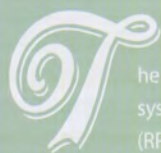


A MARRIAGE OF ACOUSTIC  
TREATMENT & TECHNOLOGY  
AT KITCHENER'S

# ROMANIAN PENTECOSTAL CHURCH OF GOD

By Kevin Young. Photos by Joseph De Buglio



The comprehensive update of the acoustic treatment and audio system for Kitchener, ON's Romanian Pentecostal Church of God (RPCG) began as a renovation – an effort to increase the size of their existing stage to better accommodate the various musical ensembles that play an important part in their worship. Ultimately, that led to a new acoustic design, lighting rig, and an audio system including KV2 Audio loudspeakers and an Allen & Heath FOH console.

The RPCG project was ambitious and fast-paced, and involved both Waterloo, ON-based firm CS Acoustics, led by Jon Jukes, and Delhi, ON's JDB Sound, run by Joseph De Buglio.

Essentially, an acoustic fix led to a new sound system, explains Jukes. "I think it was in their minds to [replace the complete audio system], but they hadn't quite decided. So we set up a demo with the KV2 loudspeakers before they ripped the room apart for a Sunday service, switched between the old system and the KV2s, and the difference was like night and day. What we demonstrated is actually what they bought."

Multiple loudspeakers and system elements were examined and considered, but owing to the room design and stage layout, it was ultimately decided that the KV2 products best suited the project, providing a minimum amount of cabinets that didn't interfere with sightlines and suiting the weight restriction of the rigging, which topped out at 600 lbs. including lighting. The company also supplied consultation and design for the complement of cables and connectors used in the eight custom boxes for the PA install.

KV2 is a Czech Republic-based audio company whose products are based on designs by company founder George Krampera. The products work in tandem with proprietary EPAK2500Rs amplifiers, designed to get as much punch out of a single box as possible. Currently, KV2's largest market is Europe, but it is making an impact internationally, having developed a strong following in China, the Philippines, Australia, and, increasingly, North America.







Jukes was instrumental in the decision to go with the company's loudspeakers. "The acoustic treatments cleaned up the bass," Jukes explains. "Many churches will buy more equipment to get better sound, but by acoustically treating a space, quite often you can run with less equipment, particularly on the bass end."

The pace of the project was accelerated owing to the fact that numerous members of RPCG's congregation are professional tradespeople – framers, drywallers, and electricians – who donated their time to the project.

"They originally projected six weeks for the project, but they're a very active congregation that can do a lot of things. Many volunteers provided time and expertise, and once they got started, it kept getting bigger and bigger," Jukes says. "One night, I was giving instructions on where we'd need power and I looked up and there were five electricians surrounding me. To give another example, the steps at the front of the church are granite, the steps to the sound booth are granite, the table that the audio mixer sits on is granite, and it was all donated. It's the nicest sound booth I've ever seen. It's basically all marble. They took out the stage, rebuilt it, and put in truss and lighting that we provided, did all the flying and rigging and did an amazing job."

Beyond expanding the stage, the renovation included the removal of existing carpets and a fresh paint job for the walls, De Buglio puts in.

Jukes' involvement with the RPCG dates back to his previous retail business, The Carpenter Shop (the CS in CS Acoustics) and his later work as manager of the Long & McQuade musical instruments store in nearby Waterloo, ON. Owing to their existing relationship, the church approached Jukes for a quote on the audio treatments roughly two years ago. Initially, he says, the project was primarily about room acoustics, but ultimately led to a major upgrade to the audio, lighting, and rigging systems.

CS Acoustics manufactured and designed the products used for acoustic treatment, and while they helped with the installation of said treatment, members of the congregation took on much of the work as well. "We did the layout with them and they put them up. So we had three or four crews going at it and did a job that would've taken us – three of us – probably two weeks, in about four nights."

De Buglio came in after CS Acoustics was attached to the project and consulted on the acoustical fix, but JDB's involvement was primarily concerned with determining which



products should be deployed for the new PA and where to place them to achieve the optimal results. De Buglio was also instrumental in the design of the room acoustics and truss deployed.

De Buglio's focus is solely house of worship projects, and he's been involved in over 1,200 church projects over the past nearly 35 years. Jukes credits him with substantial knowledge not only about room acoustics and audio, but the dynamics of the churches he's worked on – pew dimensions, the absorption co-efficient of the seating, how the service functions, what type of church it is, what SPL level they need, and speech intelligibility being among the factors he takes into consideration, drawing on experience from his significant body of work.

The level of sophistication of RPCG's music program is very high and includes a variety of musical genres during their three-hour Sunday morning services. Among those are the church's 60-piece brass band, its large men's choir, combo-based praise band, and other folk and contemporary groups. Interestingly, RPCG also offers a music education program that teaches children to play brass instruments.

"I'm biased, straight up, more to speech than music," De Buglio admits, citing church projects in which two loudspeaker systems (one for speech and one for music) were ideal, and adds that placement and configuration is generally more important than the products used. On some projects, he adds, people have been surprised by his choices for loudspeaker elements.

"From the connections I have, other than Jon, I never would have come across the KV2 products, and they are a nice sounding box," he says. "I have yet to hear them side-by-side to Danley Sound Labs products, but I think the two would sound pretty close. In fact, if you even took a Tannoy or Danley and the KV2s,

I think, just doing minor EQing and equal volume testing, that people would be hard pressed to tell them apart."

In this case, two KV2 ES1.0s were deployed, with two KV2 subs flown above them. "Because of time smearing," De Buglio offers, "I know a lot of people put the subs on the floor, but I've had the opportunity to put a sub on a chain hoist, raise and lower the sub in real time while it's playing music, and the sonic difference between having the subs on the floor and having them up in the cluster is quite different." A pair of two-way, 8-in. KV2 loudspeakers was also deployed for foldback.

Owing to the room acoustics, that humble package is really all that was required. "At a throw distance of no more than 70 feet, we're hitting the back of the room with about 110 or 115dB," De Buglio says. "The acoustics allow us to do that."

*"By changing the acoustics and sound system, it made the makeover complete, as if they just moved into a brand new church."*

Weight issues also played into the choice of KV2. The ceiling, too low for a line array, required what De Buglio terms "well-controlled brute force, full-range boxes."

He elaborates: "The lightest boxes that can move air the best were at the front of the line." Ultimately, in the selection process, it came down to weight, size, speaker design, and sonic performance. "The ES1.0 is only 74 lbs. For this installation, we had a 600-lb. weight limit that

could be suspended from the roof that included the truss system, lighting, and speaker system.

"Speakers with horns that crossover below 1000 Hz [also] move to the front of the line," he continues. "In this case, the ES1.0 speakers have a horn crossover at 500 Hz, which means better gain before feedback. When you have a low ceiling, directivity control is very important. Not because the acoustic treatment was not good enough, but because of the proximity of the loudspeakers to open microphones on stage. When loudspeakers are within 15 ft. of open mics and you're trying to mic a choir, you need well-controlled speakers and the KV2s have that." It was also helpful that the ES1.0s are three-way offerings, he adds.

Of course, aesthetics were also a concern. "The church didn't want speakers hanging lower than what they had before. Most speakers with crossover points below 1 kHz tend to be very large boxes – some over 40 in. tall when you get closer to a 500 Hz crossover. Here, the ES1.0 is only 27.5 in. tall with the horn being rotatable." While the offer was initially on the table to have the boxes hung horizontally, the church decided that the speakers would look better placed vertically. "In this configuration, it made for a smaller looking cluster with the whole assembly hanging at the same height as the previous speaker system," De Buglio notes.

As for the previous system, which was comprised of approximately eight loudspeakers, he adds: "No matter how loud you cranked them up, you'd get tons of distortion above 85dB, and the distortion was created by the acoustics of the room."

The KV2 system performs well for both speech and music, De Buglio says. "Jon really liked the KV2 speakers. It took me longer to embrace them, but we had a demonstration that won me over. So credit for the choice of speakers goes to Jon."

"Every room has unique features," Jukes





takes over. "This room was awkward in that the balcony only extended up on one side of the room. It's not a symmetrical room. It's fan-shaped and the balcony face was problematic for reflections."

The challenge in the roughly 900-person capacity church is typical of a facility that has no acoustical management, De Buglio writes in a short piece detailing his involvement in the project, explaining that the fan-shaped room's low ceiling created issues with standing waves, excessive noise, early reflections, "and lots of bass stored in the corner." The fact that the ceiling is parallel to the floor created issues, but some were mitigated by different ceiling levels in the room, if only slightly.

The carpeted floor and padded seating provided absorption above 2000 Hz, he writes, so adding more absorption panels to manage lower frequencies would negatively impact acoustical performances, including the always-important sound of the congregation's singing. "With the reverberation above 2K already less than 1.4 seconds," De Buglio writes, "and the frequencies below 1K at almost 2 seconds, there were not too many options available." Consequently, frequency-specific diffusion was the ideal route.

Generally, says Jukes, CS Acoustics' approach to room acoustics relies heavily on diffusion and RPCG was provided with roughly 250 pieces of acoustic diffusers manufactured by CS Acoustics. "There is a vast amount of things going on," Jukes says about the various musical and speech applications that would be part of a typical service. "It's not just speech. You want a certain reverb time for speech, but we also had to bear in mind traditional and contemporary music. Also, everything is amplified – the choir, the brass band, everything."

CS Acoustics' Tube Radiators, which are custom-made, half-round diffusers made of custom compressed cardboard tubes, similar to MDF, were installed to reduce bass and midrange energy and eliminate standing waves, "bringing the overall reverb time down to an average of 1.3 seconds from 200 to 4,000 Hz, which makes it a great room for a Pentecostal-type worship program," De Buglio writes. "[It has a] short enough RT60 for a high quality contemporary worship service and is live enough for great congregational singing. Eight and 12-in. diffusers were used in a detailed system to cut over 25dB between 200 and 800 Hz. This design absorbs bass energy down to 40 Hz. Since most of the bass energy is diffused or scattered along the walls, there is no bottom end buildup in the corners and, therefore, no need for bass traps in the corners. This system makes it easier to hear that low note below 100



Hz. They come across as cleaner, clearer sounds at all volume levels. And as a bonus, you can feel more bass."

The result is not only better bass response, but better overall intelligibility.

The majority of the Tube Radiator barrel diffusers were 8.5-in. round, though other sizes were used in certain areas. "We placed [those 8.5-in. diffusers] on every wall surrounding the room," De Buglio affirms.

Adjacent spaces like the baptismal area open behind the pulpit, for example, were treated as well, "Because you have reflections reverberating around in that baptismal area that the pulpit microphone picks up."

Using absorption panels that take out the high mids without dealing with the lower frequencies results in a bass heavy room, meaning less intelligibility and articulation in the low mids and highs. "So by reducing your low mids and highs and not dealing with bass," Jukes says, "you're creating a problem." In service of that ethic, only diffusion panels were installed. "The new padded pews and carpeting and the bodies [in the room during service] were enough to handle any other concerns."

Following the installation of the acoustic treatments and sound system, the musicians, choir, and brass band found the room easier to perform in and could hear themselves like never before. "The minister found it an easier room to preach into as well," De Buglio notes.

The replacement of the church's console was also key and, after thorough discussion, RPCG decided on an Allen & Heath GLD-80 digital desk – "a good sounding mixer with all of the bells and whistles you can hope for in a vibrant church," De Buglio says.

The result is what Jukes describes as a "turnkey sound system solution" – one provided knowing that aesthetics were of critical importance. "One of the major concerns is always, 'How will this look?'"

That applied equally to the acoustic treatments, which Jukes says basically disappear into the space. "Most people don't realize they're acoustical products," Jukes says proudly. "They think they're an architectural feature."

The entire project was completed between October and December 2015 – about 10 weeks in all. "There was a delay because the carpet, from one end of the room to the next, was a different colour, so after they laid it, they had to rip it out and it took four more weeks for new carpet to come," Jukes explains.

"This church went through a major makeover," De Buglio sums up in his assessment. "By changing the acoustics and sound system, it made the makeover complete, as if they just moved into a brand new church. Previously, the space undermined their worship, their music programs, and their ability to enable the participants' ability to have their talents blossom. Now that's all changed. There are no more hindrances in any of the ministries that make a house of God a house of God. As a complete package, CS Acoustics did an excellent job in providing a sound solution that didn't just address an outdated sound system, but a system that included acoustics as well."

Ultimately, says De Buglio: "The church spent money on quality gear and tried, at every step of the way, to solve problems by buying good electronics and now, with the money they previously invested, they're starting to enjoy it. So, at this point, anything they add to the system will work well."



Kevin Young is a Toronto-based musician and freelance writer.