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PERCEPTION:
FOR GREAT
ACOUSTICS,
YOU NEED THE
BEST SPEAKER
SYSTEM ON
THE MARKET.

REALITY:
THE BEST
LOUDSPEAKER
SYSTEM WON'T
HELP A BAD
ROOM SOUND
BETTER.

Getting the Message Across

Loudspeaker system design
and the worship experience

Loudspeaker System Design and Room Acoustics

by Daniel Keller

Regardless of the size of your flock, the shape of your sanctuary or the tenor of your faith, your congregation has come to immerse themselves in the worship experience. And sound is an integral part of the encounter; whether it's a clearly eloquated sermon or a raining chorus of guitars, nothing brings a congregation closer than hearing the message loud and clear.

Designing an audio system for a house of worship can be a challenging experience. With seemingly endless choices in loudspeaker designs and system configurations, determining what's right for your sanctuary can be a daunting and confusing journey.

What's Your Mission?

If there's one thing most systems designers agree on, it's that creating a worship sound system begins with the experience. Before delving into the complexities of room acoustics and loudspeaker configuration, consider the goals for your worship experience.

"It's important to spend time understanding and quantifying your own unique ministry needs," says GC Pro's Mick Hall. "Be sure you have a clear vision of what you need your system to accomplish in your ministry." Vance Breshears of Acoustic Dimensions in San Diego agrees. "Look at the room, look at the program. What experience do you want to create within these walls?"

"Our choice of system design is directly influenced by what the client wants to convey in the way of a worship experience," says Chuck Walthall of Pensacola, Fla.-based Walthall & Associates. "A contemporary worship [service], for example, usually means a full band, maybe some orchestral pieces, and that requires full-bodied sound, good low end and a fairly high SPL. That requires a more robust loudspeaker system than a traditional service would."

Within These Walls

The most important aspect of your system isn't even the system itself, but the space it's in. Acoustics are far less glamorous than loudspeakers, but the best system won't help a bad room sound better, so it's important to address your acoustics first.

"Many churches design their rooms to look beautiful, with little regard to how sound will behave in the space," says Hall. "The success of any system is dependent on the acoustics of the space, yet some churches fail to budget for acoustic design at all."

Indeed, too many churches fall victim to the lure of a shiny new system without first assessing what it will sound like within their unique space. "Typically, we'll set up a demo or simulation to portray subjectively what they're going to hear," says Breshears. "That goes a long way toward illustrating the need for acoustic treatment."

"Before you even consider types of loudspeakers, system configuration or anything else, address the room's acoustics," says Walthall. "If the acoustics aren't correct, I don't care what kind of system you put in there, it won't get a fair shake. After all, a speaker system's primary function is to increase the sound level to the listener's ear. If my room's acoustics don't support what I want to do, making it louder isn't going to fix that."

The room's acoustics should also reflect the desired worship experience. "The acoustic signature we're looking to produce for a contemporary space is not the same as what we would design for a traditional space, or an orchestral space," says Walthall.

A well-designed acoustical environment will not simply support, but will add to the worship experience, Breshears observes. "Often we'll try to create an acoustical environment where the energy from the congregation is reflected back to the congregation, while at the same time the sound energy from the speakers is absorbed for improved clarity and intelligibility."

But as Walthall points out, sometimes it's a compromise. "A lot of churches will be doing a mix of contemporary and traditional services. If you have a multi-purpose space, you have to design for the highest common denominator. The system has to support the most demanding of the programs, but ensure that it will also properly perform other needed functions."

An Array of Options

Whether you're replacing an older system or equipping a new space, you'll find a wide range of loudspeaker types, and ways to configure them—center cluster, left-right pair, left-center-right (LCR), or any of several types of DSP-controlled arrays. Again, your worship experience has everything to do with what works.

"A center cluster is great for a point-source application, such as a pulpit at center position, but not ideal for music," says Hall. "A left-right pair or an LCR [left-center-right] configuration will deliver better, more natural sounding imaging."

Breshears adds, "An LCR multi-channel system is effective for a church that wants a spatial, stereo experience. For a more high-impact experience where imaging is not as critical, we might do an exploded mono system."

And then, of course, there are line arrays. Immensely popular in touring sound, smaller line arrays are turning up in many mid-sized churches, with varying results. "Currently, most everyone desires a flown line array," says Walthall. "But not all rooms would benefit from line array technology."

"The popularity of line arrays has caught people's fancy, and they're definitely great for some applications," says Breshears. "They can provide good vertical control and impact in certain room applications. But for other types of room geometries, they're not appropriate. I think people are starting to understand that it's just another technology, another tool."

Another newer technology that's becoming increasingly popular is the digitally steerable line array. Using digital signal processing, these low-profile columns can offer focused coverage in challenging spaces, particularly where aesthetics are a concern.

"Small, steerable arrays are well-suited toward applications where the acoustics aren't treatable, or where aesthetics demand a low-profile system," says Hall.

"Often in more traditional spaces, we're limited in what we can do," says Walthall. "We just finished a beautiful 155-year-old sanctuary. The room's decay time was just shy of 2.5 seconds, and intelligibility was nil. Due to the historic nature of the sanctuary, adding acoustical treatment to the walls or ceiling was not an option. Until recently there really wasn't much you could do. For this space, a DSP-steerable array was a viable solution that worked well."

Don't Try This at Home

As is often true, doing something is easy; doing it right is hard. Anyone can wire in some loudspeakers, but to create the worship experience you have in mind, it's best to bring in a pro.

"A good audio professional can help navigate between short-term concerns and long-term solutions," says Hall. "Deal with a consultant who will listen to your ministry's needs and vision, and who seeks to understand not just your current needs but your future vision. Budget is always a factor, and an experienced consultant can help plan for easy expansion as your ministry moves forward."

"You need to take sales out of the equation and design the best solution for the room," says Walthall. "Many times we'll see clients asking for an expensive line array because they've seen it somewhere else, and some contractors will fulfill their request by putting it in even if it's not the right solution for the room. The designer needs to look first at the need and then educate the owner on how to best meet their desires."

"We try to educate the client and leave out the hype," says Breshears. "Often they've been reading the magazines and doing their research, and they've got their eye on the big system. We try to get them to step back and look at the big picture first. What's the experience they want the listener to have?"

"For any given space and worship program, there's a best solution, then there's an okay solution, and then there's the wrong solution," says Walthall. "When you take the time to educate yourself, you can determine what the best solution would be. Sometimes you have to fall back on the okay solution. But by educating yourself, you know what you don't need."

As Hall concludes, "The best tools for sound analysis ever created are on either side of your head. Use them with what's between them. It's not about a specific budget figure or a bigger-and-better mentality. Ultimately, everything should be about ministry. The decisions you make should be based on building and sustaining the effectiveness and impact of the ministry of your church."

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