Wheatstone
WHITE PAPER

Processing Smarts

Tips from the experts on radio processing

Josh Gordon
Director of Marketing and Content Development
Wheatstone Corporation

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The growing divide between radio programming and radio processing

It used to be easier for programmers to get their processing smarts. But do programmers understand audio processing the way they used to? Fred Jacobs, president of Jacobs Media, has his doubts: “One of the problems today is that at many stations, engineers are just not as present. When I was a programmer, it was great having engineers in the building because of the questions I could get answered and the conversations I could have. But if engineers aren’t in the building, how will programmers learn about processing and how it affects their station’s sound? With those guys out of the building, most programmers know frighteningly little about it.”

John Stevens, COO/Radio at Paragon Media agrees: “The programmers who are really familiar with processing are probably the older guys who are used to working with engineers. But the younger people today come up through marketing, and many don’t understand the technical side.”

As the next generation of radio programmers knows less about audio processing technology, the next generation of audio processors offers more to programmers to improve their station’s sound. This report is a step to bridge that gap.

We asked processing experts to share advice on processing audio for different programming formats, and we gathered their verbatim comments. To simplify things, we grouped those formats into seven categories known to have similar processing profiles:

Contemporary Hit Radio (CHR)

Adult Contemporary (AC)/Adult Hits

Classical/Traditional Jazz, NPR

News/Talk/Sports

Country

Adult Hits and Rock

Classic Rock

We asked participants for tips and suggestions on audio processing, as well as to select the one characteristic (from the list of 12 below) that they believe gives their programming format its most unique sound. Here are the 12 sound characteristics they chose from, as well as how many participants selected each:

1.	Cleaner	14
2.	Fuller	6
3.	Louder	3
4.	More definition	3
5.	More mid-range	2
6.	More lower mid-range	2
7.	Brighter	1
8.	Wider	0
9.	More “thump”	0
10.	More high end	0
11.	More upper mid-range	0
12.	More low end	0

As you read this report, you will notice that a wide range of opinions were expressed as to which sound characteristic is most desirable, however the sound quality mentioned most often as giving a music format uniqueness is a cleaner sound. It seems that many of the old clichés, such as how CHR stations just want to be loud while classical/NPR stations just want more definition, could be behind us.

In addition to processing experts who are focused on one particular station or format, we also invited comments from a few other experts who set processing across multiple formats, to offer a broader perspective.

A great big “thank you” to all the participants who contributed their expertise to this project.

Josh Gordon

Director of Marketing and Content Development

Wheatstone Corporation

Tips for better audio processing: Advice from the pros

• Remember who your customer is

Geary Morrill, Tech Manager, Sarkes Tarzian Inc. (WAJI/WLDE)

Always keep in mind who your core target is, and if you're not in it - please understand your opinion really doesn't count. Radio folks are NOT normal ... we turn the volume up when the announcer comes on.

Tom Lawrence, General Manager, WAKM AM950

The listener is your customer. They pay the bills the advertiser sends them.

• Set processing goals

Joshua Pierce, Chief Engineer, WMIT-FM

Take the time to sit down and map out your goals for the signature sound of your station. Involve your engineer as much as possible in setting your goals. Keep in mind that louder most likely does not mean better, and comparing your station to the others isn't a way to set processing goals. Take all the time you need to get it right: creating a signature sound for a station doesn't happen in one afternoon sitting in your car. Make small changes, listen for a while, take notes, save settings, then try your next change.

• Listen to many different radios to make adjustments

Gary Kline, Vice President Corporate Engineering & IT, Cumulus Broadcasting

I am surprised at how many engineers have a poor quality radio and/or poor quality speakers in their car. Often they may be driving the old engineering vehicle which has an average sound system at best. When I visit a market and see this, I always encourage the engineer to get a new radio for the engineering vehicle and I let them know that I'll pay for it. When I'm making an important processor adjustment I'll listen to the sound of the station in 3 or 4 different cars. I'll sit in the market manager's car in the parking lot, I'll sit in the PD's car. In addition, we will listen in the studio, on a home stereo, and go to Walmart and listen on boom boxes. It's important to listen to a lot of different radios.

• Don't over process

Craig Debolt, Owner, Debolt Communications, llc

Most listeners would go blank in the face if you tried to explain sound quality to them. However, when a station sounds full, open, flowing -- like the audio is coming out effortlessly versus a squashed, compressed, distorted, narrow loud station -- they notice and prefer it. Even though it's subliminal, in the back of their mind they're thinking "the music is better on this station," or they find themselves able to listen longer without getting irritated or having to turn it down. Or, my favorite, "I've never heard that in that song before!" You'll know it when it's right -- if you're not sure....you ain't there yet.

• Watch your demographics

(anonymous)

Don't overprocess, and be aware of the demo age you're programming to. If you're playing oldies to baby boomers, you always want your signal to be nice and clean. You probably don't need a super high end as high frequency hearing generally diminishes for those of baby boomer age.

You're better off boosting the mids and the mid highs. As far as an alternative "new music" format? Have you listened to what the kids have on their Nano's these days? They are happy to download their music for free "one way or the other" and some of that music audio quality is no more than 500Hz - 5000Hz. I would be totally embarrassed if our audio sounded like that! Listen carefully to your audio chain. In the early days of digital music some nasty artifacts appeared when processing digitized music. In a 100% digital audio chain most of those problems have been eliminated.

• Clean is the new loud

Robert Combs, Regional Engineering Coordinator, Cumulus Media – Savannah

Get away from the 'louder is better' attitude. Be the station that is clean and natural sounding. With today's processors, you can be both loud and clean, but to me, cleaner is better.

Charlie Wooten, Market Engineer-Panama City, FL, Clear Channel Radio

Loudness isn't the Holy Grail.

S!ick, host, Edmonds and Foster, Radio Exiles(.com)

Keep it clean. Don't go nuts with low end or loudness. There is no need to boost high end as it is already exaggerated. It's the little details that set a station apart from the crowd. Overall, don't allow for audio to be (too) distorted and over modulated.

• Start with clean source material

Bob Hoffman, Chief Engineer, WIL / WARH / WXOS, St. Louis

It's imperative to start with the cleanest source material available. Initially use a factory preset for your genre and make slight adjustments in increments to achieve your unique sound. Listen on a number of radios similar to what your listeners will have in the car or home. Check your competition occasionally and aim to sound not just louder, but better (ie: cleaner and/or with subtle enhancements to lows or highs as your format requires and as your listeners may expect.)

(anonymous)

1. Refuse to air these horribly recorded and limited songs that have so much low end distortion.

2. Don't over process the audio so it subconsciously fatigues listeners. Only PDs care about loudness and heavy audio processing. The public can't "turn down" the effects of heavy processing, they can only turn down your radio station if it irritates them sonically.

• Watch processing as the programs flow

Stephen Ward, Director of Engineering & Technical Services, Broadcast Engineering Ltd

Try to have programs and ads that flow together. Having a soft passage on a program followed by a very loud commercial will startle your listeners and turn them off of your station. The same is true for the reverse. Commercials should match program content and this should vary from high to low over the day's programming. We need change to keep interest in content.

• Put one person in charge of processing

Gordon S. Carter, WFMT (retired)

It is important to have one person, and only one person, who makes the final decision on processing. He/she can have a panel of advisors, but there must be ONE final decision. It is important to have a variety of opinions as no one person has perfect hearing, but the final decision must rest with only one person. Listen, listen, listen, and when you are done listening, listen some more.

• Monitor how your station's sound "feels"

Nick Straka, President, NS Radio Engineering, Inc.

Processing is your station's audio signature. Really, all you have in the end is what comes out of your audience's radios. No flashing lights, big studios or amazing looking anything. It's all sound, so your sound should be the best it can be. It doesn't matter what format, the processing should always enhance the programming, not compete with it or fight against it. Always be mindful of how the station "feels" when you listen to it. Does it give you a headache after five minutes? Turn it down. Does it sound like it's falling off the dial? Turn it up a little. Have as many trusted ears listen to it as possible. Make sure you have women listen to it as well, as their high frequency hearing is better than men's. Resist the need to constantly tweak it all the time. Sit on some settings for a few days and listen for one thing to change. The listeners will respond well when they don't consciously "hear" the processing. It should be like a sugar in coffee, enhance the flavor but not become it. Ultimately, use good programming. Bad programming through a great processor is still bad programming.

• Let your listeners know about your efforts

Wilf Rice, Owner and Chief Engineer, Airwaves Technical Services

Make your sound part of your programming and tell the listener about the effort your technical staff takes to ensure that the sound you broadcast is the very best and cleanest possible. Make your station billboards emphasize your beautiful undistorted sound.

Most important sound characteristics for each music format

Setting radio processing is about choosing priorities. Typically, the louder you make a station, the less sound detail will be heard. If you put more emphasis on the low end of the audio spectrum, there will be less emphasis on other parts of the spectrum. Therefore, choosing the sound characteristics that are most important for your station is critical. But keep in mind, the sound characteristics prioritized by a CHR station could be very different from those of an NPR station.

We asked our respondents to pick the one sound characteristic they feel is the most important sound characteristic for their station's music format, and then comment on why. Here are their answers for the seven formats included in the study:

1. Contemporary Hit Radio (CHR)

Joshua Pierce, Chief Engineer WMIT-FM, MediaTech, Inc.

Most important sound characteristic?

Cleaner

Why?

Our format makes it difficult to achieve an open sound. Today's hyper-compressed, "run it to the limit," squashed music coming from record companies leaves little compromise room for the station. Careful application of compression and limiting can smooth out differences between sources and production. Too much can make your station unlistenable -- it's a fine line. We think our listeners are tired of the squashed "how loud can we make it" stations in our area. We're trying to be unique and make our station listenable for as long as possible, and try to stay true to the artist's intentions.

(anonymous)

Most important sound characteristic?

Fuller

Why?

Nowadays, there are a lot of variations and sources that one has to deal with, not to mention some rather poor recording techniques. The point of a "fuller" sound is to level the overall playing field for all selections. For the CHR format, a lot of people run a heavy hand on the processing. The key to making this format work well is not killing it with heavy processing, but letting it breathe. Let the listener make the choice to add to or take away from the sound. Keep it clean, and keep it tight, with some headroom.

Robert Meuser, Broadcast Technical Service World Wide

Most important sound characteristic for this format:

Louder

Why?

CHR stations have always had that bigger than life sound, and loudness is very much a part of that. Part of this stems from tradition when the format was mostly an AM format. Processing on AM does increase the actual sideband power and improves signal to noise. The effect of such processing has, in a way, long become a signature on FM. In the past when there were several formats directly competing in a market, 'jumping out of the radio' as listeners punch from one to another has been considered important to ratings. Along with loudness, the uniqueness of the sound is important. It is also important to avoid audio artifacts that may cause listener fatigue which in turn affects TSL.

Use good RMS leveling as a part of pre-processing. Do not overuse the main processor, as material typical to this format is usually heavily processed on the CD. When material is played out from hard disk automation, make sure that the average level for all music ingested into the system is consistent. Where possible use the 'funnel' approach for both bit size and dynamics. In other words, start with a large number of bits and potentially wide dynamic range and progressively reduce both as it progresses through the transmission chain. Use a final processor that has smart clipping with distortion management.

"Chopper," Chief Engineer at a small group broadcaster

Most important sound characteristic?

More definition

Why?

We are in a battle with personal music players and encoded satellite radio. One weapon FM broadcasters can wield is the ability to deliver every nuance of a recording. We throw very little away, unlike MP3 with spectral masking and low-bit rate sampling. Whether people consciously notice the difference, I feel there is something going on at a deeper level in the ear-brain system that draws listeners to better sound quality. Go easy on equalization of low frequencies. Much produced material already has a strong low end. All you end up doing is rattling people's speaker cones.

Gary Kline, Vice President Corporate Engineering & IT, Cumulus Broadcasting

Don't fall into the trap of being the loudest on the dial. In certain cases it's appropriate but more often it's not. It is important to understand the genre of CHR that you are in, and the range of music in the library, so you can adjust processing accordingly. If you have competition in the market, thoroughly diagnose their sound so that you can adequately compete against it.

Bill Tanner, owner of Bill Tanner & Associates, Inc.

Don't go nuts on trying to be the loudest thing on the dial. You need to be clean, because your audience spends time listening to fairly decent audio, of course MP3s being the exception. You want a commanding presence on the dial, but being the loudest thing on the dial is not as important as being the cleanest thing on the dial.

2. Adult Contemporary (AC)/Adult Hits

Nick Straka, President, NS Radio Engineering, Inc.

Most important sound characteristic?

More definition

Why?

The listeners to AAA, especially non-comm AAA, are “music snobs” and don’t want to hear their music messed with. It still needs to be loud, but the definition and separation of instruments in a mix still needs to be heard. Clarity is key. First and foremost, use uncompressed high quality source material! Also, make sure that the release times aren’t too fast. You don’t want an AAA or AC to be pumping and overly loud. This is a high TSL format, so the processing should be set for long-term listening. But, don’t set it so you fall off the dial either. The difficult part is to strike that balance between loud and clean.

Wilf Rice, Owner, Chief engineer, Airwaves Technical Services

Most important sound characteristic?

Cleaner

Why?

Your sound will be played back on higher quality sound systems and the listeners will appreciate good sound and definitive stereo. Keep the modulation up but make sure that the sound is pure without any distortion.

(anonymous)

Most important sound characteristic?

Fuller

Why?

A lot of these stations are listened to in the workplace. A warm, consistent sound will not distract or annoy the listener. Also, do not over process the station. Loudness is important, but not worth giving up quality for. The young like loudness, but they are turning to quality because they are used to listening to MP3 and CDs.

Geary Morrill, Tech Manager, Sarkes Tarzian Inc. (WAJI/WLDE)

Most important sound characteristic?

More lower mid-range

Why?

Warmth creates comfort. More time will be spent where one is comfortable.

The key is to eliminate high frequency distortion, which is much more apparent to women than men, due to the smaller bone structure of their ears. Failure to do this will cause a general feeling of fatigue for female listeners, which will result in lower TSL. Conversely, eliminating it when present invariably leads to higher TSL, even when formatics are constant.

Chris Erwin, CEO, PTI

Most important sound characteristic?

Brighter

Why?

A bright sound is something you keep listening to because it simply sounds good. A rich, natural, open sound is the key to keeping listeners. Good processing is a light sweetening of what is already there -- that something extra that sets you apart on the dial.

Stephen Ward, Director of Engineering & Technical services, Broadcast Engineering Ltd.

Most important sound characteristic?

Cleaner

Why?

The marketplace is full of stations that tend to be loud and over-compressed, leading to ear fatigue. More listeners will stay on your station longer if the audio is clear with the least amount of distortion. Also, loud, over-compressed commercials should not follow a soft program.

Mwaka David, MM Electro Services Ltd.

Most important sound characteristic?

More mid-range

Why?

Our station programming uses a lot of talking lines and talk shows. Because of the voice energy level used by the presenter, it's advisable to process leaving a wide margin for voice variation. Keep the processing parameters at 75% to guard off distortion when a voice peaks up.

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3. NPR/Classical/Traditional Jazz

Gordon S. Carter, Chief Engineer, WFMT (retired)

Most important sound characteristic?

Cleaner

Why?

Classical listeners want to experience the music. They expect the listening experience to simulate what they would hear in a concert hall. When processing for classical music, subtlety is the key. Any processing you do must preserve the illusion of dynamic range and full fidelity. The dynamics of the music are an integral part of the experience, so the illusion of dynamics must be maintained to give listeners the experience they expect. This is not to say that some dynamic manipulation is all bad. It is necessary to reduce the dynamics to compete with environmental noise, electrical noise, poor reception, and many other things that will adversely affect the listener's ability to hear the signal. Broadcasting an extremely wide dynamic range does not serve your public. The real key is to reduce the dynamic range without sounding like you are. Classical music in particular has a wide range of sounds and will take a long time to cover all the possibilities. What sounds good on one type of music may not sound good on another. It takes time to get it right.

Don Hackler, KCSM

Most important sound characteristic?

Fuller

Why?

Jazz is all about letting the music speak for itself. My listeners are often audiophile jazz experts and know the music intimately. The last thing I would want to do is create a unique or "signature" sound that distracts listeners from the music. Audio processing for our station is about compensating for the problems of the FM audio transmission process: listening in cars, the Internet, and a variety of listening environments. You need to create a somewhat consistent sound in spite of recording and operator inconsistencies.

Kent Hatfield, VP Technology & Operations, WXXI Public Broadcasting Council

Most important sound characteristic?

Fuller

Why?

Our listeners really do not like changes in our processing, so we keep changes to a minimum... Composite clipping must be held to a minimum. However we do add makeup gain to ensure that our drive time listeners are not lost on very quiet passages.

(anonymous)

Most important sound characteristic?

Cleaner

Why?

With a varied format, one shoe doesn't fit all. The tradeoff between loudness, density, deep base, and warmth will be clarity. Again it's much easier if your station is a single format station. With a Christian/variety formatted station, the most important thing to look for in a processor is many user settings that can be saved for the various formats. You certainly won't use aggressive processing on classical music as you would a top- 40 or oldies format. Even talk requires a specific balance in the narrow band of the audio spectrum of spoken word. Telephone interfaces have jumped leaps and bounds since those of the '60s, but even still, telephone audio presents its own unique set of problems when trying to process it. Presets are nice to get you into the ball park; you will need to continue to experiment and fine tune your settings for each format, always keeping in mind that your ears may not necessarily represent those of all of your listeners.

Gary Kline, Vice President Corporate Engineering & IT, Cumulus Broadcasting

We do light processing on jazz. This format is all about having great sound definition, clarity of the music, and great stereo separation. Having good source material is also important. We don't go for loudness with this format because you typically don't have another competitor in the market and even if you did, being the loudest is not the key.

Bill Tanner, owner of Bill Tanner & Associates, Inc.

People listen to NPR for long periods of time so high quality sound is important. You are not going to play the loudness game here. They are lucky that their network, NPR, has really good audio quality so try to get your local station to be as close to the network as you can.

Michael McLair, Chief Engineer, WBUR

The huge difference that I hear between commercial radio and public radio is in the news programming. News stations on the commercial side don't have a problem distorting audio to get the loudness they want. That doesn't cut it in public radio. This makes voice processing in public radio very challenging because you've got to make the sound loud enough to stay over the tire noise under the listener's car, but you don't want to distort it.

Rodney Belizaire, Classical Music Consulting Engineer, New York City

There are many purists who listen to classical music primarily on "fine stereophonic sets," but that is not always the case. Therefore, I feel it is more important to reproduce/process for radio what the classical listener is most interested in. There isn't a lot of bottom end except for certain works that contain a grand organ. That isn't the bulk of music presented, so that fullness shouldn't be the primary concern.

Loudness is a delicate subject...the PERCEPTUAL dynamic range needs to be preserved as it is the cornerstone of reproducing what the composer of a particular work meant to convey since classical is about creating an emotion or mood. So while the emphasis wouldn't be on loudness, there needs to be a happy medium struck for the listener not in the most pristine environment (in a car, for example). This can and must be achieved by deftly manipulating the attack and release times, combined with density ratios, along with a multiband approach. The music MUST breathe in order for the listener to enjoy the experience/presentation. Again, while the listener isn't coming to the broadcaster for "CD quality" sound, particularly the audiophile, they do want the music respected... after all, it's NOT pop music! While important, still not the PRIMARY concern.

In regard to cleanliness, it's next to godliness.....and that tends to be tied to the hip with brightness since most of the classical works contain string or brass instruments that favor the upper sonic frequencies. It's VERY important to hear the detail of the sounds created when horsehairs cross strings or the brassiness of horns. I don't feel cleanliness can be extricated from brightness, so I'll make them the 2 most important factors for processing classical music.

4. News/Talk/Sports

Chance McClain, PD, 1560 The Game

Most important sound characteristic?

Cleaner

Why?

We mostly talk on the radio...but there are bumpers, rejoinders, and sound effects that go into a wide range of sound. It all needs to sound good. [You need to] make it clean. Make it crisp. Make it dynamic. Sure, I am on the AM band, but I have thousands of listeners online listening in stereo at 64 kpbs. Don't do a disservice to them by cheating the sound over the air.

S!ick, host, Edmonds and Foster, Radio Exiles(.com)

Most important sound characteristic?

Cleaner

Why?

Differing types of talk/vocal programming need to be processed for the type of effect being sought. In general the idea is to have the presentation be as if a friend was speaking to the listener in a one-on-one setting. Make it clean, clear, and possible to listen to for very long periods of time without fatigue. Process the audio for the target demographic... Don't allow audio to be too distorted or over modulated.

Rodney Zeigler, Director of Engineering, Nebraska Rural Radio Assn.

Most important sound characteristic?

Cleaner.

Why?

Our listeners are in less than perfect environments. We are an agricultural news and weather station which means our listeners are in fields, shops, and industrial environments. Keeping it clean with a minimum of enhancement will give each of them the ability to hear us the best way they can.

Over processing should be avoided at all costs. Keep it clean so it will be audible in all listening environments.

Gary Kline, Vice President Corporate Engineering & IT, Cumulus Broadcasting

Talk or sports talk stations can be difficult to process because they take in all sorts of source material. Some sources are great but others are horrendous. When you receive bit compressed audio from a remote location or satellite channel, the sound can be a little raspy -- too high ended, or too mid-rangy. You can adjust processing to counter that, but then when a regular, nice sounding program comes on, it may sound muddy. Typically your local studio mic usage in your live studio will sound good, but it is difficult to get a good consistent sound with all the other sources throughout the day. A very busy talk station with dozens of sources from different feeds may require very careful work and maybe even dayparting of processing presets.

5. Country

Robert Combs, Regional Engineering Coordinator, Cumulus Media - Savannah

Most important sound characteristic?

Fuller

Why?

Country music listeners tend to like a pure, clean sound. The bass line needs to be rich and ballsy, but too much low end and you will kill the song. Keep the brilliance and presence simple and just slightly high to be able to hear the snares and cymbals, but not enough to where they distract from the other parts of the music. And with the male country singers today having a little higher key, you want to be able to clearly hear all the notes without distortion. Mid-range has a fine line between muddiness and clarity. You want to hear the acoustic instruments but you do not want to muddy up the lower voice frequencies. The most important mistake to avoid when processing country music is over processing. Country listeners like a clean, full sound and they want their favorite songs on the radio to sound just like the CD version that they also listen to a lot. Get away from the 'louder is better' attitude. Be the station that is clean and natural sounding.

Tom Lawrence, General Manager, WAKM

Most important sound characteristic?

Cleaner

Why?

When you broadcast a lot of acoustic music live, it's important for the listener to believe he or she is in the studio with the musician.

Charlie Wooten, Market Engineer-Panama City FL, Clear Channel Radio

Most important sound characteristic?

More definition

Why?

If you strive to have more definition in a station's sound, most likely you will have a unique sound.

Avoid mixing digital transmission formats or using compressed digital STL systems.

Gary Kline, Vice President Corporate Engineering & IT, Cumulus Broadcasting

In country what's very important are vocals and a nice rich low end, not urban low end, and not thumping low end. Just rich low end. Superior vocal carry through is important so all the vocals and all of the words in the song can be heard. Having a great high end and great mid-range is also important, but processing for vocals and rich low end is what will distinguish you. Get to know Nashville and pay attention to how they master their records there. It's not always the same as other formats. That's my opinion anyway.

Bill Tanner, owner of Bill Tanner & Associates, Inc.

A country music station should be processed as a cross between AC and Top 40. Country music is well recorded, by and large, and it sounds good when it's processed well. In most markets, trying to win the loudness war is not going to help you in country. I think it's probably more about just making the processing sound as close to the source material as you can, and still be reasonably present and loud on the dial.

6. Adult Hits and Rock

Craig Debolt, owner/operator/talent, Debolt Communications, LLC

Most important sound characteristic?

Cleaner

Why?

It's important to all formats! With rock, for example, there are lots of cymbals and guitar that when compressed to no end just become noise. You eliminate the full body boldness and feel of the music and make it a stabbing in the eardrum. So many audio processing folks shrink the threshold, crank up the clipping, and compress the sound to make it loud. It's tiring to the listener and overall does nothing to make your station enjoyable to listen to. Open it up -- let it breathe, then go in and accentuate the fullness. Use minimal eq'ing and minimal stereo enhancing. More stereo enhancing equals more distortion, especially with more aggressive processing. You don't want the listener to 'hear' the processor working. A great processed audio chain gushes out of sound systems like whitewater rapids down a mountain. When it's in the zone you won't just hear a guitar -- you'll feel/hear the contact with the strings and resonance in the body. Ultimately, set it by ear....not by numbers.

Bob Hoffman, Chief Engineer, WIL / WARH / WXOS, St. Louis

Most important sound characteristic?

Cleaner

Why?

Listeners will appreciate (and have come to expect) high quality audio. If we can provide loud and clean audio with consistent quality, listeners will likely listen longer. When it comes to processing, don't overdo it. Use judicious settings which enhance the subtleties of the music and give the station its "signature sound" without affecting its "musicality." Process enough to make the station sound "big," but not "in your face" or fatiguing.

Jeff Mikesell, Director of Engineering, Locally Owned Radio, LLC

Most important sound characteristic?

Cleaner

Why?

Be clean and clear. You don't have to be the loudest on the dial. Too much processing will shorten your TSL numbers as it's irritating to the listener. The less the listener needs to mess with the sound controls while driving, the better.

7. Classic Rock

Kent Randles, Senior Engineer, Entercom-Portland

Most important sound characteristic?

Fuller

Why?

Classic Rock is basically a format for males. Males, me included, like a lot of bass. Keep in mind all the alternatives there are to listen to, and how cheap hard drives are, and don't data-reduce your music: rip or dub from CD and keep them WAV files. The cleaner the source material, the more you can process it. This is especially important for HD Radio. Don't forget that female ears are way more sensitive to high frequencies than males, so for female-targeted formats be careful with the high-frequency boosting and clipping. When you try out processors, try numerous factory presets, not just the ones for your format. Don't be afraid to turn it to "11" to find out its limits.

Dave Brown, Chief Engineer, Greater Media New Jersey

Most important sound characteristic?

More lower mid-range

Why?

A full, warm sound with lower mids is pleasing to the ear, not fatiguing, and sounds great on a wide range of receivers ... Number one piece of advice, don't play MP3's if possible on air, ever, period ... avoid the temptation to just download songs and never redub them with higher quality elements...never get hooked into adjusting the processing by listening to monitors in a studio, go out in the real world and listen in your car, boom box or 10 dollar clock radio (where most people start their day listening).... go for a full warm sound, and remember the range of audio played, from well-produced studio albums to, let's just say, lesser audio quality.

Gary Kline, Vice President Corporate Engineering & IT, Cumulus Broadcasting

I think classic rock enthusiasts are a bit more into the music and will notice sound quality and sound detail more than your average listener. I've heard a lot of oldies stations sound mediocre, while some are an absolute pleasure to listen to because somebody took the time to find the very best cuts they could find. With any piece of music it's about the source material, but with oldies and classic rock is it even more critical. You have to watch your processing adjustments closely because the music was likely mastered in these genres differently than the way it's mastered today.

Ron Parker, WCBS-FM New York on air personality. Former PD/Talent KLDE-Houston and KFRC-San Francisco

If you're a classic hits radio station, which is something I've dealt with in the last 15 or so years, you have to find an audio processor that makes it sound right for three decades of music, such as when you're playing '60s, '70s, and '80s. Start with the very analog source material that came from records in the '60s. Then you have a lot of '70s records that went through some very interesting processing by the record companies from music aural exciters. Somewhere there was a difference of sound whether you were using digitally re-mastered songs or 12", or 45 rpms. Then in the '80s we saw the advent of CDs, which had no bottom end at all to the songs. It was hard when CDs came out. We could never get the audio processing right for many years, because our source material on a Top 40 radio station was coming from records, records to cart, albums, 12", and early forms of CDs with no bottom end. We might get it right for one record, and then the next tune would come along and it wouldn't sound right. So when you're doing more of a classic hip station covering several decades, you really have to strive to get a processor that's going to get all of that source material correct, as opposed to somebody who just plays Top 40 CHR music -- that's easy.

Advice on deploying processors

Dave Brown, Chief Engineer, Greater Media New Jersey

Try the processing box out, stretch its limits, see where it goes, don't just "get it on the air" and leave it....but NEVER keep tinkering with it at the other extreme. Create a signature sound and stick with it...

Robert Meuser, Consultant, Broadcast Technical Service, World Wide

Processing can be either your friend or your demise. It is important to present the listener with a consistent listenable sound. There are many processing tools available. A number of these tools are seemingly very similar but nevertheless have subtle differences. It is important to prioritize the objectives for a station's sonic signature. If speech is important then processing should be evaluated first for the cleanest speech quality for a given loudness. If music is more important, then that should be the first objective of the evaluation. The most critical element is the skill of the person setting up the processing and the audio chain that feeds it. The best processor in the wrong hands will not achieve the desired results. In the end this is a highly subjective field where programming must be satisfied with the station's sound. Being able to interpret and implement what programming really wants is where a skilled processing expert is important to the process.

Jeff Mikesell, Director of Engineering, Locally Owned Radio, LLC

I like to listen to other stations as I drive around the state and have found some very nasty processing issues. Two stations in particular target females 18 to 34. The high end is pushed so hard there is sibilance. A huge tune out, and as we well know, people are too lazy to mess with the sound controls. Changing the station is easier. Processing for female listeners is not the same as for males. Females tend to hear that high end better and it tends to be annoying, so the processing should soften the highs more than you would on a rock station targeting men.

Jaye Albright, partner, Albright & O'Malley Country Consulting

To evaluate processing, I recommend that a station have a button push around the dial with a committee of station people. Make sure your committee includes women and men, some younger and some older, to all listen and talk about what is the best sounding station in town. Once they all agree, then compare your sound and talk about what you can do to sound better. Usually what that entails is adding loudness, fullness, a good bottom end, a good crisp top end, and transparency in the processing so you can't hear it, while keeping a certain amount of compression so it sounds active and jumps out of the radio at you. You want to be the biggest thing you can possibly be on the dial without being too overtly fatiguing to listen to. Women get turned off by very high frequencies; men tend to like crisper highs possibly more because men experience hearing loss as they get older more quickly than women do. But men also like a nice flowing bottom end and usually like more bass in the stations they choose.

Tom Lawrence, General Manager, WAKM

Make sure you have an experienced engineer who can recommend the right equipment.

Listening tests for clean sound

Of the 31 participants in this project, almost half (14) picked "cleaner" sound as being the most desirable sound characteristic for their station. For many, a cleaner sound means an absence of audio distortion and artifacts. But how can you tell you are listening to a "cleaner" sound if the very things you are listening for are not present? There are specific things processing pros look for to quickly identify a cleaner sound. Wheatstone's Mike Erickson offers his best advice on this:

To Test for Clean Sound, Push Loudness

To achieve loudness a processor has to distort your audio signal. The question is, how much undesirable distortion will creep into your processing as you attempt to achieve the level of loudness your station requires? So, ironically, one of the best ways to test your processor on its ability to process a clearer sound is to push it on loudness and see just how clean the signal remains. Once you are in this "pushed" mode, here are some specifics to listen for:

- *High end of female voices*

When you "push" a processor, the high end of female singing voices is one of the first places unwanted distortion will show up. Listen to see if there's sibilance in the high end of the voice. In a song the esses's or t's will not be clear, and will start to sound like paper tearing, or spitting. When the sound of esses's and t's starts to show distortion, other areas of the sound are probably at their breaking point as well.

- *Male voices*

Talking male voices often show distortion at points of dramatic emphasis. Listen to a male voice as the announcer or DJ gets excited or injects a lot of emphasis. This will cause some processors to bite down on the audio and, for a split second, the voice will sound fuzzy or grungy. In general, make sure all voices, both male and female, sound smooth and natural and not like they're being squashed. Make sure the voices' low end have a tonal balance.

- *Music*

When you test music, it's good to have someone listen with you who knows what the music should sound like. For example, they will know what the instruments in the foreground and background are supposed to sound like. Listen to see that they are not either over-exaggerated, or buried behind a wall of processed sound.

• *Percussion: Triangle, tambourine, or high hats*

Processors can smear the distinctive sound of individual tambourine or high hat hits together. When you listen for repetitive percussion sounds, make sure you can hear every note, and that they are not blurred together in a generally mushy sound. A good song to test is John Lennon's "Just Like Starting Over," which begins with a series of triangle chimes before the singing starts. Listen each time the triangle hits to see if the processor introduces the appearance of some dynamic range between the triangle hits. A poor processor will drag that triangle sound up and the triangle hits will begin to run into one another. Or the processor will take the sound down and then have to rush to get it back up again. With a properly adjusted processor, each triangle will sound like the original master, with each triangle hit having its own time, at the right volume level, and with distinct pauses between them.

• *Cymbal crashes*

Because cymbal crashes can be sudden and loud, they can catch processors off guard. As some processors rush to make adjustments midway through the cymbal, unnatural distortion known as "audio ducking" results. As the processor rushes to make adjustments after the crash has begun, either all the audio ducks down with it or all the high frequencies duck down. At this point, one of the following things can happen, resulting in an unnatural sounding cymbal crash:

- you might not hear the initial sound of the cymbal crash
- you might hear an unnatural change in the gain (volume) control a few milliseconds midway through the crash
- you might hear the crash at the same volume level as everything else in the song, which will take out the dynamics of the audio

These tips from Mike Erickson should help you more quickly identify when you have, or do not have, clean sound. For many engineering pros, these tips could provide a refresher. If you are a program director or manager, we hope this list will help as you talk to your engineer about clean sound.

In conclusion

There is no shortage of opinion on what makes the best processing for a radio station. While some of the advice in this report may seem contradictory, all of it is relevant because every station, market, and programming format is unique and different.

To achieve the best processing for an individual station, programming and engineering need to work together. Our hope is that this report will help both sides understand how they can cooperate and achieve a station's processing goals.

One last time, we would like to extend a special thanks to all the engineers, managers, programmers and consultants who contributed their best advice to this project.

Wheatstone Corporation