and listen carefully to the changes that sweeping these controls makes. When you find your threshold of feedback, back off the gain a couple of dB to give yourself some room to work the mic with the fader.

Some parametric equalizers offer a selection switch for either a tight or wide bandwidth for the range being adjusted. Even better yet, is a sweepable bandwidth knob. These controls will allow you to "zero in" on offending frequencies (narrow) or create a more gradual tonal change (wide).

You should start with the bandwidth control in a wide position and as you get closer to your offending frequency you can narrow it down some. This will aid in removing as little of the actual signal as possible.

Having used this method of "whittling away" any low ring, continue to listen to the speaker's voice. You can remove any S's or other offending consonants.

You may need to add some consonants to the speaker's voice. In actuality you're not adding consonants but merely adding gain in the frequency range of certain consonants in order to cause the voice to be more articulate over a p.a. system.

Remember that the objective here is to get the person's voice to be 1) articulate and 2) sounding natural.

About the author:

Mike Luzecky, founder of Sounddoctrine Ministries, has been an audio engineer for the past twenty-two years. He served as an engineer/operator at WXXI-TV 21 in Rochester, N.Y. before serving Kenneth Hagin Ministries as audio operator for ten and a half years. For the last ten years, he has served the Kenneth Copeland Ministries both full time and part time as front-of-house audio engineer for their Believer's Conventions and Victory Campaigns. Mike and his wife Leah now pastor a church in the greater Cincinnati area where they reside with their two children, while also continuing to serve KCM. *He can be reached at clcstaff@fuse.net.*

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