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A Pro-Active Approach
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by A. Grimani

It's a crying shame that people in consumer audio and professional audio don't talk more. If they did, each side could benefit from things the other has discovered. Case in point: Active, or powered, speakers. Self-powered speakers are not completely foreign to the consumer industry – they've been using active subwoofers for years – but active main speakers are certainly not the rage like they are in the pro audio world. Powered speakers are nothing new. I distinctly remember a line of them from Philips in the 70s with active crossover filtering, servo feedback control of the woofer, and built-in amplification – talk about an innovation! As with subwoofers, powered speakers offer several advantages over traditional power amplifiers and passive speakers. The studio guys are on to something, and consumers would do well to stand up and take notice. If it's good enough for the pros, it's certainly good enough for home theater.

Benefits

Powered speakers have active, line-level crossover filters instead of passive, speaker-level component networks. This makes them much more efficient – no power is lost in the filtering process. The active filters are also less expensive and more flexible, with greater adjustment capability.

A further advantage of active crossover networks is fewer electro-acoustic lobe issues. Any speaker will have some amount of inconsistency in directivity through the frequency region of the crossover. At the crossover frequency, the two drivers being integrated are playing at the same level but are at different positions in space (at least on non-concentric designs). This means that the wave front emanates from two distinct sources instead of one point source. There are unavoidable interference patterns caused by this dual-source system. The wider the region of crossover, the more the interference will be audible. One driver will typically lead the other in time, either because of physical placement on the baffle or because of inherent phase characteristics in the driver and the crossover circuit. This time discrepancy results in increased sound energy being projected off-axis from the speaker baffle only in the crossover frequency region. Cancellations of sound energy typically exist in the opposite angle of the baffle axis. That's all bad because the room isn't energized with an even soundfield, and the

speaker will sound different depending on the listening axis. With active crossover circuits, engineers can design around these problems. Having a narrower crossover region and a phase alignment that results in a projection axis continuously perpendicular to the baffle can vastly improve the overall sound of the speaker – and its consistency from room to room. It is easier to place and gets better results more of the time.

Active designs have other advantages as well. Amplifiers can be optimally matched to the driver's needs and safety margins and can include built-in excursion limiters and thermal protection that prevent damage to the drive units. Active speakers can, therefore, be more reliable and require fewer repairs. The overall system can be more compact because the crossover is more energy-efficient. There is also the possibility of built-in, configurable directivity and room correction EQ. As examples, Genelec's speakers currently have manual EQ, and B&O's Beolab 5 has an automated EQ process. Finally, there could be widespread use of digital inputs like Meridian speakers have had for years.

Challenges

Active speakers do require that you run two lines to each speaker: AC power and signal. That means AC drops at each speaker location – not a huge issue in new construction but time-consuming for retrofit projects. One alternative is to put all the electronics in a head-end unit and run separate speaker wire runs to each of the speaker drive units. That's the way all but the smallest professional systems (including cinemas) do it, and that's the way the large Genelec professional studio monitors do it. Overall, it's the solution I like best, too, because it keeps all the electronics in one rack location. Running wires directly to the drivers reduces the effects of speaker wire resistance interacting with the complex load of a traditional crossover circuit. Ultimately, it is always best to keep the speaker wire runs short, so an auxiliary amp rack can be located near the speakers if needed.

To my knowledge only one high-end speaker manufacturer has tried active speakers with external electronics: Waveform. They made speaker systems with outboard, active crossovers and amplification (both by Bryston), and separate wire runs to each driver set. Interestingly, Waveform's products were well-received by both the high-end consumer market and the professional audio community. The Mach 17 resided in Stereophile's Class A, and record label Telarc employed various Waveform models to monitor and mix their recordings. Unfortunately, Waveform is no longer in the business of making speakers.

Another disadvantage of active speakers is the potential for tweeters to receive DC signal under conditions of non-linear operation, such as asymmetrical clipping or amplifier malfunction. This would result in almost immediate annihilation of the

tweeter, but the problem is easy for the manufacturer to preempt by putting a first-order high-pass filter a few octaves below the intended crossover frequency.

Some people complain that the amplifiers in a powered speaker are of lesser quality than a separate amplifier from a “trusted” manufacturer. I say, “Who knows and who cares?” It matters not how good the amp is. What *does* matter is the *combination* of amp and speaker as a system, and that is best controlled in powered speakers.

Opportunities

If you’re serious about being on the cutting edge of technology and sound quality, consider incorporating powered speakers into your system. There are several quality manufacturers to choose from, and more will step up to the plate if they detect a trend toward active designs. You are in control of the trend, so just do it!

This article is based on a column published by A. Grimani in Residential Systems magazine September 2005. Chase Walton contributed to this article.