

EUROVISION

SONG CONTEST COPENHAGEN 2014

I must confess, it was with a great deal of trepidation that I boarded the plane for Copenhagen in May, and not without good reason. The previous year in Malmö we had seen the Swedish production eschew the tyranny of ever-grander stage sets plastered in LED video, instead retrenching to a softer, more feminine approach that saw the stage fall to the gentle caresses of projection. For Copenhagen, one of the few tantalising tit-bits that DR (Danish Radio, the national broadcaster) was prepared to reveal in advance, was that there would be almost 1200sq.m of LED. So much for a step change.

The other factor was the venue - a derelict shipyard. A monstrous industrial box 60m tall, it had the sort of reverb more familiar to Grace Cathedral San Francisco. While 14 seconds might suit electronic pioneers like Beaver & Krause who recorded Gandharva at Grace Cathedral in 1971, this was hardly the place to stage what is, in effect, a mini-festival presented with a 21st century sound reinforcement system. As it happened, DR pulled the proverbial rabbit from the hat with some panache and the indispensable bearded lady . . .

Overview

Assuming most of you will have seen at least some of the presentation during the TV broadcast (they say almost 200 million watched it, so that must mean some of you did), I will give the briefest of descriptions.

The stage in plan-view is a four sided diamond set en-pointe to the audience. Upon it sits a gigantic hollow-frame cube, known as the 'Cubus', made of up of 8ft square steel mini-cubes. In all some 56ft cubed, just two full sides stand upstage left and right, with only the top-most row of the front of the cube cantilevered out to downstage left and right. This framework is edged with a single row of RGB LED.

The deck of the stage is a water garden: a chevron of shallow pools some two metres wide delineates the two front stage edges, while the main deck within is covered by an interactive LED screen. There are black catwalks extending left and right, each with a mini-diamond at the end. Well upstage, behind the Cubus, sits a vast panorama of LED screen that extends the full width of the room, 1200sq.m indeed. Behind it sits a phalanx of automated lighting - 'the matrix' - poised to shine through.

The audience, in standard hockey arena configuration, is interrupted by first a mosh pit front stage, then a green room area that mimics the chevron of the front stage edge. Further back, the front of house control area likewise takes the chevron form. Both these functional spaces are trimmed with VL5s and translucent,



©Ralph Larmann

PVC-encased RGB that follows the prevailing stage wash as the various performances unfold. Above, endless lighting trusses follow this pattern of chevrons tailing off into the distant upstage end.

Stage & Set:

- Claus Zier, production designer

So many acts, so many different needs to be met to define their songs - it's a surprise more ESCs don't end up looking like train wrecks. The core of this show's achievement is unquestionably in the stage set - the brain-child of Claus Zier. The apparently simple box cage was at once massive and dominating, but could be made to disappear, subsumed into whatever wrapping light and video chose to place around it. Zier was given completely free rein to conceptualise the main crux of the show. How does a person come to be entrusted with such a role?

"Originally I was a carpenter, but at a young age I had dreamed of being involved with the circus." Zier told a charming tale of how he'd corralled his sister to walk upon an overturned 40 gallon oil drum while he, the circus master, directed her. "Of course, I look around here today and realise that is exactly what I have become. But from carpentry I became a construction engineer, and then an architect, studying for one year at the University of California."

His connection to television came later. "They came up with a new concept in 1997, 'The Big Class Reunion', I was asked to design a studio set for that and it proved to be a big success; being repeated in twenty-three other countries. Since that first lucky opportunity I have designed mainly for TV, news and entertainment, but also for ballet, and I still work small domestic architecture projects to keep in touch."

He adds: "I have always tried to raise visual ambitions, because I think we should compare ourselves with the best in the world. The young audience is very visually conscious - it takes two seconds for them to switch to the next channel and see something else if they are not happy, so let's have ambition and make them happy!"

The stage set is operatic in dimension, has he ventured in this direction? "I would love to get a chance to work in this scale somewhere else, and the world of pop concert spectaculars is very appealing."

So what of the concept? "I didn't know it was to be staged in an old shipyard when we began. We [we' being he and his team at Studio Zier] started with two design options, a traditional ESC look with defining elements of water and circles - water for Denmark, circles for the EBU. I'd also been looking at MTV and had the idea of a modernist box, applying a more minimalist Scandinavian aesthetic. Then when the building was selected we



Clockwise, from top left: Peter Juul; Claus Holm Pedersen; Matthias Rau; Tobias Berg; David Bajt; Kasper Lange; Noline Refsing; Kamilla Monies.

(For a full list of credits: <http://plasa.me/esc14>)

saw an old photograph of the interior with a ship under construction. It was immediately the box of the second concept, and the idea of a ship resonated strongly: Denmark is defined by the sea, I am a sailor myself.

"From that, it became this huge light cube. That's important: we wanted to get away from these large LED screens that work only as a backdrop with a performance set in front of them; this was to be more enfolding and supportive. 'Join Us' is the tag for this year's event, so placing them within the cube gives the performers a sense of place and safety, and invites everyone else in."

The giant cube boundary has LED product custom built by Martin Professional that delineates the steel skeleton. "Each cube of the structure is 8ft (2.44m), and we chose that size because so many stage pieces and props from various nations are built to that. It's seven cubes tall, 56ft (17m), and the sub-stage is 2m high. I saw also the opportunities for dancers, and suggested to the choreographer that they could use the spaces of the cube to place dancers. It might look like a Rubik's cube - a very iconic form - but it can be so much more. It allows every country to build their own environment. I also like to work with scale - that's a very Scandinavian thing - and the individual modules of the cube give that reference. People in the audience and watching on TV can relate to that - it's familiar. Also the framework gives camera movement dynamic lines to follow. So I think about the cameras, the dancers, and also the lights. I have also worked with Kasper Lange, the LD, since 2006 and we have cooperated together on many projects."

A general engineering company built the steel frame work. The Danish Royal Theatre scenic shop had the contact with the steel fabricators, so although a straight engineering company,

they were accustomed to the entertainment world and its last-minute changes.

"Four cubes in the stage left and right walls swing open to allow entry for performers and props. All the LED strips are connected by uniform connectors, but the strips themselves vary slightly in length because of the way it all fits together. The steel frame is a hollow 10cm by 10cm: originally these were planned as a U-profile to take roller blinds which could be lowered in to take projection. "Instead, at the eleventh hour we found this foil. An electro-optical film, it has been applied to the clear acrylic fascias of each individual cube, and can be switched between opaque and transparent by the application of current.

"There are ten cubes within the structure that have floors for dancers; the floors too are acrylic to maintain the transparency. The surrounding water covers some 40sq.m, the hydraulic engineering done by Aqua Logic, a local company that specialises in pools and public water features. The black catwalks' podiums are skinned with front-projection screen material so we can project from directly overhead. The director, Per [Zacharriassen], always wanted close-ups of persons on stage; these platform screens give that image in the wide camera shot and to the audience on the raised tribunes. Again, that's the inclusive thought behind 'Join Us'. I'm very completist in the room design; the green room is placed at the heart of the audience, front stage centre. It continues the diamond motif of this year's ESC logo from above. The stage and green room together form that crystal image. The tables and sofas within the green room also conform to the cubist form."

Before the event, the venue was subject to some major structural alterations. "One of the biggest changes was having three pillars



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The central feature of Claus Zier's set design - the Cubus.

removed from supporting the roof. Everything else about the building proved an ideal space, but these were too obstructive [see *Rigging* for more on this].

"The main stage is supplied by DR, the sub stage is a typical modular scaffold with a wooden superstructure built by our carpenters, and this houses the interactive screen deck of the main stage [see *Video*]. A technical 'drain' sits between video deck and the water. I consulted with all departments about this - there can be only one drain and it has to contain monitors, cameras, special effects, cabling and pyro. The water presented some problems, I wanted it to be coloured and that excludes adding chlorine because it would bleach it out. Therefore, Danish Health & Safety insist that the water be changed afresh for each show, so we have big tanks outside.

"The lowest cubes cannot be projected on from the house projectors because the performers would cast shadows, so there are projectors concealed beneath the rear decks to cover them. That means the rear-most decks actually slope down beneath main deck level to allow the projectors a slot to project through onto the cube fascia. In front of the entrance cubes we have air lifts on the lowered deck edge to raise them to stage level for the 40-second change-over between acts.

"When we looked at putting clear fronts to the cubes we first considered polycarbonate, but the extrusions striate, which causes moiré interference, acrylic is much better. The acrylic also gave a bit of moiré, but Nicoline [Refsing, video content director] did a great job working around it!

All the acrylic sheets are cut in half vertically to allow for expansion under heat so they don't bow. Unfortunately, the discovery of the electro-optical foil came after this, and again these had to be EU approved; Health & Safety insisted we add a PVC insulation along the edge to prevent shock hazard when current is applied to the foils. This added maybe half a millimetre to the complete sheets and so they now do bow slightly at times."

An obvious frustration to Zier and to video world, but in the bigger scheme of things no great tragedy, the proving of such an ambitious idea being far more important.

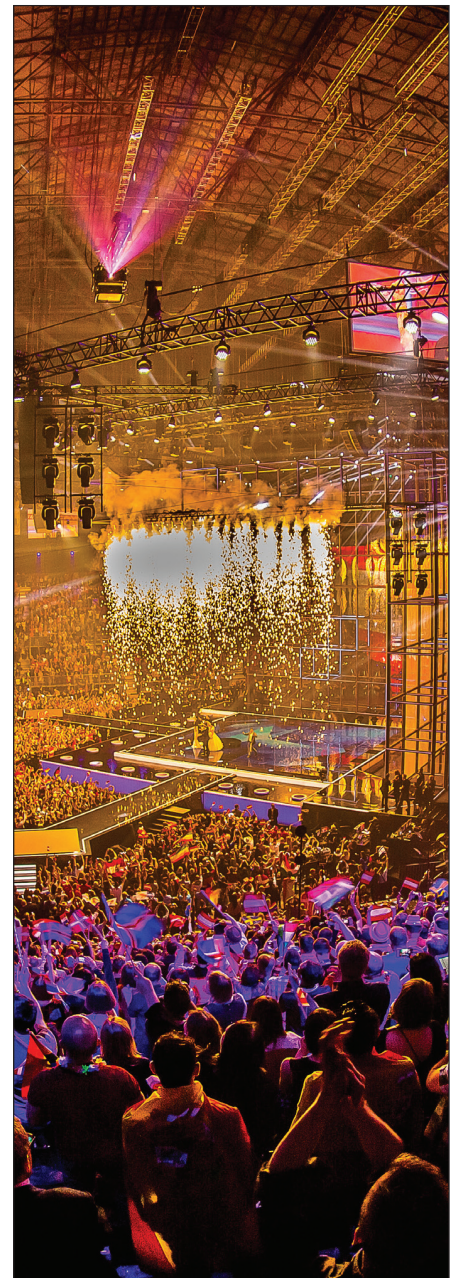
Sound

• Claus Holm Pedersen, head of sound (broadcast) & Peter Juul Kristensen, music sound director

"When we first saw the building we were shocked and I was still worried until two weeks ago," Pedersen began. "The hall had a long reverb tail of fourteen seconds at around 250Hz, a critical frequency. We had contracted Eddie Bøgh Brixen, a Danish acoustician, and following his recommendations it's now just below three seconds [see *below for more on how this was achieved*].

What about the conflicting demands of sound in the house and that of TV? "The bottom line is that, if it really comes to it, then we play the 200-million audience card and broadcast sound has to come first above the ten thousand in the hall! But Moto PA are a good company and know how to moderate the sound levels locally if we have a problem. But for the obvious things, like when the singers go out on the catwalks - effectively in front of the subs - we apply a high pass filter, of course, so the excitement of the audience is stimulated by the loud PA in the room. The cameras do need to see that excitement."

Pedersen continues: "To address thirty-seven acts, each with up to six performers on stage, we need a set system. The mics have to be all the same, and gains have to be repeated. It's all the Sennheiser 9000 digital system - they've supported this show for years and provide a dependable system. In fact, the audio is completely digital from the moment it leaves the mic capsule until it goes to broadcast. It's the first time it's been that way, I think, but that's all about eliminating latency - conversions to analogue create problems for the IEM system. We made a cooperative approach with 'Dallas' Dahl who did Malmö last year; this year he mixes monitors for the performers."



Prolyte Group is proud to have supported the Eurovision Song Contest 2014

Prolyte equipment at the Eurovision Song Contest: 276 metres of H30V truss, 350 metres of B100, 100 metres of D75, 100 metres of M145, more than 800 StageDex stage elements and over 100 metres Prolyte crowd barriers. Thanks to Malecon Ltd. and ETP.



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Equipment List

Lighting

- 260 x dimmers
- 52 x RGB LED strips
- 4 x ETC Source4 LED
- 24 x ClayPaky Alpha Beam 1500
- 192 x ClayPaky Sharpy Wash 330
- 248 x GLP Impression X4
- 199 x Martin Atomic 3000 Color
- 56 x Martin Mac 2000 Wash XB
- 192 x Martin Rush MH3 Beam
- 26 x Martin Quantum Wash
- 210 x Martin Viper Profile
- 142 x PRG BadBoy CMY Spot
- 376 x SGM Sixpack SP-6
- 736 x ShowTec Sunstrip Active (10 ch)
- 29 x Vari-Lite VL3500 Spot
- 48 x Vari-Lite VL3500 Wash
- 188 x Vari-Lite VL5 (mode 5)
- Total: 2982 fixtures

Intercom System

ELC Green-Go

Cubus

5500 x Martin Professional VC-25 Strips

Network Distribution

16 Luminex Gigacore on fibre network
Approx. 160 DMX splitters (MA and Luminex)

Media Servers

3 x Hippotizer send 43 Universes back into the system via Art-Net for mapping of the Sunstrips, Atomics and SixPacks

Audio

Arena PA:

- 29 x L-Acoustics K1
 - 20 x L-Acoustics K1-SB
 - 42 x L-Acoustics K2
 - 83 x L-Acoustics Kara
 - 22 x L-Acoustics SB18
 - 75 x L-Acoustics LA8 amplifier
 - 7 x L-Acoustics LA4X amplifier
- Monitor / Rehearsal:**
- 3 x Midas XL8 console
 - 5 x Midas DL431 input splitter unit 24-ch analogue
 - 16 x Midas DL451 modular I/O unit 12-channel
 - 15 x Midas DL442 analogue output card 8-channel for DL451
 - 33 x Midas DL452 AES/EBU card 8/8 for DL451
 - 8 x Klark Teknik DN9650, AE550 to MAD1, 64-channel
 - 200 x Shure SE535 in-ears

Wireless & Split:

- 1 x DiGiCo SD10
- 15 x Sonifex RB-AES4X3

FOH:

- 2 x DiGiCo SD7
- 4 x DiGiCo SD Rack

Video & Projection

Projection:

- 16 x Barco HDQ2k40
- 16 x Barco HDX-W Flex
- 8 x Barco SLM-R12 Performer

LED:

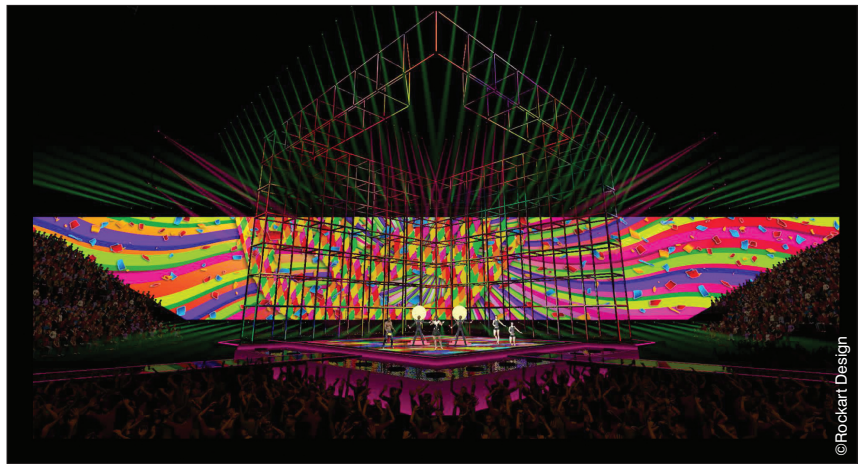
- 1170sq.m Kindwin Spider 30
- 169sq.m TecViz BS10 Interactive Floor

Media Servers:

- 9 x d3 4U Media Servers

Infrastructure:

Complete set of Tecviz Fiber optic signal distribution to all LED screens and projectors including fully redundant fibre network for media servers



One of Rockart Design's previs renders of the rear LED wall graphics (for Portugal's performance).

Peter Juul Kristensen adds: "We changed the music part this year, it's all mixed in Pro Tools and we make that mix at rehearsals. So for the performance we just switch to the live feed, linked to time code of the playback track and it mixes itself to programme. That means we have been able to edit out things like singers who make loud intakes of breath that the mic picks up. And we have been able to refine and apply different thresholds to the compression, say between the verse and the chorus of a song. This work achieves two things: the back-up system is always identical to the main in every way, and the end product is as close to the original recording as it's possible to be. It is expected that we try and measure up to the original." And just how consistent are those tracks? "Some are over-produced and we didn't want the vocals to drown inside that, so this Pro Tools work is essential."

Pedersen is responsible for the broadcast mix. "Both Peter and I work the Melodifestivalen show [the Melody Festival is where the Swedish entry for ESC is selected] and we have implemented some of the lessons we tried on that, such as being all-digital. The Danish Melody is different from Sweden's, where they stage several competitions over a period of weeks. Here it's all on one Saturday night with ten acts, so in some ways it's much like a smaller ESC. . . . In that sense, this show is just more of the same, the added complexity only comes from the requirements of redundancy. Both Peter and I have back-up engineers, and we are not even allowed to eat the same food prepared by the same chef!"

Live Sound Setup

• Tobias Berg, sound design team

"For the live sound house mix it was Robert Røhr on DiGiCo SD7; Dallas Dahl on Midas XL8 mixes the monitors. Each has a back-up desk and operator, and I put the control system together," explained Tobias Berg. "I've done many things like this for Moto PA, and a lot for DR as well. Not this size of course, but lots of large TV shows - Royal Weddings, those sorts of events where a similar level of redundancy is expected. The system design is L/C/R L-Acoustic K1 for mains with K2 for the outer hangs, beyond main L/R hangs which cover what we might call the rear seating areas. We use Kara for delays."

Berg is somewhat hamstrung by the requirement to trim the mains very high, though as he said, "nothing is throwing more than 50m," it's just that that's 50m vertically in many instances. Being able to position sources at stage level to 'pull down' the sound image through the Haas effect was a non-starter. He also had a centre main hang that had to be positioned approximately 3m to stage right to accommodate the travelling spider camera, not helping in his bid for even coverage. "There are parts of the audience not in the direct field of the K1s, we have to keep sound off the commentary booths, for example."

That said, the musical reproduction in the room was very acceptable, flown SB18 subs giving substance to the performance, even if they didn't part our hair. The three seconds of reverb remaining after acoustic modifications proved





Set designer Claus Zier with his original design model for 'The Cubus'.

Prolyte 'supports' ESC

To accomplish the immense makeover from shipyard to high-tech facility the organisers of ESC 2014 recruited dedicated rigging companies to complete the complex mother grids and support structures, needed to create rigging points for the intricate production. Specialist rigging companies ETP from Denmark and Malecom from Germany were selected to build these massive and complicated support structures, a real challenge for any rigger.

Both companies have worked with Prolyte trussing over a long period, so for this prestigious project, Prolyte was the natural choice. All in all, 350 metres of Prolyte B100, 120 metres of Prolyte D75 and last but not least 100 metres of Prolyte M125 Mammoth truss were used to build the grids and towers.

Thorsten Klein from Malecon comments: "You know the performance needs to be flawless there - we really trusted on Prolyte to perform; it has not let us down!"

Flemming Pederson from ETP adds: "Working in close cooperation with other rigging companies, like Malecon, the situation for us was similar. We used more than 276 metres of Prolyte H30V truss for cable roads alone! Next to that we installed more than 800 StageDex stage elements and over 100 metres of Prolyte crowd barriers. This equipment was used for the stage area, the greenroom, camera platforms and other technical and hospitality facilities."

www.prolyte.com



especially suitable for the Norwegian entry, a ballad with grand piano accompaniment, and a great song to boot. Elsewhere, the only time this wasn't overwhelmed by the direct-to-reverberant ratio was for the presenter announcements, which could be a little cloudy on occasion.

"We have the system sitting around 92-95 dBA slow, there are some quieter songs where we might push it a bit, but it's enough for excitement in the room. The backing tracks vary, some are stereo, and some are stems we can play with a little. We use Waves plug-ins, C6 compressors for example, just one good reason for choosing DiGiCo SD7 at front-of-house. We also use a lot of groups - I've set up the system divided so that we can take parts of the system out at the console, rather than at the Lakes. It's just a more convenient way of managing things like when the performers go out on the catwalks and we need to drop level from the above stage fills; you don't want the whole system down - 6dB. In fact, we have programmed in some macros to handle when they perform on the left and right catwalks, so we back off as little of the system as possible.

He continues: "We've done the same for those little interludes out in the green room. With the green room placed right at the heart of the audience, it's the only way to handle it. Keeping Midas XL8s for monitors was mainly a decision by Dallas [Dahl - a Eurovision sound regular] it's a convenience choice, he can take a whole snap-shot which can then be moved into the rehearsal room, and then back to the house. It's important to have that sort of management structure when moving files between consoles. When you're constantly building and building you can f**k it up so easily. One day we lost a plug-in on a vocal channel for no apparent reason, so we reimported a Wave session from the night before - easy."

Acoustic Mods

Eddy Bøgh Brixen is one of the most respected consultants in Denmark. For Eurovision, Eddy had the challenge to bring down the Rt60 of the hall from 12 seconds to something slightly more useful. They have hung 60.000sq.m of Molton to cater for the mid and high frequencies, and another very large amount of Flex Acoustics'

AqTube air cushions to take care of the low frequencies (www.flexac.com). Flex Acoustics' inflated membrane sound absorption technique is a patented invention of Niels W. Adelman-Larsen, a Danish drummer who got tired of always having muddy sound in venues. He studied acoustics and did something about it.

Video Content

• **Nicoline Refsing**, creative director and content producer

For those who, like me, were unaware, Nicoline Refsing is an acolyte of the Stufish school of creation: "I first worked for Mark [Fisher] ten years ago, stayed for six years and then set up my own company, Rockart Design. From my background in production design I was seeing more and more creative direction in video content. I am fascinated by how to work content and stage/set together; where does one start and the other end?"

Refsing is a native of Denmark so perhaps a natural fit for the role on ESC, but her residency in the UK didn't mean it would be a straight shoe-in. "In fact, Kasper [Lange] the lighting designer approached me a couple of years back to explore if we could do shows together. I'd never really done any work in Denmark before and now ESC has proved to be our first opportunity. I only joined the production team in January; by then the set design was done and I set about delivering visualisation. The key was finding out the intention of the set, how it was conceived to work. Per [Zachariassen] was fascinated by mapping and creating 3D objects both within and outside of the set. With such a short time before delivery I did a lot of research on content generation houses, looking particularly at mapping skills. In the end I chose Blink TV and Hello Charlie, both UK-based, and Gravity from Germany. To that team we added two individuals: Artem Kurenkov - one of the guys who worked on ESC in Moscow, and Nils Pormann from London. That set the content team.

"We wanted a lot of animation, on four different media surfaces, most of them used in every performance, so I presented the team with a lot of 3D renders and a detailed brief on content for each song - maybe five to ten pages of how the graphics should be configured. That process is steered by two things: the countries mostly provided specific briefs but for those that didn't, I listened more closely to the music and lyrics and worked from my emotional reaction, which is how we all respond to music. I ask the question, will it touch other people?"

"The interactive floor is wonderful, we went to Holland to see it and looked at their standard animation. Originally it was just going to be used for the Danish interlude acts that provide the entertainment outside of the competition performances, but we started to see opportunities to use it for the competitors. Montenegro is a good example, where we use it for the skater that circles the singer." [See below for more on this.]

"Although we presented 3D renderings of conceptual possibilities ahead of time, we couldn't start working on graphics until after the delegation meeting in March. That meant we had to fully produce two hours of content in a month. The assembled team structure worked

really well on that challenge - their strengths really became apparent as we went into production rehearsals and we got see where things didn't actually work as envisaged. The moiré effect off the foil on the cubes is a good example, and the fact that the foil, when 'closed' and projected upon, wasn't bright enough. That lack of gain meant a lot of work on adjustment - in all we've ended with 6TB of changed content."

"I must just mention the guys who look after the D3 servers from Mediatec, Bullen Lagerbielke and Luke J Collins: there were 37 performances and most received between three and six revisions; some countries were on version 12 by the time EBU implement the 'no more changes policy'."

When we sneaked a covert visit backstage, the server pit was serene. Whatever the trials of the rehearsal period, they were long gone, and an air of easy confidence prevailed.

Video Hardware

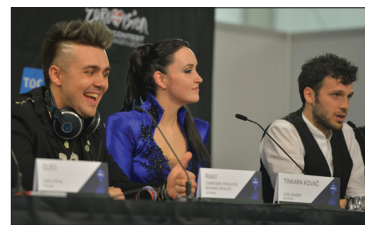
• Niclas Ljung, project manager, Mediatec Ljung dived straight in: "This is our seventh year at ESC and we've always invested in new equipment for the show. We've always wanted to make something really special on the stage surface. The interactive floor is the biggest ever built - there's 169sq.m of Tec 10 as it's called. So far it's working very well. The reinforced glass cover even took a heavy grand piano with little brass wheels, though it did damage the surface, what can you do?"

"We have tried a lot of interactive screens. This one has no wireless sensors, it uses weight sensors, four in every panel, and you can adjust the effect based on weight and velocity. The way D3's Ash Nehru has responded to making the D3s work with it - producing an interactivity module was essential [see below]. There is a lot of data from 792 sensors, and, of course, the weight/speed data makes it scalable - jump higher, land heavier and the effect grows. It's a lot of data and it has to be processed really fast.

"The floor is made by Kindwin, the same people who build the Spider 30 for the back wall. 40% of the wall is ours, the rest is subbed from our usual partners such as Creative Technology. There are so many different LED screens these days, having a relationship where we regularly cross-rent identical product is very useful. Spider 30 has been around for five years now and we see regular requests for higher resolution, but this was up and running in two days. It's very stable and durable. You want proven reliability on a show like this.

"Projection is problematic on the acrylic panels of the cube. We raised the projectors' output by about 30% to compensate for the loss. I believe once the foil makers see the potential for use as a projection surface they will develop a better surface reflectivity. In fact, it already works really well for back projection, but there was just not the space to do this here. We did anticipate the need to mount projectors under the back edge of the stage deck to cover the lowest cube panels. It was

DPA Mics spread the ESC word

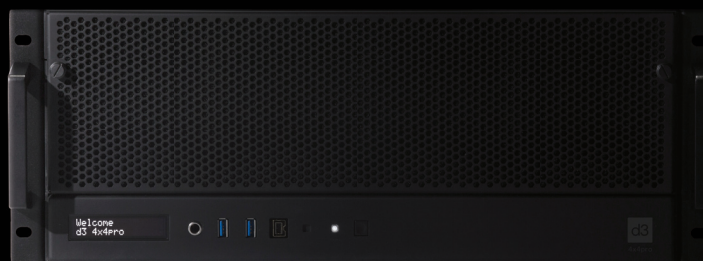


DPA Microphones played a key part in ESC 2014 by providing the company's d:screet Supercardioid Miniature Podium Microphones for the official press room.

Bent Iversen, key account manager for leading Scandinavian PA company, DPA Soundco (which, despite the similar name, is not affiliated with DPA Microphones), is the main sound technician for the press room. He says: "We installed 20 d:screet Podium Microphones, which were specified by broadcast rental company Best Broadcast Hire (BBH). These are positioned on the press table where they are mounted on K&M table bases. Most of the people taking part in the press panels are musicians who have a tendency to be quite loud. So, we needed microphones that could cope with a loud monitor system and sudden changes in volume. We also wanted microphones that could handle a situation where singers decide to sing as well as speak, which does sometimes happen at Eurovision press conferences."

Sound was delivered to the attendees at the often packed-out press conferences via APG loudspeakers.

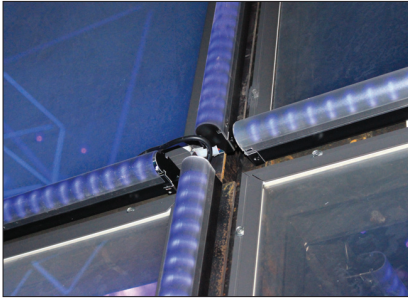
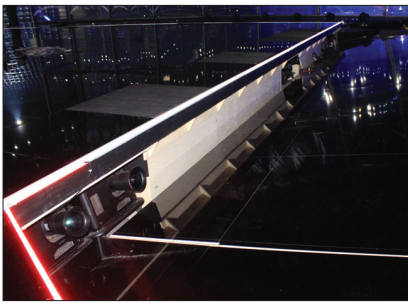
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it's what you do with it that counts.



the new pro range is here.
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From top:

The hidden Barco projector positions beneath the lowered upstage lip.

Close-up of the Martin VC-Strip on the Cubus.

The video world control station.

A favourite of LD Kasper Lange, the familiar face of the VL5 was much in evidence, here seen lining the front of the Green Room area.

Continuing a tradition of innovation at Eurovision, Flex Acoustics' AqTube air cushions played a major role in lowering the reverberation time of the B&W Hallerne.

(photos: PLASA Media)

tricky, the throw distance is barely three metres and there's not much space, but the Barco HD Flex12ks do the job and match perfectly with the more powerful machines doing the main projection on the cubes above from out in the house. The trick is to match the pixel resolution; the HDQ out front project in portrait, the others in landscape - that's all managed in D3."

In Malmö you'd started to implement fibre-optic infrastructure. "Yes, the signal-to-screen infrastructure has become more and more important each year, and more tricky because of increases in quality. The back wall is 3,800 pixels wide, so the screen is already 4k. The signal is routed on fibre. We get fibre as close to the destination as possible, while still remaining accessible for service. Then go 3G using the facility within the Barcos. Easily rigged and easily replaced, 3G makes sense at those vulnerable points. There is a fibre ring for all the media servers backstage; all control is from front-of-house. We also have the content farm, where Nicoline's team make all the content modifications on the ring so we can very quickly upload from them to the servers - even a TB loads acceptably fast over a gigabit network. We have extended our investment in D3, we find them very reliable, and their workflow fits a project like this perfectly."

Rigging

• Jonas Ritz, head of rigging

Jonas Ritz is a freelance rigger, who by his own admission had never worked on anything quite so huge before, "but I regularly do work for DR on major TV shows, *The X Factor*, *Melody*, and I worked on the Parken show ten years ago, and was part of Soren Durango's team last year in Malmö. So this was all very familiar. There are some 600 points below the spreaders - 500 hoists, roughly speaking - and a hundred dead hangs. All the rigging comes from either Litecom or PRG, and one or two local vendors."

You would imagine a shipyard building, with its need for super-heavy lifting gantry cranes, would be an ideal rig house: "There are many tons hanging from the roof, but no, the support is not in the right place, so we are reliant entirely on the snow loading of the roof. That was made more difficult when production had three main roof pillars removed. We had to substitute a huge roof rafter to span the gap. Initially, they told the consulting engineer that the load upon it would be UDL [uniformly distributed load] and of course it's not, so he then had to re-calculate and re-brace. It's a 64m span and there's approximately half the roof load upon it. That took us to the limit at the foundations of the building, and there was no way we could, in the time allowed, increase the strength there. So there is no load left above stage.

"It's 47m to the low steel, another ten to higher beams; the old beam crane rails are at 30m. We do have some motion control, maybe 50 CyberHoists, mostly for the 3x3 Martin Rush MH3 light pods, so they are all light loads. Four of the Cybers are used on stage for various countries' flying gags, and we have a pyro truss that needs regular replenishing.

"Like last year, the Spider cam is the biggest concern. It was just really difficult to get the

diverter pulleys into the right position within the structure of the building. With long running catenaries you lose about 8% of height across a building almost 70m wide. And just how do you brace a pulley in mid-air, that is positioned, say, 12m away from the nearest wall?"

With that amount of travel it must have been almost impossible to calculate the way it would perform? "We modelled it in 'Inventor', starting by drawing the building and applying the production as it went in. It became more and more complex as the thing evolved, and complexity only adds limitations. We couldn't have done it without Inventor."

Lighting Hardware

• Matthias Rau, PRG

With two lighting contractors working the same monster project, there was every possibility of difficulty: "This was the first time we have worked such a project with Litecom," said Matthias Rau, PRG's project leader. "And actually it's been great. Martin Professional took care of the architectural LED product on the cube, but everything else is from the two lighting companies. We do have our own Hippotizer servers to run the SGM SixPacks and Sunstrips on the back wall behind the Spider 30 screen, just the quick and easy way to programme some effects. In general there is a 50-50 split on the supply of fixtures - obviously the Bad Boys are all ours - the only difference being Litecom use Schukos, we use Cee-Form, but that is simple enough to manage. Between myself and Balder [Thorrud], Litecom's project manager, it was easily sorted.

"All the truss is PRG, and the matrix back wall is from Litecom. We supplied all the roof cables and distros, Litecom all the floor system and control cables. The desks come from the two of us.

"The back matrix is a nice job by Litecom - 1m spacing between Vipers, [Martin] Atomics and [Showtec] Sunstrips interleaved, and [SGM] SixPacks, it's really neat. They mount at an angle on special brackets Litecom had made and it looks great.

"Despite almost 2000 lamps, mainly moving heads, and kilometres of cables, it took just two weeks to set up - then we had a week programming before we started the rehearsals using stand-in performers. Balder designed the fibre-based control network, and the programmer/operators are all Danish, coming from Kasper's regular team. Working with a split German and Danish crew has been no different than last year when we worked with Starlight, the Swedish company."

We didn't have the chance to speak with Thorrud about control, but Rau gave a thumbnail sketch: "The desks run in two sessions, one for key light, the other for the main show, so four desks run the show, one for mains with Kasper, one for system watch and clean-up, one for MIDI time code, and one on pre-sets."

Lighting Design

• Kasper Lange, LD

With almost 1,400 moving heads and over 2km of truss, you'd think the lighting excessive if you hadn't seen the scale of this venue, but with

many lamps rigged somewhere around 60ft above the floor level the need for quantity becomes apparent. It's also highly significant that Kasper Lange totally embraced Claus Zier's set design aesthetic. There is not one single light adorning the cube, which removes a lot of dramatic positional options from Lange's design. However, it didn't prevent him finding other ways to bring drama and differentiation to a demanding show. It might just be a giant cube and huge back screen, but if you watched it on TV you'll know that lighting, video and set combined wonderfully.

Lange's inventory is vast and all embracing - most of the big names are represented: Martin Professional, Clay Paky, PRG, Vari*Lite, GLP, SGM, Robert Juliat, ETC - there are even 48 PAR 64s, and the whole vast armoury is controlled by an equally impressive battery of GrandMA2s.

"I've been using Martin for years," began Lange. "They're an obvious choice, being Danish. PRG suggested I take the BadBoy. I've never used them before - they're great and really powerful. It's also my first time using the SGM SixPacks and they're also absolutely great. The Vari*Lite 3500, Wash and Spot I've used for years and the VL5 is just such a great looking light for the cameras, with such a smooth pan and tilt, and yet after what is it - twenty years? - there's nothing else like them. Atomics with scrollers are another dependable tool, and curiously there were not enough Martin Auras available at the time, so again PRG suggested the GLP Impression which covers the audience area perfectly."

And your main tool? "The Sharpy Wash is the great workhorse of the show - small and handy, you can fit them in anywhere and they're very, very powerful. Normally I'd use the original Sharpy as well, I've been using them for what feels like years, but again they were not available in the kind of quantities I needed, so to maintain consistency I used the new Martin Rush MH3 - another first for me."

Lange managed quite a few 'firsts' on this show, but he's no novice. "I've never done a show as big as this, but Claus and I have worked stadium shows before. My philosophy is, the bigger the show, the simpler the lighting needs to be. All ideas have to be simple and clean to make an impact: put 200 Atomics into a room like this, so what?"

He continues: "PRG provided me all the followspot operators. I have ten Robert Juliat 2500W - a mix of Aramis and Cyrano, and the operators really help me. As with so many things, this is my first time working with PRG and led by Matthias Rau they have all been great. Working with so many Danish guys from the Litecom part of the crew, led by Balder, you wouldn't notice any difference between them, fantastic cooperation. Balder is my key assistant and has been with me for 10 years now. He planned the control network. To manage a project this large you have to use the team selectively. So, for example, we did the initial pre-programming at a studio at DR. Me, Johnny Thinggaard Sørensen and Timo Kauristo would do the first verse and chorus, then hand it on to the other members of the programming team to finish the complete song, while we started in the next.

"In terms of what we programmed, some delegations send very detailed lists - fade out here of two seconds, that sort of detail. Others are much less specific 'We'd like this in blue', they say, but they don't say which blue. Fortunately, we were given videos from the domestic show of each competitor. We'd sit down with Nicoline and watch them all - that was a great help - but they did come quite late, just as we went into the DR studios. To manage time and give ourselves chance to study the videos properly, we began at DR by programming the Danish interval acts used to wrap the contest. Then we came to here and commenced dress rehearsals using stand-ins to perform. These were recorded and sent to the delegations. It's an idea first tried in Malmö last year, the feedback from the delegations before they come and join us saves some time. Of course, some of them love what we send, some hate it. But we expect that - sometimes communicating ideas is not so easy. Once they get here for the proper rehearsals the process becomes really intense. We might rehearse 20 acts in a day working from eight in the morning till eleven at night. That gives us maybe fifteen or twenty minutes to

modify each act before we start on the next one. Any big changes have to be made in that small time of opportunity. After that, EBU prevents any further major changes and insists we just focus on refining cues. But now all 37 acts are happy."

"The MA2 system is a reliable, solid console, and I've been using MA desks for years. When you're broadcasting a show to almost 200 million people you need to trust the desk."

I asked Lange if through all of that speed programming he had emerged the other side with one or two songs with which he was really pleased. "I'm happy with all of them," he began diplomatically enough. "But if you had asked me two weeks ago I'd have given a different answer. We have ended with a production that is shiny and neat," implying perhaps that there are probably songs he'd like to have presented in different ways, inevitable with such a wide range of influences determining outcomes.

"We ended up with all sorts, straight rock and roll like Finland, theatrical, music hall. Look at the brief recaps they do when the scoring is

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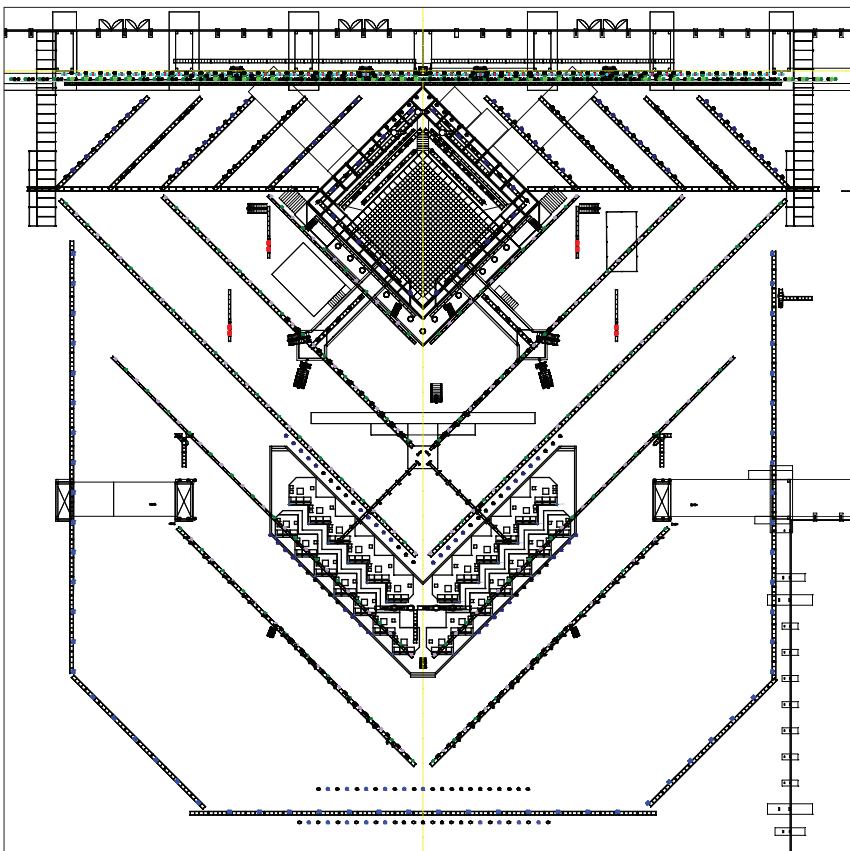
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Plan view of the arena lighting rig.

taking place, when you get to see all acts in 15-second clips in quick succession, then you can see the variety. There are a lot of different people involved and with a lot of different opinions. That's a challenge."

Production

• **Kamilla Monies, head of production**

Kamilla Monies' task is no small undertaking. "I started in the music industry," she began, "then in '85 I switched to TV and have worked there ever since. Like most people on this project I have spent the last few years working shows like *The X Factor*. As regards ESC, we already know and work regularly with the main Danish contractors. Those from outside, like PRG and Mediatec, have done ESC before which was very helpful, but the contracts were open to public tender. How have I managed? Quite simply I have a good team beneath me, that and the prior experience of several contractors. We had ten weeks to build this, they had six in Malmö. We allowed the extra four because of the building - we anticipated problems, particularly with the rigging, and that has proved to be the case."

How does your prior experience enable you to manage such a monster? "Shows like *The X Factor* are of similar multi-performer format, just smaller, so many of the smaller problems that appear are very familiar to me and easily solved. The biggest issues were the incredible reverb of the building [see elsewhere], the holes in the roof, and the removal of original support pillars. It wasn't just the main hall where HCC took out roof pillars, three were also removed in the second, smaller hall. HCC dealt with all of that." (HCC - Host City Copenhagen - is a managing consortium of four parties: the city council, the region, Wonderful Copenhagen and REDA, the owners of B&W Halleerne.)

"The basic premise was that for DR coming to the shipyard the experience should be no different than if we were bringing the show into a proper performance venue. So, for example, as well as fixing the roof - not perfect I might say, but not bad for such a huge expanse - they also provided all the seating. We did the floor and brought in Power Shop to do the power: even a 'proper' venue wouldn't have the kind of power required for this show."

The Cube LEDs

We were fortunate enough to be indulged by Martin Professional, who escorted us backstage to take a closer look at their video LED strip system that is mounted to the steelwork of the Cubus. The LED video product, called VC-Strip, is primarily an indoor install product for TV settings, theatres and commercial applications.

Discrete in itself, but when this many of them come together on the cubus structure, it makes

quite an impact - it is subordinated to the Mediatec video system. "It's driven by a D3, one of several that also run the back wall," explained David Bajt, a freelance video specialist working for Mediatec. "There is also one D3 for stage left projection, one for stage right, and one for the interactive floor, plus back-ups. Something like 99% of the playback is on timecode. In the show development stage we gave D3 dongles to all the content houses - that way we could send it all to the director and get it signed off."

The VC-Strip is ideal for this kind of application, as Martin's Leif Orkelbog-Andresen explained: "There are 5,500 LED strips on the cubus. Each standard 400 mm strip has 16 RGB LEDs on 25 mm pitch; these can be shortened, two LEDs at a time, down to eight without the need for any electrical, or mapping modifications - simply snap and use, done on site."

This a critical factor for set designer Claus Zier as the LED strips needed to be trimmed to suit. "The LEDs are all calibrated at our factory," says Orkelbog-Andresen, "so all are the same colour temperature for the TV cameras. Up to 45 strips can be daisy-chained on the Molex connectors, and are driven by our own proprietary protocol off P3 controllers, which take a feed direct from the D3."

The Power Port racks used to distribute signal and power to the strips has 4 outputs each, bringing the total to 72m of LED strips per Power Port, meaning the hardware stayed at ground level, just cable and strips deployed up the structure, greatly simplifying any service or repair which is paramount on such a project.

Conclusion

Intellectual or ignoramus, there is - across its ever widening musical lexicon - something in the Eurovision Song Contest for everyone; some part that we can relate to. Who'd have thought a bearded lady could be so entrancing? That said, ESC poses the question: as we celebrate the 70th anniversary of the D-Day landings that heralded the end of the greatest conflict the world has ever seen, is the European Song Contest the apogee of post-war achievement? Frivolous, I hear you say, but consider this: the Russian entry was roundly booed. Could you ask for a better demonstration of democracy in action?



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