

Immaculate install

The ability of certain line array loudspeakers to use DSP to 'steer' the sound they produce is proving its worth in many houses of worship. **Richard Lawn** visits the Cathedral of the Immaculate Conception

LOCAL AUDIO AND A/V

contractor Tom Lee Engineering has provided many sound solutions to houses of worship in Hong Kong, and has earned an enviable reputation for providing systems with clear speech intelligibility. For the Cathedral of the Immaculate Conception, the company again opted to install an Axy's Intellivox column speaker solution, using a combination of DC115 and DC180 models, following Ease software analysis of the acoustics.

Located in the Mid Levels district of Hong Kong Island, the Cathedral of the Immaculate Conception was consecrated in December 1888 following five years of construction. Built entirely of granite, the English Gothic style cathedral is 20m high, and measures 62.5m in length and 30.2m in width at the transept and 18.6m at the nave. The sound system that was originally installed consisted of 48 5-inch speakers arrayed vertically in groups of six and 12, but without the correct design considerations to avoid the interference that resulted in uneven dispersion and problems with excessive reverberation. The Intellivox speaker system now in use is clearly a case of less is more, replacing an abundance of inefficient speakers with fewer, correctly installed columns.

With the new system, the old mixing console and rack-mounted amplifiers, gates, compressors, feedback suppressors and graphic equalisers are now redundant, freeing up valuable church office space in the rear where they were previously installed. The DC180 speakers are all self powered and have digital signal processing capabilities that can be monitored and controlled via a laptop computer and Axy's software.

The main challenge facing Tom Lee systems design engineer Danny Wong was to devise a system that would give a high direct-to-reverberant sound ratio – one capable of maximising the level of speech arriving in the seated areas of the widely spread congregation while minimising the sound energy reflecting off walls, ceilings and other acoustically reflective surfaces. By using DC Intellivox speakers, he was working with an integrated system that includes amplifiers and DSP capable of controlling the vertical directivity of the sound via the Axy's WinControl software run on a laptop. Using the software, the system can be configured, and all



Temporary installation of DC430 for evaluation



Final installation of the loudspeaker columns



Complete installation in the foreground with old and test installations behind



The cathedral nave and organ, showing the pillars used for loudspeaker placement

relevant status parameters and temperatures can be monitored via an RS485 network. As well as assisting with the set-up, this means that any operational failures can be reported by WinControl. A single Furman Sound PS8E power conditioner regulates the incoming power supply and ensures that the electronics in the column speakers are not exposed to power surges or spikes.

The equalisation for the speakers was determined by ConEQ (convolution equaliser), which is the first Acoustic Power Equaliser

available for use as a sound analysis tool.

Traditionally, an installed audio system's frequency response is equalised on-axis, with off-axis sound largely ignored. While the on-axis sound is heard directly, and is most important, the off-axis sound reflected off walls, floors, ceilings and furniture can represent as much as half of the sound heard in rooms with good acoustics. ConEQ takes roughly two minutes to measure a speaker's frequency response at over 400 sample points spanning

all radiation angles, and equalising the whole effective signal from the speaker. The automated measurement process is conducted using a single microphone, and the accumulated measurement data is analysed and calculated to generate coefficients, which are used to build the equalisation curve. In addition to the large indoor system, the cathedral has an outdoor shrine with a water fountain paying homage to Mary, which is served by two Technomad Vernal 8 speakers.

The challenge offered by the Cathedral of the Immaculate

Conception is consistent with that of many large spaces – not only worship spaces, nor only traditional buildings.

The availability of sound systems and the expertise of integrators and contractors to use them are playing a large part in our quality of life, whether attending a church service or passing through an airport or train station.

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The cathedral exterior



The Technomad installation outside the cathedral