Nidarosdomen

EXCLUSIVE FOR INSTALLATION EUROPE

A Renkus-Heinz Iconyx digital array system met a modern challenge for Norway's oldest cathedral

Group photo, left to right: Consultant Frode Bye from COWI; Gunn Karlsaune of the Nidarosdomen and Nidarosdomen technician Sjur Olsborg

By any standards creating a sound reinforcement system that could be discretely heard, yet remain virtually invisible, in one of Europe's most historic cathedrals, would add up to a fascinating challenge for an audio pro.

So when Frode Bye, a senior engineer at the Norwegian acoustics department of Danish multinational COWI, took the call his delight at the request was tempered with awareness of the sensitivity of the task ahead. His design – implemented by Renkus-Heinz's Norwegian distributor Benum A/S, represents a European landmark for the Californian manufacturer's Iconyx digitally controllable column array, as the largest project of its kind on the continent since the product's 2006 launch.

The altar of the soaring Nidarosdomen (Nidaros Cathedral) in Trondheim, Norway, marks, according to legend, the spot where King Olav Haraldsson was buried after his death in the battle of Stiklestad in 1030. A restoration and reconstruction programme began in 1869 and continued for more than 130 years. Today Nidarosdomen attracts around 400,000 tourists annually, making it one of Norway's premiere visitor destinations.

ACOUSTICS ANCIENT AND MODERN

The sound reinforcement system was a critical technical element of the restoration project and had to meet design criteria that went beyond the norm for historic buildings faced with 21st century expectations.

The real challenges were posed by the way in which the 1,700-capacity space is used, rather than the acoustics – the average RT within the soaring granite arches and pillars is a reasonably manageable four seconds.

The cathedral, in daily use, holds some 300 worship services a year, as well as funerals, weddings, state occasions, innumerable televised concerts and organ recitals

Orchestral and choral performances and Christian pop and rock also regularly feature – performed either in the nave with the choir, the eastern presbytery or the north and south transepts that extend from the central crossing.

Lessons, readings, recitals and music – and thus the primary sound source – may emanate from any point within these locations, and two or more of these areas may be used simultaneously.

Frode Bye comments: "There was a lot of dissatisfaction with the old sound system; people are used to hearing crisp, articulate speech and high musical quality at home and in other public places. They want to hear what is being said and played clearly."

He adds: "We did some initial reverberation measurements but that really confirmed what we already knew: for a cathedral, the reverberation time is not very long, yet intelligibility could be very poor in many places.

"Localisation of sound sources and controllable directivity were the most important things because directivity is also so important for intelligibility."

The other two major factors were musicality and visual impact. Column loudspeakers would be a logical solution but have not historically been designed for high quality musical reproduction. At Nidarosdomen, to have any chance of acceptance by the custodians – both local and national – of the ancient building, they would have to be both near-invisible and highly musical.

Bye: "We were looking for a high degree of musicality because we want to use the system for concerts and have very high fidelity music reproduction. Most concerts here don't need a huge sound system; a compact system is sufficient but it needed to be of very high quality."

AN ICONIC DESIGN

While the church's usage requirements were leading Bye in the direction of a multiple-zoned system with multiple input locations, the other influencing factors of aesthetics and musicality came into play.

In the initial design stages some two years ago the consultant conducted his first experiments with digitally controlled column arrays and comments: "I listened to a modern column system and was quite impressed with what could be achieved with it. I thought a lot about it and believed that this kind of solution would be right for this church. As I continued working on the project I learned that Renkus-Heinz had their Iconyx Series coming out and had delivered a few projects already, so that came into the frame as well.

"We were convinced to go with it for two reasons. One, because the musicality of the Renkus-Heinz product meant we could do more music without hiring in sub-systems. Another was that the price points meant we would have more money to spend elsewhere in the system budget."

Meeting the low-visibility, minimal intrusion requirements was achieved by exploiting the Iconyx cabinets' digital beam-steering capabilities which allowed the enclosures to be mounted flat against the pillars. The cabinets were also painted to precisely match the colour of each individual enclosure's location.

Gunn Karlsaune, who represents the Cathedral's interests for Norway's Ministry of Culture and Church Affairs, told *Installation Europe*: "Everything had to be approved by the department because of the church's importance in Norway. Great attention had to be paid to the colour of the loudspeakers. It also helps that there are fewer speakers than before, and those are much less visible than the old ones, partly because they don't have to be tilted. Everyone was surprised how invisible they were."

Four Iconyx IC16 cabinets, each sporting 16 individually-amplified and DSP-ed 4"/1" coaxial drivers, face into the nave from corner pillars. The four-corner setup is repeated in the similarly-sized presbytery – the east wing. With the Steinmeyer organ at the west end in use, perhaps with the choir, the east-facing pair of IC16s is used to cover the nave area, delayed into the presbytery if necessary using that area's own pair of east-facing IC16s.

Conversely, when a service is taking place at the eastern (high altar) end, the loudspeaker configuration is reversed, the west-facing pairs taking over as primary and delay systems.

In the outlying north and south transepts, a single IC8 faces into each transept from the crossing point – the cathedral's central atrium. A single IC16/8 – containing 16 coax drivers, amplified and DSP-ed in pairs rather than individually – is mounted on the far wall of each transept. These systems can be operated individually or in unison with cross-delays programmed in as appropriate. In any event, there are only ever two loudspeakers in operation in each area of the church.

In installation terms, the self-powered Iconyx system's CobraNet-native design allowed the slender CAT-5 and mains cables to be discretely chased into the pillars' cement work.

SIMPLE OPERABILITY

As with the vast majority of churches the sound system must, at times, be operated by non-technical personnel. This called for simplified control over the multi-zone / multi-delay loudspeaker configurations, and Bye's chosen solution comprised Medialon Manager Panel control software via an Yamaha DME64 matrix mixer.

A central control rack is located deep in the cathedral's basement where the Medialon PC, the DME64, Yamaha TH200 distribution amplifiers and a patch panel are housed in the historic vaults and feed audio via the CobraNet / Ethernet network to the loudspeaker network up at ground level – a network of 100V line loudspeakers also provides foldback to other rooms around the building.

The Medialon setup provides touch-screen control over three main modes – 'Guide Announcements', 'Sermon' and 'Music/Orchestra'. The Crestron touch screen itself – which sits atop a small playback and recorder rack tucked into a wall niche in the north transept – displays a schematic of the church [see image] and provides simple switching between these three basic setups, plus more detailed selection of microphones and loudspeakers if required. A Medialon Rugboard wireless LAN touch screen tablet extends remote control over the system from everywhere else in the church.

Wired and wireless Shure and Sennheiser microphones take care of spot positions and are available to visiting broadcasters via multiple splitters and patch panels in some 20 locations around the cathedral – COWI and Benum having made sure to look after everyone's interests.

The same flexibility extends to manual sound control, as the option to insert an audio console for full live mixing control by a professional sound engineer was considered essential by the team.

Karl Brunvoll, vice president of international sales at Renkus-Heinz, said he had been impressed by the consultant's attention to detail. "One of the things that we noticed when we got involved here was how much hard work had gone into the original specification by a qualified consultant, who was then kept onboard throughout the whole process. We were very impressed by the work and detail that went into it; we don't often see specifications that are so well thought through."

Frode Bye concludes: "We've had positive a lot of feedback from the users since the new system went in as well as people working there or people visiting from other churches. Even those with hearing loss comment on the sound quality; they can finally hear what is said."

SIEBDAR: COWI

Bye's division within COWI has its origins in two formerly independent Trondheim companies which merged, the combined operation eventually being bought out in 2004 by COWI. Bye and his 25-odd colleagues provide acoustics and electro-acoustics consultancy and system design both in Scandinavia and internationally.