MERGING WORLDS

Checking in with loudspeaker engineer/ designer Dave Gunness.

by Kevin Young

NOTED FOR HIS WORK as an audio/electrical engineer, loudspeaker designer, and inventor over a career spanning more than three decades, if there's one constant in the professional audio career of Dave Gunness, it's innovation. And, perhaps more specifically, the fact that while the process of building something is valuable, the willingness and drive to continue to improve on your own creations is even more paramount.

The 56-year-old vice president of research and development as well as lead product designer at Fulcrum Acoustic – the rapidly growing loudspeaker manufacturer he co-founded several years ago – points to the creative aspects of design as always having been key to his work, and explains that his earliest creative impulses manifested themselves musically.

"I started out singing in church," he says. "I think the biggest audience I played to was at a Christmas service to something like 1,500 people." Stage fright was never an issue, he adds: "When you start out at six you get over it."

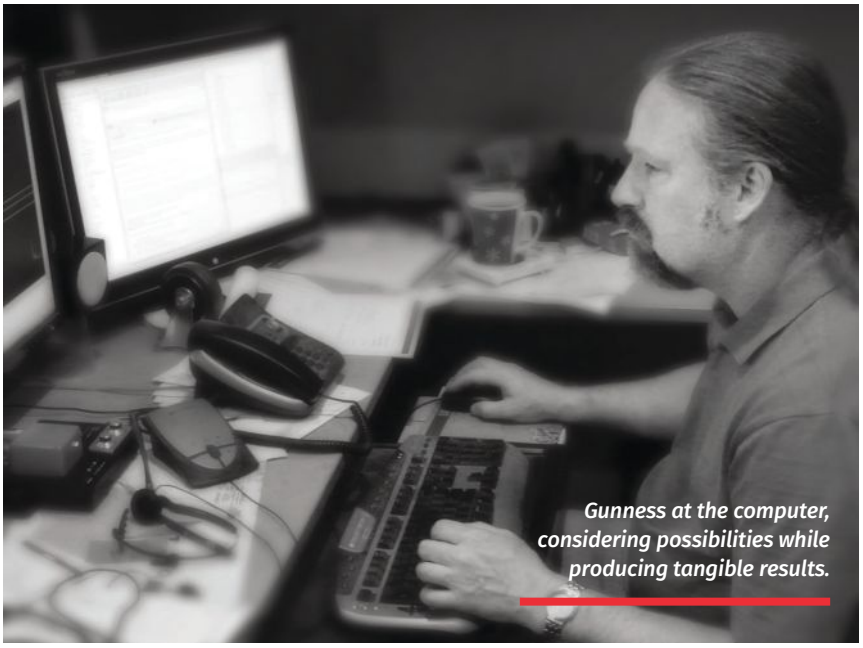
Growing up in Janesville, WI, he had an interest in audio and recalls buying multiple car speakers at a rummage sale, hanging them around his room and wiring them up in different combinations. His musical interests continued through college when he performed bar gigs as a solo acoustic guitar player/singer and in various bands to make extra cash. And, since he couldn't afford pre-built loudspeakers, he made his own.

"They weren't complex, but they worked, and since I built them they went through probably a dozen revisions by the time I was done," he notes. "I kept playing with the crossovers and changing out drivers and various things. It was a learning experience."

EARLY DIRECTIONS

Gunness' first career choice, however, was aeronautical engineering, which he studied at Purdue University in West Lafayette, IN. But it didn't last: "I went into the program thinking I'd design light airplanes. When I found out that nobody was actually doing that, and that aeronautical engineering meant you got to work on landing gear knuckles or something, I decided to go back to Wisconsin."

There, he enrolled at the University of Wisconsin-Madison in electrical engineering, which, by way of a "flat-out coincidence" led him to pro audio. "In my second year there I discovered they'd created a new emphasis in the department called electro-acoustics," he explains. "This was after Richard Greiner, who was famous for work he did on transistors in the early 60s, had gotten tenure. His emphasis was in semiconductors, but his passion was audio and he got this new program put in place, so I took on loudspeakers, acoustics and audio circuits.



Gunness at the computer, considering possibilities while producing tangible results.

It was great."

His love for music, however, hadn't lessened. He still felt the lure of a career on stage. But what ended up tipping the scales in a different direction was a case of laryngitis. The story's a little more involved than that, however. "In 1982 I played in what I'll call a mercenary band; we had a booking agent, and whenever one of his bands canceled we'd substitute. One week we'd be a country band, the next a wedding or a rock band. It was a horrible experience," he says, laughing. "Everywhere we went people were disappointed that we'd showed up."

After a car accident enroute to one of the band's gigs left him with a serious concussion, he was unable to attend classes at the beginning of the next college semester, so he decided instead to sit it out and play full time. "I got a great gig: three nights a week, 75 bucks a night – good money in those days," he notes. "I played for a couple of months and came down with laryngitis. I couldn't talk, but I could still sing so I continued until I lost my voice entirely. So I'm sitting there, halfway through the semester – can't sing, can't go out and play – and I realized how fragile a music career is and that it might make a better hobby than a job."

Right after graduating in the mid-80s with a degree in Electrical and Computer Engineering from UW-M, he relocated to Buchanan, MI, accepting an engineering position with Electro-Voice. Even then he hadn't entirely shaken the music bug, however: "Early on I had the idea that I was going to work for EV for a couple of years, save a bunch of money, buy a good sound system and then play music," he says. Married by then, and with a family on the way, he realized it simply wasn't realistic and concentrated fully on serious loudspeaker design.

FURTHER PROGRESS

His first assignment at EV was to design the coaxial, all-weather Musicaster 100 voice/music loudspeaker, and then it was on to bigger things, literally. In 1984 he filed a patent for the core concept that ultimately became the MT-4 large-scale concert touring system, still fondly recalled by many old-time "road dogs" to this day. The "MT" stands for "Manifold Technology" and essentially it's a method for using a manifold to combine the outputs of multiple compression drivers for increased SPL and more coherent summation. Additional patents followed in conjunction with the development of horn improvements for both EV HP Series and Altec Lansing Vari-Intense loudspeakers.

In 1995, Gunness was named senior engineer at EAW, moving to company headquarters in Whitinsville, MA and joined by his wife Kathryn and their two children. Ultimately he rose to director of research and development, working with a talented engineering team headed up by Kenton Forsythe. After initial attention to creating custom loudspeaker designs for a variety of applications and clients, his research into directional control of concert loudspeaker clusters led to what became the KF900 Series, another large-scale system incorporating DSP for each individual row of drivers in a cluster, and with the ability to deliver targeted down fill coverage without altering the cluster structure. It resulted in two additional patents.

Concentrating on both individual and collaborative possibilities with DSP, coaxial loudspeakers and digitally steerable arrays led to the creation of FChart software and, later, Gunness Focusing, a significant impetus to his work. "The big one was using DSP to make things better," he notes. "That started in college. DSP for audio really wasn't a 'thing' yet. It was theoretical. There was a DSP chip that Texas Instruments came out with and my senior project was a paper about it. I didn't have the chip, just the manual, but I wrote code, counted cycle times and figured out how many times you could run a given length program in 22 microseconds at 44 kilohertz and evaluated the possibility of using a microprocessor to process audio.

"That was about 10 years before DSP really started gaining interest in audio. I felt people were using DSP to replace things they already could do in analog. It added convenience, but I felt there were things you should be able to do with it that went way beyond what you could do in analog."

VALUE IN THE CHASE

Gunness' need to innovate, he says, is a product of his personality, passion for music and audio, and the fact he was encouraged, particularly by his father, to be creative from an early age. "That's important," Gunness states. "If you grow up believing you can do anything, when

you get an adult job you approach it from that point of view. My dad let me build a canoe when I was 10. I found a *Popular Mechanics* article that showed me how, he bought the materials, and I built it."

He only paddled it on open water once, explaining, "I had no way to get it to a pond, but it was the experience of building it that was the value." While that creative mindset is the engine that drives him, it took a bit of time to actually get it running. Technology needed to catch up, and he also needed organizational support to turn concepts into reality.

By 2002, still with EAW, he formulated a way to code and test his concepts, but he and his colleagues – Jamie Anderson (now with Rational Acoustics) and Rich Frembes (now with Fulcrum) – needed a specific DSP platform that just wasn't available at that time. Creating the NT Series of loudspeakers, he adds, finally provided the team with a suitable DSP platform to move forward.

Gunness had begun development of his proprietary FChart software while at EV, seeking a software tool that would, essentially, make him a better designer. That project, too, stalled for a time. "But I learned from it, and at EAW, I thought, 'Well, this time I'm not going to try to get funding. I'm just going to write it myself. It doesn't matter how long it takes."

For the record, it ended up taking 12 years and – unsurprisingly – he's continued to enhance and improve on those programming concepts since co-founding Fulcrum Acoustic in 2008. "People know about the specialized aspect of FChart – that I used it to do steering calculations for the KF900 system, and that it's the core of the (EAW) DSA Series – but it was also the integrated platform for core engineering. We'd measure loudspeakers with it, do polars, perform directional analysis, and obviously, DSP. I couldn't have done Gunness Focusing without that software. Fulcrum's engineering approach is structured the same way, using an equivalent software platform that we've dubbed 'Rayleigh' and a similar suite of DSP techniques called 'Temporal Equalization' or 'TQ'."

The essence of Temporal Equalization is incorporating DSP techniques into the design process from the outset. "Rather than choosing a compromise between two competing attributes, we physically optimize the attribute that can't be addressed with DSP and solve the other problem with DSP. Temporal Equalization is structured in such a way that it can be implemented on most modern system processors. In fact, Fulcrum provides verified TQ settings for more than 20 processing platforms."

SEEKING SINGULARITY

Engineers, Gunness believes, fall into one of two classifications: divergent or convergent thinkers. "Divergent thinkers generate new ideas/inventions. Convergent thinkers finish things." He's worked at residing in both camps, noting, "For me, divergent thinking was natural, but I had to learn to focus on finishing things, otherwise I'd be generating inventions that would never see the light of day."

Music's still a part of Gunness' world, even if it had to take a back seat role.

Convergent thinking played a role in his decision, in 2008, to go into business with partners Stephen Siegel and Chris Alfiero in creating Fulcrum Acoustic, which has production facilities in Whitinsville. His vision was to streamline and shorten the development process while also being able to fully concentrate on the technologies and products most appealing to his interests and the marketplace.

The TQ Install Series of coaxial loudspeakers for the installation market were the first result of the quest. "Coaxials are a common thing throughout my career," he says, citing the EV Musicaster 100 and at Fulcrum, his goal was to eliminate some of what he sees as the primary problems of traditional coaxial designs: intermodulation distortion, bulk, and weight. "It's not that we decided to make coax the core of the company," he adds, "It was just that once we figured out we could make multiple patterns work in the coaxial format, there was no good reason not to make the next thing coaxial."

Fulcrum's priorities in terms of R&D and product development varies from year to year. Most recently, attention has turned to overcoming excessive rear low-frequency radiation with what the company calls Passive Cardioid Technology, first introduced in the FL283 and FLS115 line arrays and now the basis of a line of cardioid subwoofers that includes CS118 (18-inch) and CS121 (21-inch) models. And yes, it's patent-pending.

As the company has grown, Gunness says, it's become increasingly difficult to spend as much time as he would like on advancing design concepts. While recent staff additions, such as the addition of director of engineering Nathan Butler, will ultimately open up his schedule, the real break won't come until Fulcrum completes its new 35,000-square-foot Whitinsville factory in 2017.

Even the briefest glance at the company's website will tip off anyone unfamiliar to a decidedly non-corporate culture and sense of humor that comes from the top down – Gunness, for example, in addition to being listed as vice president of R&D, is also touted as "lead coffee maker."

"It's important not to take yourself too seriously," he concludes. "We've all been through the corporate wringer, so we don't use terms like 'onboarding employees' and that kind of stuff. In fact, we cringe when we hear things like that – let's not forget, we're doing this for enjoyment and satisfaction, not just to make money." LSI

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