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Muse

Eight stadium shows does not a summer make, (with apologies to Aristotle, never knowingly a fan of rock and roll). Muse, we might surmise, have taken leave of their senses. View just one photograph and the presentation is self-evidently expensive, yet surely no bean-counter worth his salt would sign off on this kind of investment for just eight shows? They could have scaled up their year-long arena production, but no - they took the expensive route, completely redesigned their show, and we have to conclude this is solely an indulgence for their fans.

In terms of a viewing spectacle it certainly ticked all the right boxes for stadium rock; and let's face it, Muse do have something of the bombast about them. Eye-watering video landscapes, a rather pleasing modernist take on stage set design, and in a sign of yet further profligate spending, an entirely rational response to noise pollution. "The sound regulators at San Siro [Milan], Stade de France [Paris] and Wembley [London] in particular are all concerned with the inhabitants living close by," said Muse's FOH engineer Marc Carolan. But Muse are necessarily a loud band? "We have taken a double ring of delays to achieve both things, high SPLs in the stadium, reduced SPLs outside," he says.

In terms of audio management, double delays is not rocket science - any stadium show could do similarly, but most don't. Arguably, sustaining the value and quality of live performance should be an increasing focus; performers and record companies alike are now realigned to the new revenue stream so they'd better think about maintaining it.

"We discussed this with all the promoters and agents," said production manager Chris Vaughan. "Yes you get additional seat kills, and yes it does cost us more in terms of transport and rental, but the benefits are tangible. No noise complaints - well, just one in Milan - and a very satisfactory response from the fans. This band scour YouTube every night, and believe me they let me know if they think something is wrong with the production."

Vaughan did recount a tale from the start of the Arena leg autumn 2009, when a kabuki drop snagged one of the 'skyscraper' screens above stage. "They did pull my leg over it because I had warned that this was inevitable. But the point is today's bands can, if they choose, be in direct contact with their fans' experience after every show."

Words & pictures by Steve Moles

That sound quality is so important presents quite a conundrum in the live context. Muse fans are typical of the iPod generation (a sound storage system that by definition reduces and compresses). They accept these compromises because of the convenience, yet they appear to become very discerning in the live environment. Carolan and I had quite an interesting discussion on the psychology behind this anomaly. (*This is your brain on music* by Daniel Levitin, and *Musicophilia* by Oliver Sacks are useful sources if you're inclined to explore further.)

The indication from these and similar books is that however we may diminish and corrupt the listening experience through devices of convenience, there still remains an innate drive to listen to music, and an ability to discern real quality. Elements within music - tone, pitch, rhythm, melody etc - between them excite almost every part of the brain in one way or another. Nobody went to Old Trafford to see Oli Metcalfe's excellent lighting, or view Tom Kirk's empathic visual artistry, but they all came to 'hear' the band.

Production

Chris Vaughan is one of those production managers who divides opinion, but whatever side of the fence you're on, there's no doubting his success (he is currently pre-planning what will be a grand spectacular for the fully reformed Take That next year). For those who dislike him their ire seems to stem from his adherence to budgeting; Vaughan drives a hard bargain. Yet here he is, presiding over arguably one of the most profligate shows around.

"You have to weigh up the big picture," he says. "With audio a lot of the considerations tends to stem from rather purist attitudes; so it's easy to be dismissive. But with the two-ring delay system you must weigh up all considerations. Delay towers are ugly and obstructive, but I have been convinced by how good it sounds. Traditionally, with any delay tower you try to position them so they align with existing aisle ways in the grandstands, but that's not always the ideal audio position; so how far do you go? You could end up with speakers everywhere; Marc, along with his system tech' Paddy Hocken and the people at Skan, have come up with a happy medium that outweighs the inconvenience."

And what of the other departments? "As regards the overall expense of this Stadium outing, sound is a lot more finite and quantifiable, not so with

lights, set and video. Getting these to work together is where costs are saved," says Vaughan. "We start with sound: I encourage set design to work from where the PA hangs, not try and mask or blend it later; same with lights. Although Es Devlin designed our set for this and the arena tour, it was LD Oli Metcalfe who had the concept, he moved it to the more architectural 'building' concept."

Devlin's arena design was three virtual skyscrapers (four walled cubes of LED video) that rose up out of the stage, with their upper reaches flying in from above. For the stadium shows, Metcalfe has effectively transposed the band to performing within an architectural cube, rendered in huge scale by the trick of a very forced perspective.

"Oli had the concept, Es produced the definitive design. Malcolm Birkett, part of my production team, is a CAD expert - he builds the architectural detail, then goes to Stageco to determine structure. When you have a project this size it's advantageous to have one person like Malcolm to oversee the process, especially if politically that person is outside the circle of design interests. Malcolm is very objective about considerations of sound, light and video. Also, a comprehensive 3D CAD model allows us to place the show into venues to see any problems. Being able to simply plonk our production into a virtual Wembley means promoters can accurately look at things like premium seating positions."

"The set evolution is a natural progression; Malcolm and I flew to Singapore in February to show the band the animated CAD drawings, which they agreed in principle. Malcolm then interfaces between Stageco and Brilliant Stages who made all the fascias for the video. But we weren't able to give the go ahead till 5th May."

This is a persistent bugbear: set companies in particular are constantly berated for delivering set pieces right up to the last minute, yet band management invariably confirms orders late. "The answer, I think, is the intense cycle of promo and shows that bands do these days. Yes, they could have made the decision earlier, but their focus is on the immediate future. Also, shows are more ambitious, it's serious engineering - this show is a prime example - Stageco has engineered a serious cantilever support for us to apply Es Devlin's forced perspective building and the weight of LED screen from XL. So in the evolution, before we even ask the band, we ask the suppliers - can it be done? can it be done fast enough to make touring practical? and can we afford it? The bar is very high these days: we start with concepts like, 'a full-size elephant will rise out of the B stage'." (A reference to last year's Take That extravaganza).

If we accept that inevitably 'build orders' will always be late, are there at least any positives that have emerged from this particular project? "It is a cliché that every time you go out you learn something new; this show is no exception. Many already probably know this, but for me it was new; Use the same tractors for steel as you do for production. That means you can use steel tractors to shunt all the production trailers into place for load out - that in turn reduces production drivers' 'on duty' time. With the new EU reg's dictating that every driver must have a complete 48-hour break every two weeks, things like that add up. It's especially important when you play stadiums were there's little parking available; we have 18 steel trucks, 33 production. Using steel drivers for shunting makes a big saving, especially when your routing goes Paris, Madrid, Nijmegen."

"The other thing is packaging, we have splitter trucks from Stage Trucks, trailers with split decks that allows us to roll in, for example, all the High End Show Beams, then raise the deck and push other gear beneath. We've also gone for dolly packaging: lighting people have been doing it for years, sticking multiple dimmers into old lamp meat-racks so cabling time is reduced; Skan worked a similar thing for the arena tour to excellent effect. Eliminating flightcases makes things much faster. With this stage design, all cabling is routed below deck on the technical floor, so dollies can be rolled onto the main stage. The reduction in cable connections also reduces fault-finding time, as less equipment is plugged/unplugged between shows. Weather-proofing is also improved - a cart is a simple structure to weatherise."

Set, Lighting & Video

It's only right and proper that the three visual elements should be seen as an integrated whole. Metcalfe's concept, as interpreted by Devlin and realised by Brilliant Stages, is quite a revelation - "something resembling the Titanic" said one of the broadsheets, alluding to the peak of the stage which could be a ship's prow. More to the point is the perception of grandeur: 68 metres of videowall form the stage flanks . . . couple that to the subconscious effect of the forced perspective, and this is a mighty structure.

Above, L-R: FOH sound engineer Marc Carolan; lighting designer Oli Metcalfe; video content designer Tom Kirk; system tech' Paddy Hocken and Tony Smith (visiting PA tech); production manager Chris Vaughan.

Video content and live image is all the responsibility of Tom Kirk. "Tom is a long-time friend of the band," said Vaughan, "and has grown with them. He's great because he knows exactly what the band wants, and he and Oli work well together."

For a confidant of the band, Kirk is without airs: "I started out doing simple camera work for them, first I learnt how to shoot, then record. We started from simple projection, now here we are with enormative LED." ('Enormative' - good word). Although Kirk went to university to read English Lit, he has taken time to educate himself to his chosen career: "I went to film school, the Met in Ealing. That was beneficial to what I do now - how to shoot subjects, how to light them - and I did extensive work on editing. For this show we have a bucket-load of visual content, all generated bespoke to each track, and run to time-code, which keeps it locked into what's happening on stage."

All video equipment and PPU comes from XL Video; Kirk uses Catalyst servers, with the content produced by his own fledgling company, Banoffee Sky, which has its own video artists and animators. He frequently drops the 'audience experience' into his conversation, a strong indicator of how seriously he takes his work. But where do the ideas come from? "The band and I have a long and good relationship; generally I pick ideas. I might talk to Matthew [Bellamy, lead singer] about the lyrical content, or Dom [Dominic Howard, drummer] who is very involved on the visual front. I start with a storyboard. If they like that, then it's into the studio to do maybe three or four seconds to highlight how it comes to life. That's enough to make the judgement on the go-ahead; they do trust me and it's a decent amount of money they put into this work."

"We've had the stage animated, so we can bring the surface to life, move windows, ripple the surface, that sort of thing. It was difficult getting the visual for that, the set only completed as we went into production rehearsals at Milton Keynes, just five days before the first show." Kirk had prepared in advance, but it was a tight assignment and well worth the effort that went into its curiously unsettling effect - but then that's one of the markers of this band.

"For the live content I have six manned cameras, three mini-cams, and three robocams. I have just one operator for the robos, four professional ops from the XL

Equipment lists

Sound - Skan PA

Reinforcement:

144 x d&b J-Series J8/J12 cabinets
112 x d&b D12 amplifiers

Lancashire CCC configuration:
Main Hang: 18 x J8 + 4 x J12 per side
Main Flown Subs: 9 x J-SUB per side
Side Hang: 16 x J8 + 2 x J12 per side
Side Flown Subs: 6 x J-SUB per side
FOH Towers: 10 x J8 + 2 x J12 per side
Delays: 10 x J8 + 2 x J12 per side
Pavilion Delay: 8 x J8
SR Under Balcony: 2 x C7-TOP
Ground Subs: 20 x J-INFRA in Sub Array
Fills: 4 x Q10

FOH Control:
Desk: Midas XL4 (34 x Mono / 14 x Stereo) + Midas PRO6
Inserts: George Massenburg Labs, Tube Tech, BSS, dbx, Empirical Labs, KuSh Audio, Sound Performance Lab, XTA, Smart Research, Drawmer
FX: Bricasti, dbx, Yamaha, Eventide
Drive: A Massenburg GML 8200 parametric EQ and Smart Research Smart C2 inserted over L/R. From the XL4, signal goes to an Apogee Rosetta 800 to do the A/D conversion, which then feeds a Dolby Lake (used as main system EQ). Signal is then sent to stage as AES/EBU 96kHz direct to the d&b D12 amplifiers. d&b wireless R1 network is run from a remote desktop with three d&b R60s and two R70s. There is also a fully redundant Dolby Lake and Apogee Rosetta 800 as well as a second AES multicore. The D12s are also wired with analogue inputs in the event of AES/EBU failure.
Multitrack Recording: ProTools HD3 (96-ch) recording system with 6x Avid 192 I/O, 1x Avid Sync I/O and Apogee Big Ben

Measurement:
Analysis Software: Ascendo Room Tools, EAW Smaart 5, Dolby Lake Analyser Bridge
Measurement Mic: Earthworks M30 + Wireless Shure System
Interface: 2 x Edirol UA-25EX

Monitors Control:
Desk: Midas H3000 & Digidesign Profile (2 x Stage Racks)
IEMs: Sennheiser G3 IEM (18 systems)
Inserts: George Massenburg Labs, dbx, Summit Audio, Drawmer
Preamps: Avalon VT-737SP, Neve 1073 CH
TDM Plug-ins: Sony Oxford
Subs: 2 x L-Acoustics dV-SUB (Drums) and 3 x d&b J-SUB (Bass)
Guitar Monitor: Dickinson Guitar Amp with d&b M2 drivers

Microphones:
Drums: Beyerdynamic M88, Shure Beta-91, Shure SM57, Neumann KM105, Shure Beta-98, Neumann KM184

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Left: Barco Mi-Trix videowall.

Above: HES Showbeam and Showgun fixtures.

team for the manned cams." The other two ops are pulled from the main crew pool. "I run the show from out front. I have a Grass Valley switcher and two Catalysts. It's quite a complex show, multiple inputs; working from front-of-house was something I saw from our time opening for U2 last year; with limited rehearsals seeing the show from the house helps bring it quickly alive."

The 3D relief fascia of the videowalls gives the show great solidity, it's as if the band were playing Piccadilly Circus, not some temporary stage. Content is so dispersed over the vastness of it that viewers are never blighted by the tendency to watch the video rather than the band; in that sense, the sheer volume of it portrays in a very subliminal fashion. Take a song like Problematique with its strong narrative drive, and then see Kirk apply lots of effects to live camera feeds: in that sense he's rarely literal, but his sensitivity to the band's impressionistic output is very apt.

Lights: Oli Metcalfe

"I took the ministerial theme that was the arena production and drew from that." It sounds simple when you hear it direct from the lips of Oli Metcalfe. It's interesting; I'd never considered 'Ministry' as inherent to the setting of this Muse show, but of course it is. Firstly, Metcalfe's inspiration of taking the arena Cube and reinterpreting here to the structure we see is quite obviously a giant pulpit. That the band preaches is not overt, not in the Bono sense, but they've always had something of the rail-against the-hidden-prying-eyes-of-the-State thing about them.

"Es [Devlin] made it architecturally more developed, it's all bespoke engineered. Chris took it to Stageco and they munched it up as the engineering challenge it was. The intention always was to use the projected images to change the building into other forms - it was always just a fascia. Once we had that 'bending towards you' surrealism of the structure, it just remained for Tom to jump in with the video to all that LED."

As Kirk has said, 3D mapping of the structure took place at Milton Keynes during production rehearsals: "Easyweb came and did it there, so everything was rendered only five days before the first show." Easyweb is a French company specialising in 3D video mapping: see their website showreel for a flavour of their activities (www.easyweb.fr).

With the show structure so different between arena and stadium Metcalfe had to re-address the lighting content. "Yes, we did re-programme from scratch. The setting meant there was little room for top light, just the diamonds within the upper surface, that was already physically quite heavy, so choice was limited, 64 MAC 300s in the end."

This is a lamp that he had to work hard; en masse they certainly delivered, even at the more taxing saturated extremes. "Elsewhere, my main fixtures are Studio Command 1200s, for this show a nice, small short-throw wash. Behind the stage vents they're ideal. VL3000s, again strong in the big context. And High End Showbeams, the Showgun variant with split-beam function. I chose the Showbeams because they're brighter than Little Big Lites and there's no external ballast. I also like the blue crispness of the MSR - looks great on camera."

Neg Earth is the lighting supplier for this tour. Metcalfe actually has a mix of Showbeam and Showgun, 16 active of each type. "For this show virtually all light is concentrated in the three-quarter height down to sub-stage level, so what top light I do have has to be used sparingly. The B stage that tracks out into the audience is lit by VL3500 Wash up on the FOH towers, with 301s under the deck. The flying saucer façade was made by Specialz, and they also provided the DMX trigger that runs all the LEDs they mounted around the kit."

Curiously, the kit was also built by Specialz: I wasn't aware musical instruments were on the menu there these days.

For control, Metcalfe sticks with his preferred desk, the Hog III. An enduring fan of the desk's potential, these days he's even more enamoured. "With a full-size expansion wing and the new DP8000 processor it's become even more powerful. There is no other desk I'd rather use. Take it into festivals and for me it does the best job of working with the various changes of lights you encounter. I'm running seven Catalysts off it: they're all lightly worked - two for MiTrix, two for projectors, one for IMAG, one for the Eyeball above the roofline, and one for MIDI pixelmap. The seventh I use out front for reference. It provides a mixed image window so I can see what all the others are doing. Hugh Davies-Webb from XL Video helped me with the Catalyst programming; Erlwin de Gams programmed and finessed the Hog III. We built the show using ESP Vision, it streamlines the workflow from pre-production; I can export a scene from VectorWorks and off you go - DMX number, patch, plot - you don't have to re-draft a technical plot from the creative process. As with Tom's process, I was able to present the band with stills in storyboard form for them to approve. This way, even at that presentation level, you have effectively already created building blocks for the actual show. That meant when we did get to rehearsals at MK Bowl we had time free to put in all the effects, bells and whistles."

There's one overriding contradiction to this show in visual terms and it is the over-abundance of video to lighting; if you looked at the equipment list in terms of sheer firepower you'd say no contest, video wins hands-down. So it's important to note that this is not the sense one gets viewing the show, and that is down to setting: Devlin's façade, in breaking the video down into multiple windows, switches the emphasis off the image, and allows the eye to soft focus across an array of image parcels. That one simple conceit rebalances the account. Light and video, mutually choreographed by Metcalfe and Kirk, provides a homogenous presentation, cinematic in its scale.

Monitors

Adam Taylor has been mixing monitors for Muse since 2001. He describes the set-up. "All the band are on in-ears, I run four stereo mixes for them and a couple of stereo mixes for backline techs. There are no wedges on stage but I use two L-Acoustics dV-Subs for Dom the drummer and two (three on our arena set-up) d&b J subs for Chris on Bass. We're using Sennheiser G3 systems for all, which I find to be very good. The RF is very stable with the dual receiver capacity of the belt pack and the audio quality is far superior to any other system on the market . . . After various trials with generic and custom moulded drivers we have settled on the UM2 from Westone . . . I'm a big fan of generic drivers as they are easily replaceable, relatively inexpensive and in most cases sound as good as a custom. Although, saying that, we have recently been supplied with a soft UE7 from Ultimate which our keyboard player really likes. The canal piece is soft silicone which avoids the 'opening up' problem associated with solid body moulds."

Like [FOH sound engineer] Marc Carolan, you use an analogue desk. Is that a band preference, or your own? "On the last tour, Black Holes, I was mixing on a Digidesign D-Show. We started introducing external analogue preamps at the request of the band and from this decided to go all the way with a Midas Heritage 3K for this tour. However, I still needed to retain some automation, hence the Digidesign Profile side car. This desk takes some of the same inputs (for use on certain songs for different EQ, dynamics etc) as the H3, extra inputs for bigger shows and provides all my effects. It has the same mix bus setup as the H3 and its outputs sub into the auxes on

Bass: Beyerdynamic M88, Shure SM7
Guitars: Royer R-122L + sE Electronics Reflexion Filter
Vocals: Neumann KM105
Wireless Mics: Sennheiser EM3031 + SKM 5200 with Neumann KM105 capsule
Wireless Guitars: Shure UHF-R + UR1 Packs (16 systems - L3E and R9 Ranges)
DIs: Radial J48, Avalon U5
Ambient Mics: 4 x AKG C-414, 6 x Sennheiser MKH 60 Shotgun

Support Control:
FOH Desk: Digidesign Profile
Monitor Desk: Digidesign Profile
Wedges: d&b M4

Video - XL Video

12 x Barco HD Projectors
80sq.m Barco S-Lite
30sq.m Barco O-Lite
270sq.m Barco MiTrix screen
1 x Kayak PPU
5 x Sony D50 Cameras
2 x J86 lenses
4 x Robocams
1 x Polecam
1 x DV Camcorder

Lighting - Neg Earth

Lighting Control:
2 x Wholehog III Lighting Console
2 x Wholehog III Rock Expansion Wing
2 x High End DMX Processor DP8000
3 x Luminex DMX8

Media Servers:
7 x Catalyst Pro V4 Media Server

Moving Lights:
16 x High End Showgun 2.5
16 x High End Showbeam 2.5
32 x Studio Command 1200
32 x Vari*Lite VL3000 Spot
24 x Vari*Lite VL3500 Wash
14 x Vari*Lite VL3500 Wash FX

LED Fixtures:
124 x Martin Professional MAC 301 LED Wash
8 x James Thomas PixelLine 1044 LED Batten
20 x James Thomas PixelPar 90L - IP20

Followspots:
4 x Strong Gladiator 3k followspot

Strobes:
50 x Martin Professional Atomic 3k strobe

Smoke / Haze / Fans:
6 x Breeza Fan - Black
6 x F100 fogger
2 x JEM Roadie X-Stream

Truss:
Litec, JTE SuperTruss, JTE SuperLite

Motors:
96 x CM Lodestar
10 x CM Prostar hoists
Kinesys control

the H3. The Profile controls scene changes for the H3 via MIDI, which allows me to route to VCAs, mute groups etc for each song. The main reason for opting for the H3 is obvious - sound quality. I would have preferred to use an XL4 but the stereo aux sends on the H3 won it."

The B stage rises directly in front of the main PA, and at a point where the vocal mic is up around the longer-throw section of the PA. How do you maintain a workable gain structure with the kind of fidelity the band needs to hear in such circumstances? "Generally the Stadium shows have not been too much trouble in terms of venue acoustics, apart from the obvious cavernous space issues in the San Siro, for example. The relatively low ceiling of the stage does cause some nasty reflections down the vocal mics, but again doesn't cause too much of a problem. Having artists out in front of the PA with open vocal mics is probably the worst situation you could have - there is no way of dealing with it other than to keep the level of the vocal in the mix as low as usable and bring up the drums etc for timing. A big help is also to isolate as much sound from outside as possible with good-fitting in-ears - and a little boost on the pack volume is usually necessary."

I spotted a device in your under stage racks I've never seen before, Vintageking Audio, what is this and what's it's application for this show? "It's a Neve mic preamp, in a Vintage King chassis that we use for the main and spare Guitar mics. The mics we use are Royer ribbon mics."

Finally, you have a tricky visual position below stage - that's an obvious difficulty. But in your opinion, what is the most difficult issue you have to contend with on these stadium shows? "Being in a bunker with a small letterbox to see through is less than ideal for a monitor engineer. The set-up extends to our arena shows too, but is less of a problem there. The set designers obviously do not think the sight line between band/engineer is that important! Over the years I've developed a method of taking cues from the band via subtle facial expressions, body movements etc - this is now difficult to see with my limited view. I have to have a spotter (my tech Richard Gibson) outside the bunker to take the band's requests. Unlike other bands in this situation who have dedicated video cameras on each artist, we have a show feed which is not much use apart from letting me know where about on stage the band are."

FOH Sound

As discussed in the introduction, Muse are a band that demand to be listened to. The double ring delay was founded entirely on the desire to provide maximum SPLs within the stadium while limiting the spill without. House engineer Marc Carolan was in no doubt how this would be achieved: "With the Arena tour, as soon as we knew it would play 360° it had to be J," a reference to d&b audiotechnik J Series: Skan PA is providing a system that even in the stadiums, is one hundred percent J Series (barring four Q10s for front-fill).

Carolan continues: "I have other favourites, I especially like L-Acoustics, but to cover 360° needed so many different types of their boxes, and what I needed was consistency. We have made one switch since moving to stadiums, taking the J Infra instead of the J Sub. The Sub doesn't have the 'weight' of the Infra, so we'll stick with them when we return to the US arena circuit for the second leg." The Infra reaches down a further 5Hz to 27Hz compared to the Sub, those three 21" drivers providing the kind of low end even Tony Andrews would approve of.

"Once you've got the same cabinets with the same drivers, then you can look at localising energy as much as possible, without compromise to the listening experience; that way the strong dynamic I mix for is transferred to all the audience. Local councils are happy but there is a cost. I had to get support from the band, but the results have been measured and approved."

Carolan did put his neck on the line. "With all due respect to the predictive software - and the d&b software allows very accurate 3D modelling - a modicum of experience is required. We went to San Siro for the first time, where the Council are very strict. Our agent and band management made a point of going to the worst seats in the house and heard the effectiveness. This isn't just noise control, this is making it sound good everywhere in a stadium environment."

I considered this while walking around the rear of Old Trafford as I made my way out before the encores and yes, even here there was something of the mosh pit atmosphere. Muse music is nothing if not urgent, propulsive, exciting, and Carolan delivered on all counts. You might suppose the compromise would be imaging; whatever the delay alignment, the sheer physical perception of distance imposes a subconscious separation from stage, but not so, and at these levels and with such clarity, nobody was complaining.

The system comprises 144 boxes of J Series. "Each ring of delays comprises four 'pods' of eight J8, with J12 at the bottom on the rear pair," said Hocken. "Here we did add a fifth position to cover

the pavilion. Experience has shown we can get a good degree of flexibility with positioning of the second delay ring, so sightlines are more readily accommodated. We pull power locally for each tower, signal from an eight-way multi daisy-chained to each. Each time AES goes through the amps it buffers the signal, at 96kHz we get a good 120-125m from the Green cable."

Hocken had a lot of useful information on signal transport; Skan had also elected to ship the full PA system to the US running off transformed power, and Hocken had some useful pointers here as well. "We found running the d&b D12 amps transformed up from 110V the gain reduction kicked in," the amps autosense power condition. "The maximum US feeder is 4Ø, that's approximately 120mm². The amps kick a lot of current down the neutral so we had to double the neutral cable all the way back through the transformer."

The rationale for shipping the full system across the Atlantic was not so much the weak £/$ rate, but the packaging of Amps in dollies, with full harness cable trays mounted above (see Vaughan's comments in the Production section). "Signal-wise we use a posh Apogee A-to-D converter (an Apogee Rosetta) to 96k, then into the Lakes, and in parallel we have an analogue back-up Y'd out of the desk; so we can switch to analogue at the Lakes if all else fails."

Carolan is mixing from a Midas XL4, with a Pro6 on the side. "It all runs on Van Damme Super Green cable (from VDC); at 100m+ it was getting hard to lock the clock on regular Green cable, so we did ask VDC for this improved variant when we knew the stadium shows were coming."

The Super Green 8-way multis run between amp dollies, terminating in nice chunky connectors: a fan-out resides permanently within the dolly, splitting to various connectors, not least the RJ45s, "so everything vulnerable stays there and is never dragged across the field," as Hocken so rightly said. "It's surprising the toll taken by shipping this gear back and forth, even the analogue gear breaks down. The desks have been rock solid, but we do get recurring problems with XL42s, H3000 and Distressors - fuses in particular. The only problem we have with the d&b D12 amps is the onboard delay; not enough of it. At San Siro the runs exceeded 150m so we used a module of Lake and applied a universal 50 millisecs across everything, then set specific delays at the D12 as normal."

But what of Carolan's approach to the show, any curved balls from the stadium setting? "The wing vocal positions left and right are a bit tricky, and the B stage as it rises, lifts straight into the long throw field of the main PA. The PRO6 I have on the side was originally just for the kit on the B stage - now I use it for everything there. With Matt's vocal I do some very specific EQ, as little compression as possible, and when I say very specific EQ, I mean very focussed in, so there's still a full vocal sound."

Which means that Carolan employs that most trusted of analogue devices, a quick hand on the fader. "The B stage is 30m out and 15m up in the air, and it rotates, not easy for him with what he hears above his in-ears of the main PA; we did initially getting some fluttering which the EQ has addressed."

Carolan uses a Massenburg GML 8200, a studio spec' device that Hocken drew attention to. "For me it's the definitive mix EQ, it gives me just enough when vocals get brittle at the high end. I set it up ahead of each show and barely tweak it during; for me it's audio crack."

Other than that, everything else front-of-house differs little from what Carolan used three years ago when Muse were last reviewed in these pages. We did have quite a lengthy discourse on the pros and cons of digital-vs-analogue and the relative listening experiences of audiences, resulting in this interesting fact from him. "Are you aware that 47Hz is the fundamental resonant frequency of earthquakes?" No, surely it's determined by magnitude and factors of rock and earth? "Well you should check out a French film called Irreversible; it's a tone they apply beneath the soundtrack and you don't notice it till it's gone. It would appear to be imprinted on the human brain and induces a feeling of anxiety in all of us." 'Yes?', I said, wondering where this was leading. "I use it with the intro piece to the show," he replied, a certain glimmer in his eye. "It works well with the arrival of the rioters to open the show."

Anxiety through sound; sound as emotion. A trick, but I like it. It's what audiences should experience. Emotion is what going to a live show is all about. For me, hearing Muse live in the skilled hands of a thoughtful engineer like Carolan, excites me to the point of rejuvenation, from 56 to 16. Maybe that's its evolutionary purpose? I'll have to send a note to Oliver Sacks.

Next Month:
Jean Michel Jarre at the O2 Arena