

The Case for the AirAura, the ‘Radio Clean Machine’

**Four reasons why you will want to
hear the cleaner sound of the AirAura**

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Introduction

Ever since the loudness wars of the 1980s, audio processor manufacturers have been adding more and better ways to process audio and improve the sound quality of radio stations. But recently there has been a shift in which sound characteristics are most desirable.

A just released study from Alethea Research found that the sound quality radio professionals now believe is most important for their station's sound is "cleaner." Being loud is still important, but processing technology has advanced to a point where most processors can maintain competitive loudness, making loudness much less of the differentiator some felt it was in the past.

Designing a processor to maximize "clean" required a new design philosophy. A big part of clean sound is an absence of distortion. So, instead of looking for ways to add more processing, we had to find ways to reduce it. All processing is distortion. Some is pleasing to the listener's ear, some is not. But to create a significantly cleaner processor, we had to rethink processor design in terms of "processing less."

The result of all this is the AirAura, in which every processing step has been fundamentally redesigned to our "process less" philosophy. We have reduced the number of actual steps from four to three, increased the resolution of our limiter to 31, and added advanced control technologies that enable it to process much more precisely. As a result, the AirAura has the cleanest sound ever heard on a radio station before. Which is why we call it, "The Radio Clean Machine."

This white paper is divided into four parts, each offering a compelling reason why you will want to hear the AirAura's cleaner sound:

Reason #1: Our 31 band limiter delivers far more sound detail than any other limiter on the market.

Reason #2: The AirAura's "process less" design creates a sound cleaner than any you have heard.

Reason #3: Others who have heard it, love it. Here are some comments from our current users.

Reason #4: A cleaner sound could help craft a "signature sound" for your station.

A cleaner sound can help your station stand out and the AirAura can help you achieve this.

We invite you to hear the difference.

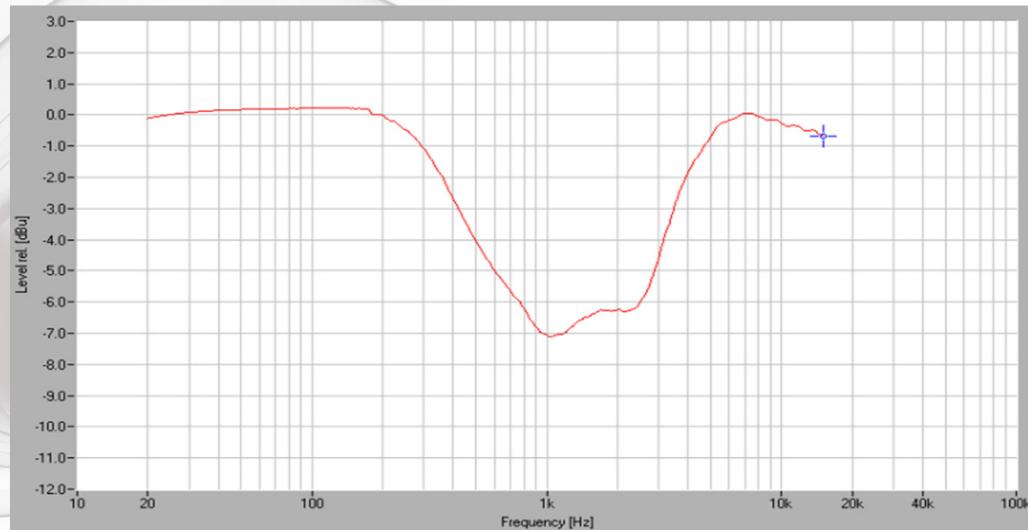
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Reason #1: The 31 band limiter delivers far more sound detail than any other limiter on the market

Until Wheatstone introduced the 31 band limiter, most processors in radio had limiters with 8 bands or less. A 31 band limiter can significantly improve the clarity and detail of a station's sound, while reducing processing artifacts. There are two advantages that a 31 band limiter has over limiters with fewer bands. The first has to do with what happens when a single band is activated on any multiband limiter.

Advantage #1: When processing work can be accomplished within narrower bands, less distortion results and far more detail reaches the ears of the listener.

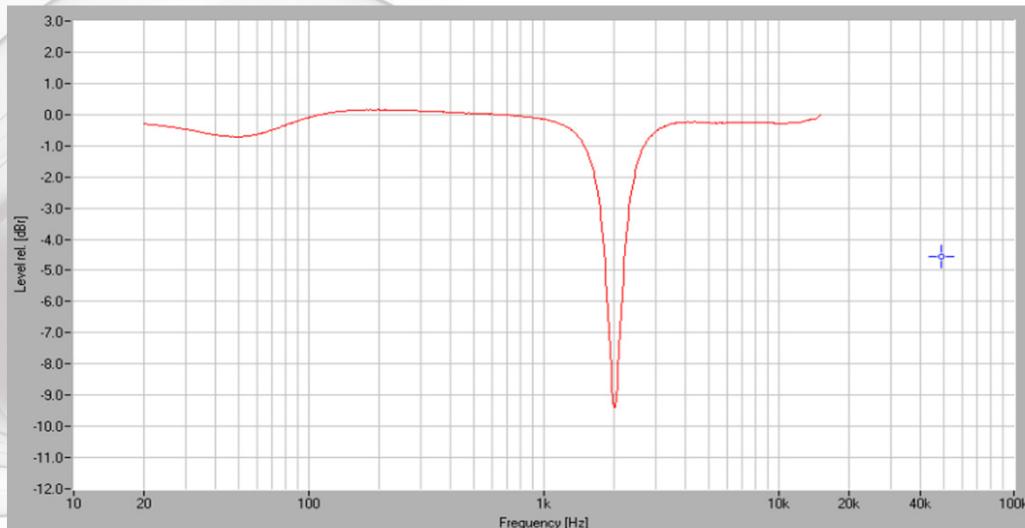
The primary purpose of a limiter is to prevent sounds in an audio signal from exceeding a set level. Below is a comparison of how limiting works in 6 and 31 band limiters. Here is an illustration of a common multiband limiter where a 2kHz signal is causing limiter band four to achieve more than 6dB of limiting. You can see that a significant portion of the overall audio spectrum well above and below the 2kHz signal has also been “limited,” or reduced. This illustrates just how much of the audio spectrum is affected when just one band is in limiting, and how much less sound detail will make its way to the listener.



By contrast, next is an illustration of one band of a 31 band limiter operating under the same conditions: an isolated 2kHz signal requiring more than 6dB of limiting in just one band. As you can see, only the 2kHz signal is being limited and the rest of the audio spectrum remains virtually untouched. Because a much narrower portion of the audio spectrum is reduced, far less sound detail is lost, and more of the artist's original sound reaches listeners' ears.

Listeners often describe the sound of a 31 band limiter as being cleaner, but what is actually happening is that they are hearing more detail in the audio – detail that is usually destroyed by the normal function of conventional limiters. In simple terms, the high resolution of a 31 band limiter leaves more of the original audio signal untouched so listeners hear more of the original sound and not the sound of the limiter working.

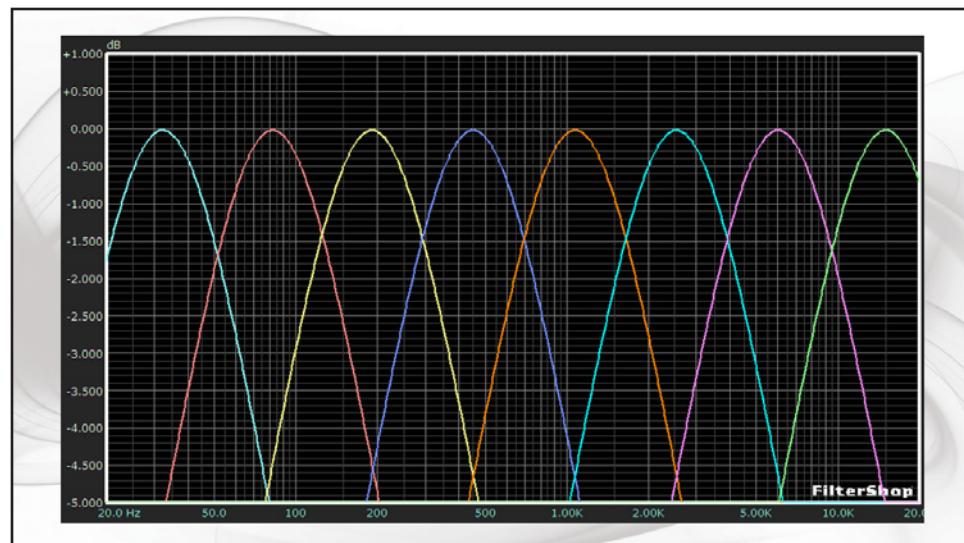
The second main advantage of a 31 band limiter has to do with how the limiter bands interact.



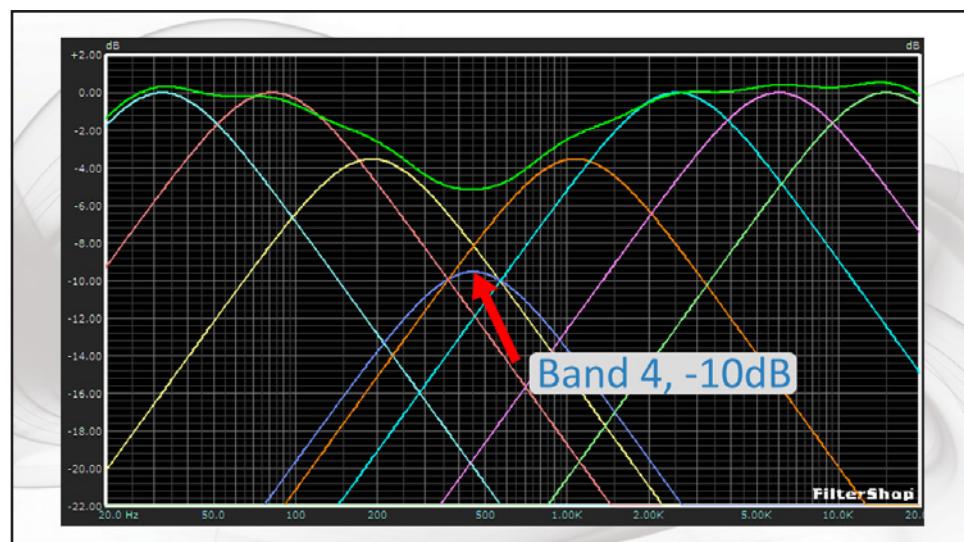
Advantage #2: Because processing bands always overlap, limiters with narrower bands significantly reduce the total negative impact of limiting on a station's signal.

As the sound of a radio station passes through a processor, the bands of a multiband section never work in isolation: they affect one another because of natural leakage into adjacent bands. Let's look at how the leakage of a 31 and an 8 band limiter compare.

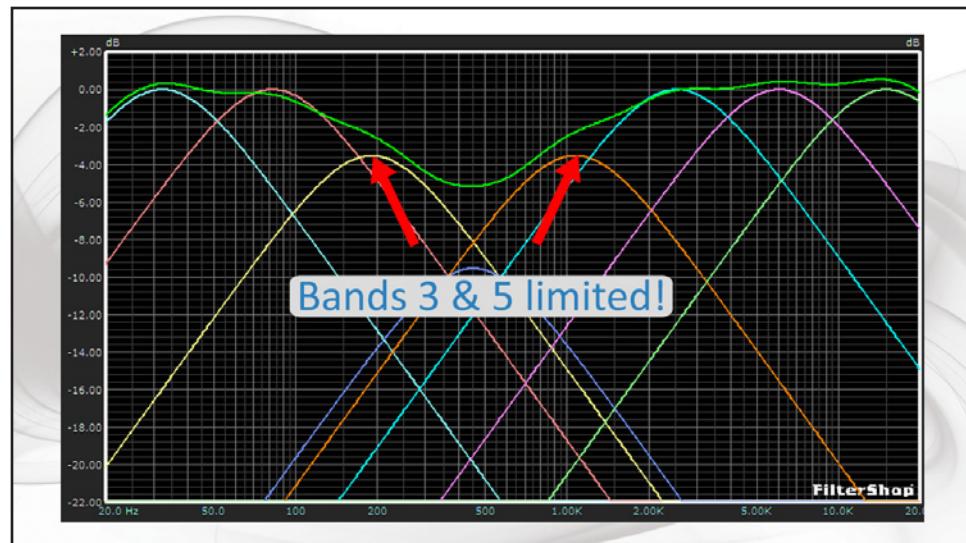
Below we see the eight bands of an 8 band limiter.



Because the limiter bands affect each other, notice what happens when band 4 is activated. The limiter appropriately reduces the level of energy in band 4.



But because they are interconnected, the bands above and below band 4 are also in limiting. As result, the overall loudness is reduced not just in band 4, but in bands 3 and 5 as well.



On an 8 band limiter, when bands 3, 4, and 5 are activated, it is three bands out of eight, or 37.5% of the entire audio spectrum that is affected. That is a significant amount of sound detail that will never heard by listeners, as well as a large percentage of a station's overall signal that will be distorted. If we were to apply the same math to other limiters, we would see that...

- On an 8 band limiter, **37.5%** of the audio spectrum is affected
- On a 6 band limiter, **50%** of the audio spectrum is affected.
- On a 5 band limiter, **60%** of the audio spectrum is affected.
- But on a 31 band limiter, **only 9.5%** of the audio spectrum is affected.

There is a big difference between reducing sound detail by 50% or more of a station's entire signal versus only 9.5% every time a single limiter band is engaged. If you do a side-by-side listening comparison, you will hear this difference.

Now that you've seen how much Wheatstone's Vorsis technology has improved the performance of the limiter by increasing the resolution to 31 bands, read on to see how Wheatstone has revolutionized the other processing steps as well.

Reason #2: The AirAura's "processing less" design creates a cleaner sound that you will want to hear at your station

The signal path of a traditional audio processor is: Broadband AGC, to multiband AGC/compressor, to multiband limiter, to final clipper.

Prior to the introduction of Wheatstone's Vorsis technology, most radio processors followed these four basic steps:



The above chart shows four processing steps, but in the AirAura, we do it in three steps by eliminating the need for using a broadband AGC.

Here's how:

AirAura performs the multiband AGC processing in one step, not two

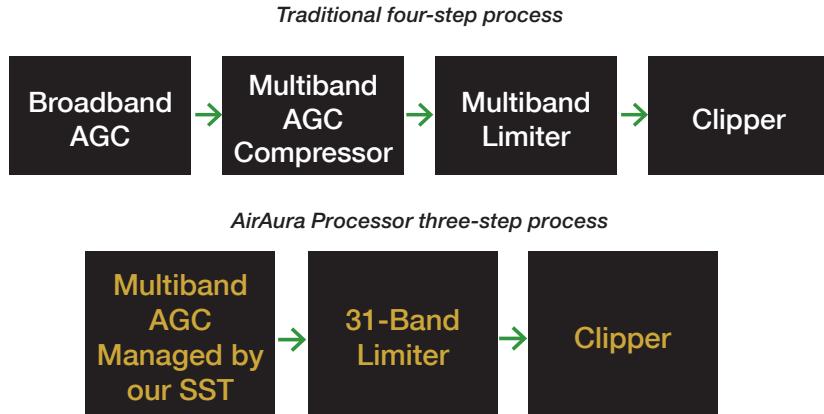
All multiband compressors have an operating zone where they work and sound best. In this zone they are neither processing too much nor too little, but just the right amount; they are in the sweet spot. The reason processor designers put a broadband AGC in front of their multiband AGC/compressors is to try to force the multiband compressor to stay in that sweet spot.

Before the introduction of Wheatstone's Vorsis technology, all AGC processing followed a linear two-step progression in which the signal first entered a broadband AGC and then moved into a multiband compressor. But this two-step process has major drawbacks. Because the broadband AGC cannot see or hear what the multiband compressor is doing, it is rough targeting at best, and the target is often missed.

Wheatstone has completely reengineered the AGC function into a one step process. Our Density Compensation™ technology manages the multiband AGC function and always keeps it in its sweet spot. We call this management system "SST," short for Sweet Spot Technology™.

The SST monitors the multiband AGC, the work that is being done within the individual bands, the input and output signals, and even where the end user has set the controls. It then makes decisions on how to best manage the multiband AGC in real time, while the audio is changing. Using all of this information, the SST manages the multiband compressor far more precisely than the two step "hand-off" approach.

Essentially, the SST helps the AirAura create a cleaner sound by processing the signal less in two ways. First, because the need for a broadband AGC has been eliminated, an entire processing step can be skipped, resulting in significantly less processing and distortion. Second, since the signal is always kept in its sweet spot, the multiband AGC/compressor does not need to work as hard, and can process more accurately.



A clipper that processes less by processing smarter

Just as we use advanced sensing and control technology to better manage our multiband AGC, we also do so with our clipper. Unlike other clipper algorithms that try to cover up distortion after they've already made it, AirAura's algorithm 'sees' the audio within the various processing sections, can recognize what would be objectionable distortion, and prevents it before it is ever even created.

Anticipatory control versus reactive control

Wheatstone's Vorsis technology equipped processors are the first processor brand to use "feed-forward" technology to eliminate these errors and the need for corrective processing.

Because the signal coming into any broadcast audio processor constantly changes, broadband AGCs, AGC/compressors, multiband limiters and even final clippers need to be able to dynamically adjust their responses. Prior to the introduction of Wheatstone's Vorsis technology, this was always a three-step process:

First: The signal is processed in the processing step.

Second: As the processed signal exits it is measured and a control signal is generated, based on what that level should have been.

Third: The control signal measurement, calculated for the old signal, is now passed back to the processing step to adjust the step as new audio signals arrive.

This three-step process, known as "feedback technology," has two major drawbacks. First, the processing step is always operating on slightly old information because it is adjusting the gain for the current audio level based on a signal level that has already come and gone. Second, because the adjustments are made after the signal has passed through, this process allows poorly processed signals, or "errors," to occur. These errors cause the processing stages that follow, such as the limiters and clipper, to work harder. The errors are usually brief, but because audio signals constantly fluctuate, many can be generated.

In addition to creating new processing strategies to improve audio in each of AirAura's processing steps, we have introduced "feed-forward" control technology throughout the entire processor for the first time.

Feed-forward technology measures a signal milliseconds before it enters the processing stage. As a result, adjustments in the processing stage are made before the incoming signal arrives, so no error signals are ever generated. Because there is much less 'corrective' processing required, the sound is more natural, cleaner, and possesses more detail.

When feed-forward technology meets smart signal management, real time anticipatory processing becomes reality

Full feed-forward technology throughout the entire processor has an additional benefit. When it is combined with the smart algorithms that manage our AGC (with SST technology) and final clipper, it creates a system that can see, anticipate and process audio to a much higher degree of accuracy. While some manufacturers have forms of audio control technology, none have combined it with real time information that feed-forward technology provides.

Here is a summary of design innovations built into the AirAura that enable us to deliver a much cleaner sound.

- **A 31 band limiter, not just 4, 5 or 6**

Because we do limiting in much narrower bands, far less sound definition is lost.

- **One-step AGC processing, not two**

Because we eliminate the need for using a broadband AGC, we can skip an entire processing step, resulting in significantly less processing and distortion.

- **Feed-forward signal control instead of feed-back**

We eliminate processing errors by adjusting the signal before it enters a processing step, not correcting it afterwards.

- **Anticipatory control based on real time information**

When the smart control of the AirAura AGC and clipper are combined with the real time information provided by feed-forward technology, true anticipatory processing results.

Add up the differences and you can see that AirAura is a very different broadcast audio processor, built with a unique philosophy to process less and process smarter.

Reason #3: AirAura and other Wheatstone Vorsis technology customers experience cleaner sound differently

Do you think you know how clean a processor can make your station sound? “Clean” is a sound characteristic that can mean many things: the absence of distortion and audio artifacts, a greater presence of original sound and musicality, and more definition.

When people hear the AirAura or other Wheatstone processor for the first time, they are often surprised because it sounds so different than processors they have heard before. In their own words, here are some current customers describing their experiences. (Please note: We have replaced any reference to our competitors with “Other.”)

Some describe our cleaner sound by its lack of distortion.

Says Holly M. Misslin - KG4WXV, Assistant Engineer & IT, Cromwell Radio Group:

“The first thing I noticed is how incredibly clean the audio sounded. It didn’t have that STL noise behind it like you often hear with the “Other”, or other processors. The other thing I noticed is that in areas where you sometimes hear multipath, I could hear the Wheatstone smooth or almost iron out the multipath, which I thought was incredible. Here is my conclusion: With the Wheatstone AirAura in line, this is the best that 102.5 The Party has EVER sounded – period! And I have heard that same comment from friends and other engineers in town.”

One great quality of clean sound is that it can make a wide variety of songs sound better. Myron Jackson, Program Director, KZGM - Real Community Radio Network, Inc. explains:

“We were a new station. Our engineer said we’d like the Wheatstone. He was right. The Wheatstone set our station apart from all the others in our area. There was a very noticeable difference in the sound. I heard things in songs that I’d never noticed before. The separation was incredible. When listening in my car the sonic field seemed to extend beyond the car. Our first couple of days on air testing were fun. We played a variety of music as we took turns going out to our cars to hear the incredible sound. Since we play a huge variety of music -- everything from classical to hard rock at various times -- we set up presets that are automatically triggered from our studio. That way each type of music gets the proper processing and we sound good. Listeners were impressed with the sound and called to tell us so. Many of our programmers were astounded by the clean, clear processing. I liked it because right out of the box it made us the best sounding station around.”

What does “cleaner sound” sound like when you actually hear it?
Dan Slentz, DoE at KOB TV Albuquerque describes how he evaluates clean sound, as well as his first experience listening to a Wheatstone processor:

“I gauge a couple of items which become less subjective even to the ear. Does a cymbal sound like a cymbal or a can being crushed under someone’s foot? For us, it was clean and clearly a cymbal. You could easily make out the difference between a brushed cymbal and a sticked cymbal. The high end was there and oddly sounding like the response was above the 15k FM high end. With your processor, you’d swear we were actually producing a received high end of 18k. On the flip side, the low end is my other measure. Does a kick drum or a plucked bass sound “real” or is it exaggerated or squashed?

Our low end was clean, produced a nice dynamic warm tone, but wasn’t “fake” or exaggerated. And finally, is the mic’s vocal presence (of both the musical performers and the jocks) still clear and coming through? Yes to all! Music sounded great! Now I know manufacturers all say “there should not be any ‘unique signature’ to a processor” but I do need to say that yours absolutely had a unique signature. The same type of unique signature a Neuman 87 has or a vintage guitar amp. This is not a bad thing at all. People like that sound and want it. If your processor made a CD sound like a processed CD, then what’s the point?

We wanted a sound that was “uniquely better” and not the same as every O----. Our Wheatstone was not only incredibly clean and accurately reproducing the audio, but it created a “uniquely better” sound. “

Two Wheatstone customers described their stations’ new cleaner sound as having more “life” to it:

Ralph Turpen, owner/manager, Turpen Communications LLC WBNL:
“[Our] station sounded flat and with the VP-8 our sound came to life. Music sounded alive and makes us so listenable. Other engineers started calling me and listeners said we sounded louder and fuller.

Kris Rodts, Director, Engineering, IT & Facilities, CKUA Radio Network:
“We were using very old processing technology prior to upgrading to Wheatstone. The sound had no life to it -- sounded kinda dull. As we play multiple music formats including classical, there was no happy medium. The upgrade to Wheatstone changed all that. We are not so concerned about sounding the loudest in our market -- just [having] the ability to sound as good as we can -- and that has been achieved.”

Others describe their new cleaner sound as having more dynamics while maintaining loudness:

Conrad Kimbrough, Chief Engineer, WKRX-FM: “We were using an “Other” and just had a stereo signal that was barely listenable. With the Wheatstone VP-8 we now sound great. Being able to have a louder signal with great dynamics, our listeners have noticed and say that they can pick up our 3KW station even farther than before.”

Kenneth S. Fine, Chief Engineer, Noalmark Broadcasting & FiveStar Enterprises: “More open, brighter and louder. Station manager said he was hearing things in songs he had not heard before.”

Here is what some of our customers tell us their listeners had to say:

Alexander Ponson, Director, COOL FM 98.9: “Cool FM 98.9 sounded like an AM radio station. Now we sound very good. I can say the best audio on the island [Aruba] Is COOL FM. Clean and clear. Everyone asked, ‘what did [you] do? The radio sounds very good now. What happened?? What are you using now?’”

Ed Dulaney, Chief Engineer, Townsquare Media: “After adjusting the processor, I received numerous compliments from staff, management and listeners on how much better our station sounded, compared to the competition (which is using an “Other”).”

George Kowal, Chief Engineer, CBNT: [about the AirAura] “Manager mentioned that even listeners called, complimenting us on our sound.”

For some people in radio, hearing cleaner sound from their station takes a little getting used to, as Randy Justice, Chief Engineer, Bristol Broadcasting WQBE, WCSR recalls: “I switched from an “Other” to the [Wheatstone] FM2000. The PD and GM loved it. The next day the jocks all said it sounded different, and different is bad. I then went back and forth between the two boxes and they couldn’t stand the old “Other.” Two days later they all said they were used to [the FM2000] and they haven’t complained since.”

The antidote for skepticism about our new technology is for people to hear and use it. That was the experience of Glenn Rowe, Chief Engineer, Carthage Broadcasting Co. Inc. As he explains, “I have to admit to being skeptical, having been a long time devotee to ‘Other.’ But after a short time, I am convinced of the quality of the Wheatstone VP-8. The ability to handle extremely hot passages is amazing. I am hearing instruments I haven’t noticed before with our current format. The most often heard comment was concerning the crispness of our sound in comparison to the ‘Other.’ Especially at the ends of the spectrum. Also, loudness without the ‘wear you out’ factor.”

Finally, the AirAura is so clean it can help you fix quality issues in your air chain that your old processor was covering up, says Michael McCabe, Engineering Manager, Rogers Kitchener Radio Group: “After our Wheatstone processor was installed we noticed a cleaner, fuller sound. We also noticed how bad some of the production elements and downloaded songs were. There are three production studios here. All three sounded different...Once we figured that out we started to sound consistently clean, not consistently inconsistent. We were asked by all staffers and management, ‘did you change the processing? I like it.’ That’s all.”

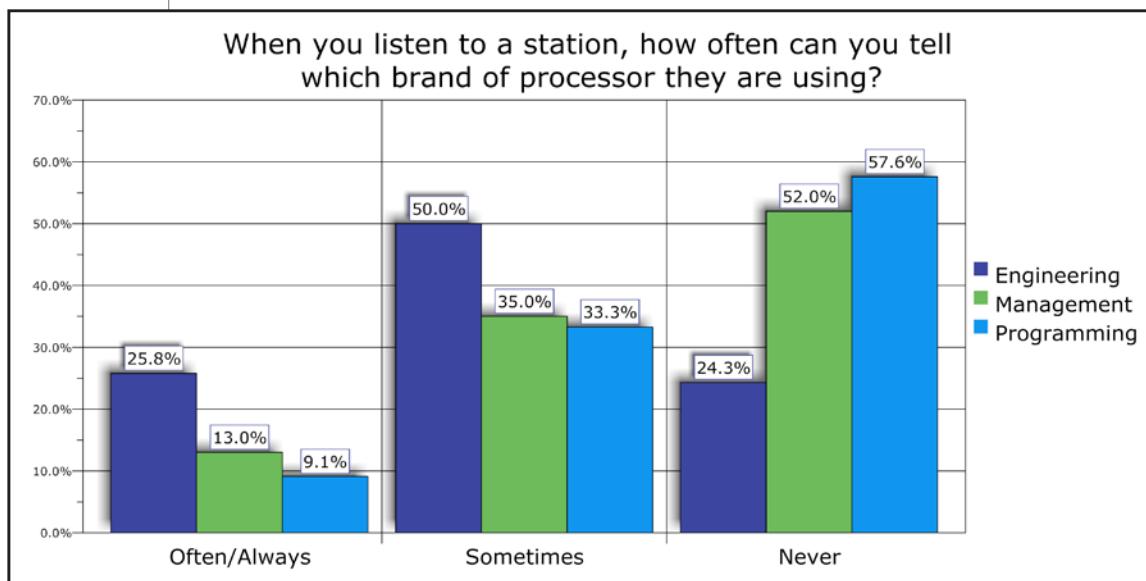
Bottom line: The AirAura and other Wheatstone products deliver a cleaner sound than any other processors. As you can see, this is not just hype, it is something that many others have experienced. Give us a call to arrange a demonstration and hear the cleaner difference for yourself!

Reason #4: A cleaner sound can help you redesign your station's acoustical "signature sound"

There is evidence that the acoustical 'signature sound' of your current processor is more recognizable than the signature sound of your station.

Jeff Keith, Wheatstone Senior Product Development Engineer says, "Processors have a signature sound. If you scan across a dial and you're with the right radio people in the car, they can punch the stations, one after another, and almost without error identify the processors."

A recent study from Alethea Research showed that about one in four radio engineers could "often or always" identify which processor brand a station was using just by listening to its on air sound, and another 50% could do so "sometimes." What this means is, despite all of the custom settings and adjustments, each brand of processor has an overall, identifiable sound.

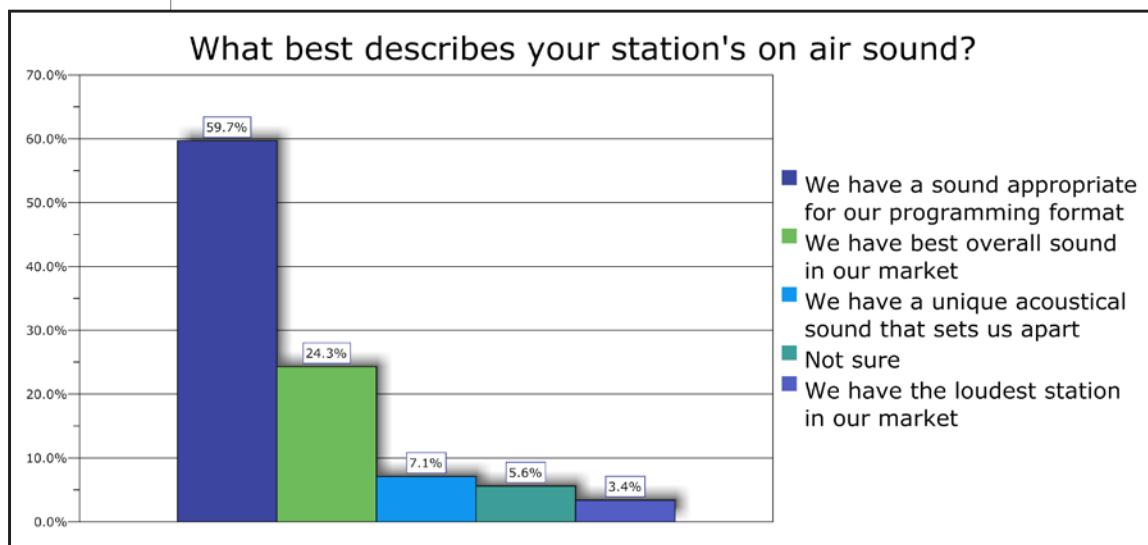


For the past 15 years, stations have had to choose between processors that offered an even-tempered signature sound or a bolder, louder signature sound. Today there is a third choice: processors from Wheatstone, which offer a cleaner, undistorted sound.

In the same survey mentioned above, when radio station personnel were asked to pick the statement that best described their station's acoustical sound, a majority (59.7%) selected "we have a sound appropriate for our programming format." Only a handful (7.1%) selected "we have a unique acoustical sound that sets us apart."

When it comes to describing acoustical sound, most radio people think of it in terms of how it supports programming, and much less often as a way to differentiate a station with listeners.

Unless you have an AirAura or other Wheatstone processor, it is likely that the acoustical signature of your current processor is more distinctive than the acoustical signature of your station. The AirAura is designed to be so clean that it does not have a recognizable signature sound of its own. Our intent is to give stations a fresh start at designing their acoustical signature sound. Customers who work with the AirAura in this way discover they have far more latitude than ever before. For those who miss the sound of their old processors from other brands, we have presets that can make the AirAura sound like them. While we do not promote the AirAura as a loud processor, customers have found the AirAura can be louder than most processors. With more latitude a station can craft their own sound.



Our goal is to enable two stations in a market to both use the AirAura and sound much less like each other, and much more like themselves.

Let us help you compare your current processor to the AirAura and hear the potential a cleaner processor could have in shaping a more distinctive signature sound for your station.

In conclusion:

When it comes to radio sound, hearing is believing. Until you actually hear a comparison of the AirAura with your current processor, it will be hard to fully appreciate what a cleaner sound can do.

In this white paper,

- we have explained how the AirAura's exclusive 31 band limiter delivers more sound detail to the ears of listeners
- we have described how our "process less" design philosophy has created a smarter processor which delivers far cleaner sound with fewer processing steps.
- we have shared the comments of our customers describing their experiences with the cleaner sound that AirAura and other Wheatstone products deliver.
- finally, we have shown how some of our customers are using the AirAura's cleaner sound to revisit their station's on air signature sound.

For more information about the AirAura, including videos, go to:

RadioCleanMachine.com

**To set up a demo call Mike Erickson at 252-638-7000 X127 or email us at
CleanMachine@wheatstone.com**