Bose brings great sound to Kompassen in Enköping

Six years ago, the Ena Church in Enköping, Sweden, decided to launch the construction of a new venue for the congregations activities. Very early on they found the perfect premises, owned by the county, but it would be until only a year and a half ago that construction could begin. The new venue, Kompassen (The Compass) is a complex comprised of not only the Ena pentecostal-evangelical free church but also houses a hotel, conference center and a restaurant.

Ena Church entrance veiled behind leafy greenery

Tomas Carlsson of Bose® was tipped off to the project by a colleague, and approached the project managers of what he originally thought was an ordinary church installation. He would soon find out this was not the case:

- What's been built is a two-stage venue with a sacred room for services, events and concerts plus a smaller stage. Music and other audio had to be distributed over the entire building in the café, a gymnastics hall and other rooms, says Carlsson who realized fairly early on that the big hall was a prime candidate for the company's recently launched

Tomas Carlsson (center) together with Per Lindborg (left) and Vilhelm Thisner (right)

RoomMatch™ system. Tomas Carlsson, a Sales Engineer at Bose, has done his share of church projects together with colleague Field Engineer Jörgen Allén:

- We immediately realized that RoomMatch was the right solution when we saw the venue. Conventional speakers would have a hard time to master the acoustics, but when the church was being planned the RoomMatch system wasn't even launched on the market yet, says Carlsson. But that, says Allén, gave them plenty of time to work with and affect certain aspects of the venue.

At the time when the Bose team entered the field of battle, a lot of decisions still remained for construction leader Per Lindborg to be made. They still hadn't decided on exactly what materials to use on all surfaces when the Bose team moved in with their "two-stage rocket" audio design system.

- I got the dimensions and measurements, programmed it into our room designer, Modeler®, and could now demonstrate the acoustic effect of different thickness in the wood-concrete ceiling, different materials in the walls, says Jörgen Allén who relied on the second stage of the system to help design the final room: Auditioner®. The auralization solution allowed the church representative Mikael Bergman and construction leader Lindborg to not only see changes represented as tenths of seconds in various reverberation time calculations – a practice Allén describes as "completely impossible" to make any real decisions with.

Instead, they could put their heads firmly into the Auditioner station and hear the effect of any changes. This made quite an impression on Mikael Bergman, the church chairman:

- After all is said and done, one wonders how other suppliers can promise to fulfill the clients needs. With Auditioner we could hear exactly what we'd get, he says and continues:

- I've felt very safe the entire journey that our demands were going to be met, concludes Bergman.

Jörgen Allén says the Modeler-Auditioner workflow gives the field team an edge:

-This enabled us to design the loudspeaker system easily and in direct connection with audio engineers who are operating the hall today, says Allén.

With the computer model established, it was time to design the loudspeaker system itself. Tomas and Jörgen are both noticeably excited when they can talk about the selection process of RoomMatch, since it comes from an ambition to tailor the sound reinforcement installation to the specific room:

Three array speakers per side over five meters up in the air, plus four subwoofers on the floor.

- This is a dream we've been dwelling on for that past 15 years and the idea is exactly what we finally ended up doing, Allén says and goes into the flaws inherent in most line array systems. Traditionally, most line array-style loudspeaker systems have two, three or four models to put in the array apart from subwoofers. System designers are free to select from these models which normally mostly differ in the radiation of audio energy, but are still limited by the preset directivity choices.

Hence, Bose wanted to realize the concept of constructing a specific loudspeaker for each room. From the very beginning, that is. The idea soon proved to be unrealistic; imagine the supply lines and delivery times for custom-designed speakers at every installation. But then someone had an epiphany:

- We'll design several modules with different vertical and horisontal coverage, and let the Field Engineers take their pick from the mass produced units, says Allén. This reportedly cut lead times by 80% and was something Bose could put on the market.

- We can choose modules suitable for concert halls with difficult, large acoustics and exchange components back and forth to tailor the spread to the room, Allén explains.

- The differences in exchanging just one or two modules are staggering when we have all these to choose from – we have 20 models, exclaims Allén.

The RoomMatch system brings four horizontal patterns to the game: 55°, 70°, 90 and the widest member of the family at 120° dispersion. In every horizontal family there are five vertical selections to be had: 60°, 40°, 20°, 10° and even 5° vertical dispersion. These speakers, connected together, form a Progressive Directivity Array. Every array module loudspeaker features two new 10" woofers and six wideband mid-range compression drivers.

The frequency response for each array module is 60 Hz to 16 kHz (±3 dB), with only one crossover at 550Hz. Thanks to the extended bandwidth of the compression drivers, there's no need for a mid/high crossover, thereby avoiding the problems inherent with placing crossovers right in the middle of vocal clarity. Quite some time was also spent designing the phase plug for the compression drivers to remove resonance without resorting to DSP.

Each loudspeaker weighs just short of 56 kg and is steel-framed and engineered from birch plywood covered in polyurethane. But that's the array modules. If you're feeling the need for some punch below the quoted 60 Hz there's also the RMS215 subwoofer array module with - you guessed it - two high-excursion 15" woofers. Out of courtesy we'll refrain from listing all the model numbers for the array module speakers since there are twenty of them...

Akira Mochimaru, General Manager of Bose Professional Systems, sees the system as a great opportunity to deliver "concert-quality sound for fixed-installations in almost any room size, shape, acoustic requirement or budget", he said in a recent Pro Sound Network interview and mentions "consistent front-to-back and side-to-side tonal balance" as a crucial aspect.

This can be particularly tricky to achieve with run-of-the-mill loudspeaker systems that excites the room in bad ways, with reflections causing cancellations and uneven coverage resulting in dissatisfied concert visitors.The entire system is powered by Boses first real amplifier system. For the engineers in professional audio, it might come as a bit of a surprise to hear that it's developed partly by Boses car audio division. The reason?

- There's no, and I mean zero, margin for stuff to break in that field, Allén points out. Imagine a major car manufacturer having to issue a recall because of something the audio company supplied:

- You'd be gone the next day, Allén says – only half joking. He explains the process after the Pro Audio division decided to borrow tech from the Car Audio division:

- They're completely digital, no mix between class AB and D – D all the way. We demanded that it'd sound as nice as the great AB class and spent years on end achieving this.

There was one time, according to Jörgen, that they were doing a field test in the presence of some 50 audio engineers and were playing at full concert levels: the 15-inch cones were hardly moving at all. That's when you're sure the amps are in control of the speakers. Integrated into the amplifiers are the loudspeaker processors and system DSP, keeping the amp's 4000 watts of power in check and allocated between two to eight channels.

The installation in Kompassen was managed by Bose Pro Partner Bigelius Production AB. The audio engineer who actually got down and dirty during the installation, Vilhelm "Ville" Thisner, tells the inside story on the installation:

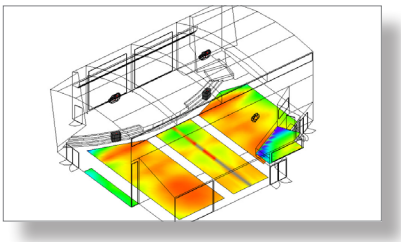
- We spent countless hours there running cables, says Thisner who's been working at Bigelius since 2005 and continues:

- Actually rigging the loudspeakers, well, that took an afternoon.

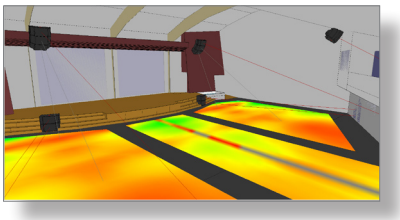
When doing the computer model of the room, Tomas Carlsson and Jörgen Allén saw some specific issues that had to be adressed. Many surfaces were constructed using a one-plane steel cassette which is "very economical" according to Allén, but hardly the ideal surface if you want controlled reflections.

- Exactly everything is reflected from it, says Allén who continues:

- We can't send any sound at all close to that wall, and we could accomplish that during the design of



Images from Modeler®:Direct Field Coverage at 1-4kHz



the RoomMatch system. If we'd been using conventional loudspeakers in the hall, I think one would perceive the reverberation time as longer, worse tonal balance due to the reflections and the overall coverage as worse.

Jörgen Allén with the Auditioner system, allows customers to hear how the proposed system will sound before it is installed.

As a Field Engineer, the job of Jörgen Allén has been to allow the clients to listen to what the architect and acoustics designer has accomplished and then design the system to suit the needs of the clients. Bose's room design system, Modeler, has been in use since 1985 with the purpose of allowing the designers to make acoustic predictions so accurate that the company guarantees every installed system to sound as modeled.

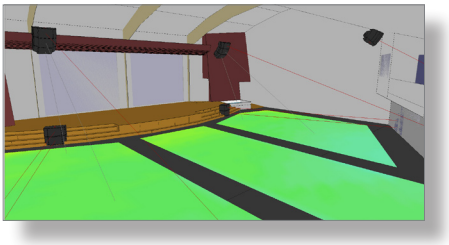
Conference room with Panaray® MA12

- If the installation isn't up to the task the first time it's started, then you're a goner, says Allén. Fortunately, the more complex a room, the more reliable the results are in his experience.

The combination of Modeler and Auditioner is so potent that he claims he'll "change jobs" if someone told him he couldn't work with it any more:

- We're living in a world of cheating here, where we can listen to the result before it's installed. It's that good, and that makes us comfortable to give real recommendations and guarantee the quality of the install based on this, he says.

The recommendation given, and installed, was three array speakers per side over five meters up in the air, plus four subwoofers on the floor. In order to form a progressive array, the top speaker is a very narrow 55° x 10° throw, followed by 90° x 20° and finished off by a broader 120° x 40° module. An additional 12040 unit was also installed further out in the hall to cover the most important seat of all; the audio engineer's mixing desk.



Speech Intelligibility calculated as STI

About that quality they mentioned, what happened when everything was in place? According to Vilhelm Thisner from Bigelius, things were tight just before the opening:

- The house itself was finished but the final installation of power lines hadn't been completed so we left some makeshift solutions for that, but when we fired up the system the first time we were amazed, he says.

- I thought the sound was great at first, but then Bose came to make the final system adjustments and then it was… Really, really great. It's very nice and controlled, says Thisner. And he's not the only one who's happy:

FreeSpace® DS40 speakers pendulous from the ceiling in the café

- From where we're coming, it's a great reference installation says Tomas Carlsson, Sales Engineer of Bose and continues:

- It's almost a showroom of Bose products, he concludes. Church chairman Mikael Bergman is also a happy camper:

- We're just so pleased, he says, speaking of both the new premises and the audio system:

- First priority was that we'd get a system that our staff could handle on their own when we're not doing very complex productions. Even our services are, more or less, concerts with speech, singing and instrumental music it's very important to us.

- Things have turned out as I expected and I'm very happy, Bergman says and reports that he's gotten several comments from the congregation members that the audio is excellent.

And that, in the end, is what's most important. ■

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