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DOES AV DELIVERY NEED TO CHANGE?

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Singapore: MICA (P) 017/06/2020 PPS 1604/05/2013(022953)

A total of 30 d&b V- and Y-Series arrays are suspended from the roof of the MCG

The ‘G force

The MCG’s upgrade will be enhancing audience experience once a return to the stands is permitted. **Richard Lawn** reports on changes at the world-famous Australian sports ground

THE BIGGER THE VENUE UPGRADE, THE GRANDER THE expectations, challenges and pitfalls associated with them. The Melbourne Cricket Ground (MCG or the ‘G) was upgraded with a full-range audio solution in time for the 2006 Commonwealth Games, suffering subsequent exposure to the extreme seasonal weather ranging from freezing winter winds roaring off the Southern Ocean to baking hot summers. Like the cricket, football and rugby fans who flock to the venue, it is also required to resist the elements.

To maintain the MCG’s status in the competitive Australian stadium market, a weatherised PA audio replacement was warranted that would significantly enhance the audio experience across the 100,024 seats. Accordingly, the Melbourne Cricket Club (MCC) committee pledged an A$25 million investment to improve the stadium experience for fans. Having successfully overseen the audio upgrade for the Sydney Olympic Stadium in 2013, Auditoria director Scott Willsallen was invited to discuss his ideas with the MCC some 12 months later.

“For the Olympic Stadium project, I really wanted to demonstrate a working example of what immersive stadiums can sound like,” explains Willsallen. “When the open tender was disclosed, my colleague and senior consultant Luis Miranda and myself travelled to Melbourne for meetings with each department of the stadium. These included operations, assets, general management, venue management, event management and all the other factions constituting the stadium business. It was not a formal interview and, as such, we were not sure whether we’d done well or not.”

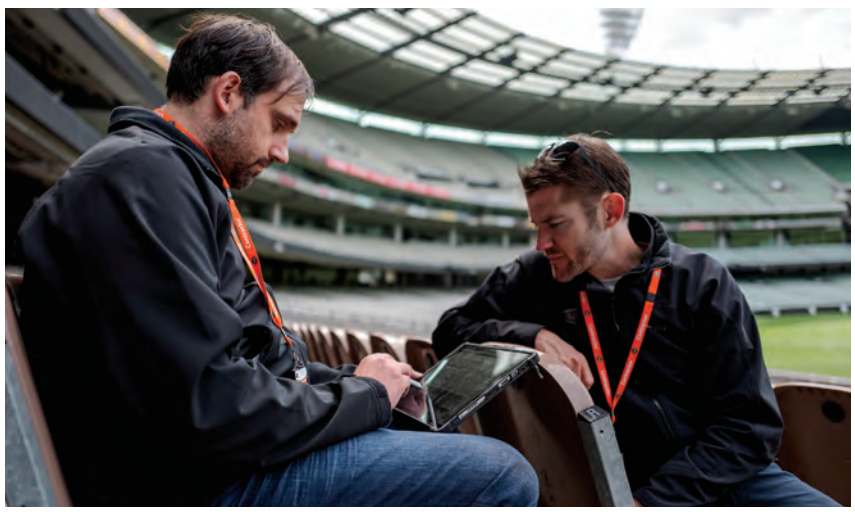
However, the meeting signalled success for the Miranda–Willsallen double act. Together with the appointment of Diversifed (formerly Rutledge AV) as the head contractor for the vast systems integration, the pair would form a formidable off-field team.

From initial tendering to final commissioning, the timescale of less than 18 months would severely test the experienced Diversifed team. “To push through that sort of revenue in a short period of time was always going to be a challenge,” recalls Diversified project director, Matt Edgcumbe. “In terms of size, the Melbourne Convention Centre was similar, but that was spread out over three years rather than 12 months, so it was a very tight timeframe.”

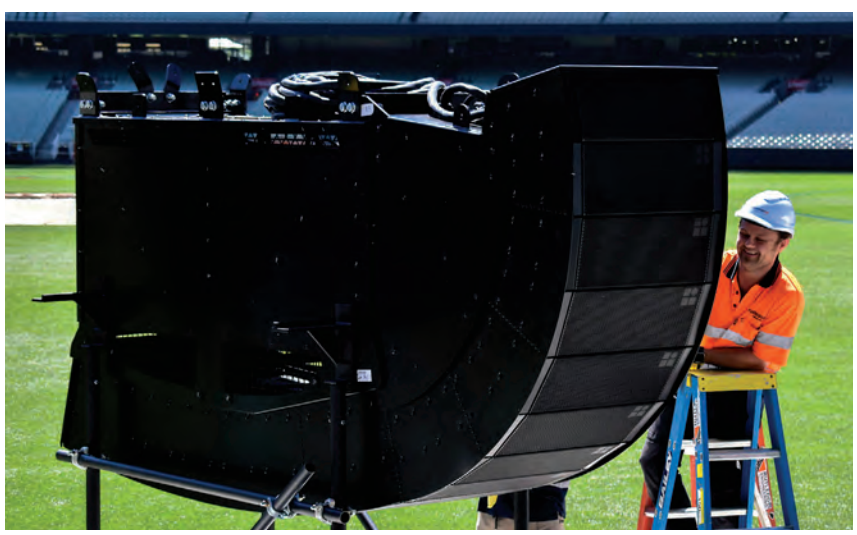
Auditoria’s vision was to provide the best audio to every seat in the house. Miranda and Willsallen carefully considered every facet of the audio journey in the finest detail, from the moment fans enter the gates, stroll through the concourses and bar areas and ultimately take their seats in the bowl.

Willsallen is the first to testify that the works conducted at the MCG were no ordinary upgrade. “The directive of the MCG board was that the audio would enhance the fans’ experience to create an exceptional game day by connecting the fans with the on-field excitement and drama,” he explains. Having adopted a Smart Stadium Strategy seven years prior to the upgrade, the MCC had been actively measuring

L–R: Auditoria’s Scott Willsallen, Justin Arthur and Luis Miranda



L–R: Auditoria's Justin Arthur and Scott Willsallen considered every facet of the audience journey



d&b V- and Y-Series modules await hoisting up to the roof

Preparing for liftoff

the fan engagement and experience. "This was not empty PR speak – it was a consistent theme in every meeting," says Willsallen. "The audio would need to communicate to 100,000 spectators, so intelligibility was key. If you're sitting at one end of the MCG and the action is occurring at the other, the stadium's audio has to transmit information as well as entertainment."

Willsallen's other concern for the MCC was how the venue was going to entice fans back from bars and homes. "The stadium is iconic for its size and so the experience had to match this expectancy," he adds. "You have to convince potential spectators to come out of the comfort and warmth of their homes with their HD displays to travel across town, quite possibly in the rain or blistering heat. They then have to either park their car or take public transport before travelling home again. So you really need to develop a structure that people want to gravitate to and feel part of."

To enhance the fan experience, Willsallen did his homework by attending sporting events to gain a better insight. "What happens when a spectator leaves their seat and heads to a bar? What are they listening to? If a goal is scored while they're away, they shouldn't have to miss out; they need to remain connected to what's happening in the field. In addition, what role is the audio playing in the fan experience when entering the stadium from the car park or the station? Is it easy for them to find their seat or make their exit, especially if they are supporting the opposition? It's not simply about enhancing the audio once the ball gets kicked – all the different elements constituting the experience need to be considered."

Having identified that 100,000 people can either be simultaneously in their seats or elsewhere, such as one of the bars, Willsallen designed the MCG as a 200,000-capacity venue. The modern stadium today cannot simply rely on a once a week or fortnight sporting event; its use needs to be maximised. Therefore, corporate events, weddings and other smaller events need to be staged on other days to maintain profit. Fortunately, the MCG is in close proximity to Melbourne's CBD and benefits from great transport links, with event organisers viewing it as a prestigious venue for their clients.

Prior to the audio upgrade, the 'G's first-phase makeover included the adoption of 5G high-density Wi-Fi, 326m^2 of LED ribbons, Daktronics vision boards and 2,000 IPTV displays. Inconsistent audio coverage in the 'G led to the second-phase upgrade. Prior to the audio systems being installed into the bowl PA, concourses, bars, exits and entry points, a comprehensive EWIS (emergency warning and information system) had to be interwoven into the architecture.

"Depending on budget, three options were available to the MCC," explains Willsallen. "Firstly, a hybrid model with repairs and improvements to the existing PA; a second whereby the speakers in the seating bowl would be replaced; or an entire stadium upgrade. Fortunately, the budget was made available for a complete upgrade."

Having transplanted himself into the role of spectator, Willsallen devised two designs for the bowl. "Normally, the bowl accounts for up to 70% of the audio budget," he explains. "However, for the MCG, it was only about 40% because so much more coverage is needed beyond, including the concourse restaurants, bars, conferencing facilities and meeting rooms. Even though I had already spent six months in the building during the Commonwealth Games, I did not fully comprehend the scale of this project. It was imperative, therefore, to create a spreadsheet for identifying every single room in the building. Ultimately, we listed a total of 3,127. Of course, not all of those rooms require sound reinforcement, but an evacuation PA and voice announcement system was needed."

Rather than select varying bespoke brands for different aspects of the audio design, Auditoria finally proposed one. Based on a combination of factors including weight, cabling, output, coverage and supplier support, d&b audiotechnik was ultimately selected. "Working with one reputable manufacturer's catalogue made life a lot simpler," explains Willsallen. "Using one amplifier platform was the basis for the entire stadium design. In addition to their amplifiers, d&b manufacture a wide range of installation and concert-grade

Key personnel

Melbourne Cricket Club
General manager, IT and innovation: Rey Sumaru
AV and broadcast lead: Timothy Phypers
Project manager: Susi Schroeder

Case Meallin:
Project manager: Emma Pearce

Diversified:
Project manager: Dan Woodward
Project director: Matt Edgcumbe
Project coordinator: Susanna Salmi
Site supervisor: Tim Lesich
Project assistant: Tegan Collier
Design engineers: Paul Jamieson, Menaka Gunawardana
CAD: Mehak Bansal, Jarryd Edgcumbe
Field engineers: Victor Laubscher, Jesse Widgery
Network engineer: Alex Bollom
Sales/bid manager: Shane Cannon

Auditoria:
Principal: Scott Willsallen
Senior consultant: Luis Miranda

ITE:
Project manager: Frank Agosta
Engineers: Martin Clenick, Frank Hall
Supervisor: Andrew Agosta

Vertigo:
Project manager: Daniel Hutchinson
Supervisor: James Kiely

Able Industries:
Project manager: Michael Martyn
Engineer: Andrew Briggs

loudspeaker products that meet architectural demands. In terms of servicing, it didn't make sense to select different brands – d&b's Australian distributor NAS is both local and highly renowned."

The Auditoria data and documentation saved the Diversified team an enormous amount of time onsite. "Having such detailed designs available at the start allowed us to pull the cables with confidence," comments Edgcumbe. "We were familiar with the site, so we decided to install the bulk of the cable during the cricket season in January and February when there are fewer disruptions."

The MCC approved Auditoria's proposal to create dedicated entry and exit infrastructures for announcements. "I found that the eyes are easily distracted by multiple things happening on game day, so spectators can be guided both in and out of the stadium by their ears," evaluates Willsallen. "You don't need to rotate your head when using your ears. In addition, information that's delivered aurally in front of you has a higher priority than from any other direction. When entering the stadium, the information required needs to be directed from speakers pointing at you and as you walk towards the stadium, without any sound following you. When exiting the same gate, a separate set of loudspeakers announce specific messages for fans walking towards unique exits. The information received by the ears is specific to that particular exit, so the fan knows exactly where to go."

Traditionally, stewards standing outside the gates used a radio microphone to relay general information to the crowds. Willsallen opted for pre-recorded messages saved as presets, which could be placed in queue lists with gaps between messages. "If you can identify a problem from the CCTV at the different gates, the operator can change the messaging to improve the movement," adds Willsallen. "For example, if a family with children is heading to the stadium for the first time in years, it can be quite an intimidating and stressful experience. The more information you can provide, the more confident they will feel entering and exiting the stadium."

Two speaker systems work together to deliver messaging for fans entering the 'G. Weatherised d&b 12S models above the entry gates direct those entering from a 60m distance, with rows of xS 5S speakers providing less frequent and more specific messages such as having bags for inspection and tickets ready upon approach. "A separate PA system of 5S surface-mount speakers comes into operation following the event, providing information such as public transport announcements. For a relatively low cost, the audio in these zones combines intelligibility and power."

Owing to its sheer size, together with the contrast in height and structure between the north and south grandstands, the bowl PA became the main focus of Auditoria's design. "We started from the top and worked our way down by maintaining a focus on the performance and frequency response regardless of the zone," explains Willsallen. "Owing to the arc of the roof in the north stand, the shape of each frame had to be customised. Therefore, the architectural drawings had to be accurate and validated with a survey."

At the outset, Auditoria modelled 12 different PAs in the bowl in which careful consideration was given to the capacity of the roof structure and the building's architecture. With the preliminary structural engineering and calculations conducted and the design agreed, Wonder Works created animations and modelled the venue in 3D with the audio system.

Ultimately, 30 arrays combining V- and Y-Series modules were affixed to the bowl with custom-built frames. Of the 495 cabinets suspended from the roof, 454 are array speakers, with another 41 serving as delays. Providing long-throw and short-throw capabilities respectively, the V/Y combination was successful in providing even coverage to every seat, including the 20–50m throw to the lower seats in the northern stand. "The gain difference between the two is minimal, but the larger V12 module is more efficient," adds Willsallen. "If the throw distances are similar, the same speaker would need to be used in the lower bowl. It took a little effort to glue the upper and lower bowls together acoustically, but the transition landed on a gap quite deliberately."

In the upper bowl, there are twice as many arrays focusing on the seats as there are in the lower bowl. A total of 28 arrays integrate three V-Series subwoofers in cardioid mode with some delays for pushing more energy into the lower bowl. "This pattern control robs the upper bowl a little, so we added a delay cardioid sub to fill the gap. With this broadband coverage, every seat has been designed to be musically exciting in addition to intelligible," explains Willsallen.

Work was conducted between football and cricket seasons

North stand atrium, level 4

d&b V- and Y-Series modules are affixed to the bowl with custom frames

With the design of the bowl PA precisely modelled and transferred to architectural drawings, Diversified was then tasked to apply these to the real world. “There was a lot of mechanical design work to be completed, particularly revolving around the rigging and hanging of the speaker trusses from the roof,” explains Edgcumbe. “This was a major design challenge because the original design had the clusters in and suspended on winches for flying in and out quickly in case of an extreme weather event. Ultimately, the roof engineers concurred that such a precaution was unnecessary, allowing us to revert to a traditional, dead hung design.”

Having installed the loudspeaker components adjacent to the catwalks prior to the 2006 Commonwealth Games, Diversified was now charged with decommissioning them. Although the arrays needed to be suspended as close to the edge of the roof as possible, rigging points and access proved to be fairly inaccessible. In addition, the structural load was insufficient for the calculated weight, particularly for the loftier northern stand.

“We needed to devise a method for there to be enough structure to hold it up, but it would be light enough not to buckle under extreme winds,” explains Edgcumbe. “Ultimately, we proposed an aesthetically pleasing and lighter solid steel structure plus bracketry that would be fixed to the roof with architectural rods. This also provided some flexibility when angling them to the roof. We subcontracted Able Industries to shape the metal structures before calling upon the expertise of technical riggers, ITE and Vertigo, who hoisted themselves up 40m to attach the individual arrays. Each array is a mechanical design masterpiece.”

Diversified was forced to abandon its original plans to gradually install the arrays around the bowl during the football season. “We soon realised that it was going to be problematic introducing cranes and plant machinery onto the field of play during the winter,” says Edgcumbe. “The MCC is very precious about its turf and deploys grow lights, shining them onto the grass so that it can continue to grow during the winter months. Ultimately, we conducted the works in the four weeks in between the football and cricket seasons. By leasing a factory in Collingwood, all the arrays were preassembled in just three weeks prior to going onsite. Once driven into the stadium, each array was then hoisted with a crane from a position in the seating area.”

A total of 18 ELV rooms in both the old southern and more recent northern stands house the 273 d&b audiotechnik 10D, 30D and D80 amplifiers that drive the loudspeaker network in the bowl, under-balcony zones, dining areas and premium bars. Given the architectural limitations, the Diversified team created impressively short cable pathways to trunk the vast infrastructure of 6mm and 8mm cabling.

The complexities of the bowl PA are exonerated by the existence of 57 under-balcony bays. “I had to put a lot of effort into building up the same energy levels as the remainder of the stadium in terms of SPL and bandwidth,” declares Willsallen. “Acoustically speaking, the worst seats are the under-balcony seats and, in a stadium that is so layered, there are thousands of under-balcony seats.” With an 18m depth, the level 1 under-balcony area has a shallow seating tier. “Given the depth and the narrow aperture, there is very little energy being directed from the main sound system to provide any real energy to the under-balcony seats. Ultimately, I decided to treat each individual zone as a separate venue.”

With system compatibility in mind, each of the 57 level 1 under-balcony bays has been outfitted with four E5 and four E8-D cabinets together with a 15-inch cardioid sub affixed to the structure behind the visual displays. “Blending into the stadium’s architecture, compact S5 cabinets have been installed for the seats that are not covered by the bowl PA or the dedicated under-balcony systems. Now, the under-balcony areas are furnished with their own dedicated full-range audio systems with minimal energy spilling back into the bowl. Crucially, we managed to create a seamless audio transition for spectators when they are moving.”

A Q-Sys digital audio routing system serves as the matrix for relaying recorded messages to the designated zones on the correct game day, including the guest areas and suites. Pre-recorded entry and exit messages to 2,806 d&b audiotechnik and QSC speaker outputs can be overridden manually when required via the call stations outfitted with Q-Sys PG-1600 gooseneck microphones. Specified primarily for its audio control attributes, Q-Sys also integrates with the BMS and operates over the IP network to control the LED ribbon boards, digital PA and IPTV. The two dual redundant Q-Sys Cores provide AES digital audio and analogue backup. A further 43 CXD8.4Q networked amplifiers drive the bars, concourses and BOH areas. Two Optocore signal transport systems are being used, one for Q-Sys and one for the DiGiCo SD9 and 4REA4 mix engines in the control room, expanding the DiGiCo capacity and providing network devices to add scope for inputs and outputs to be patched from the console with the final link to Q-Sys via dual redundant AES/EBU connections.

“Ewan MacDonald from the Q-Sys distributor TAG in Sydney made the whole process clear and informative, giving us the confidence to specify it,” adds Willsallen. “The Diversified programming team went to a lot of effort, not just to deliver what was needed according to the specification, but by working with the operations team to develop a user interface that they’re excited to use.”

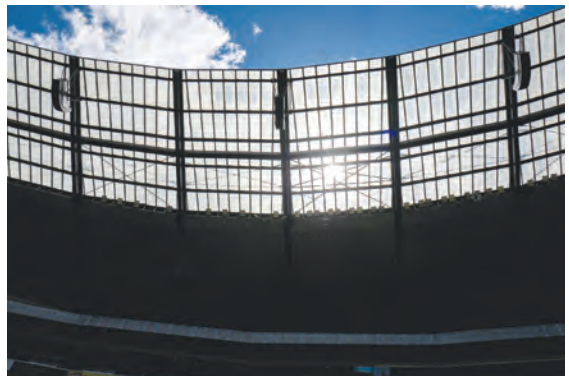
Auditoria specified 20 dual-element shotgun mics around the stadium to extend the bowl atmosphere to the indoor bars, function rooms and concourses. “The goal was to improve the audio quality for the broadcasters who had previously cited feeling disconnected from the sport and not being able to engage in the games,” explains Willsallen. “I then looked at removing the barrier of engagement in the premium rooms by adding a microphone with a variable pattern that can be adjusted on a preset basis remotely. The operators can vary the parameters of the shotguns, such as the balance of the mid to the side. The balance of a particular microphone is fed into the stereo and mono mix before being saved as a preset. It is then fed into the Q-Sys system and distributed to all of the restaurants and bars.”

Auditoria realised that the bars and corridors could become a deterrent to spectators prior to the game and during any intervals in play. As such, Willsallen convinced the MCC that the background noise of the under-balcony seats and atriums of the north stand could be better controlled by adding 3,000m^2 of 100mm-thick Megasorber sound absorbing material. “High costs and weather durability always deter the treatment of vast concrete surfaces in such a reflective environment,” muses Willsallen. “For the concourse areas, I had to consider the concrete roof, the concrete and glass walls and the noisy stadium where congregating spectators are trying to order beer

Technical riggers attach arrays at 40m up

Blue skies were a welcome sight for the Diversified contractors on top of the ‘G

The mezzanine of the MCG’s Long Room



The roof of the north stand

and chips yet cannot hear what the vendor is saying because of the noise emitting from the bowl. So much acoustical energy is being pushed into these spaces in addition to the crowd noise that I took the rather unusual step of adding acoustic treatment. The difference in terms of intelligibility is staggering. You can walk from a treated bay in the northern stand into an untreated bay in the south and be amazed by the difference, even when the stadium is empty."

Live productions no longer rely on hiring loudspeaker systems when hosting either small- or large-scale events. For such occasions, the main system control room – equipped with a DiGiCo SD9 console, Waves SoundGrid plug-ins, DiGiCo 4REA4 mix engines and an inventory of Shure Axient digital mics – takes on special significance. Willsallen is keen to highlight that the MCC can repurpose its existing speakers for bespoke entertainment needs.

The very narrow dynamic range of a stadium makes it a highly complex, unusual environment. "Once you've taken into account the background noise and the maximum level you can operate at, the gap between the two is quite small," explains Willsallen. "With added enthusiasm from the crowd, that gap narrows. Few operators know how to operate a console in such a scenario. As such, we've started to add Waves plug-in packages on consoles for stadiums because they provide a level of processing that doesn't normally exist."

Auditoria added many nuances that are performance-based, with others designed to add efficiencies, making it more affordable and hence appealing to smaller corporate event hirers. "The control system needs to deliver a set of tools that an operator can manage and so we've tried to add efficiencies should a corporate event need to be hosted on the field of play. If that also requires a video package to be added, we have enabled that. Normally, a team of four people would be required: an audio technician, a video switcher, a VT operator and a technical manager. Now, a video tape operator has a fader panel that allows the operator to adjust the levels using a couple of inputs. This has been made possible by adding the DiGiCo 4REA4 platform."

Auditoria's Scott Willsallen with MCC delegates surveying the proposed works on top of the 'G

Despite the renowned system integrator's 40-year pedigree, Diversified is aware that this project represented a steep learning curve. "We certainly learnt that you cannot undertake a job like this by trying to do it yourself; you need a lot of help," confesses Edgcumbe. "In addition, the implementation of a project can only be as good as its documentation, so you need the client to agree to the project's requirements in writing. Difficult questions arose which led to long and sometimes difficult conversations, but we eventually arrived at a point where the MCC appreciated the outcome of the design."

2020 – the year of Covid-19 and empty stadiums. "It will be so good when we can throw the doors open again and fill the place with people," concludes Edgcumbe. "Everyone connected with the MCC has a very strong passion for the enjoyment of sport, they love the stadium and the opportunity to provide an environment that spectators enjoy. There is a pride in it all."

When fully attended events restart, the stage is set for an almighty roar from the 'G's capacity crowd and a fully integrated audio upgrade designed with the fan in mind.

www.auditoria.systems
www.mcg.org.au
www.nas.solutions
www.onediversified.com/au