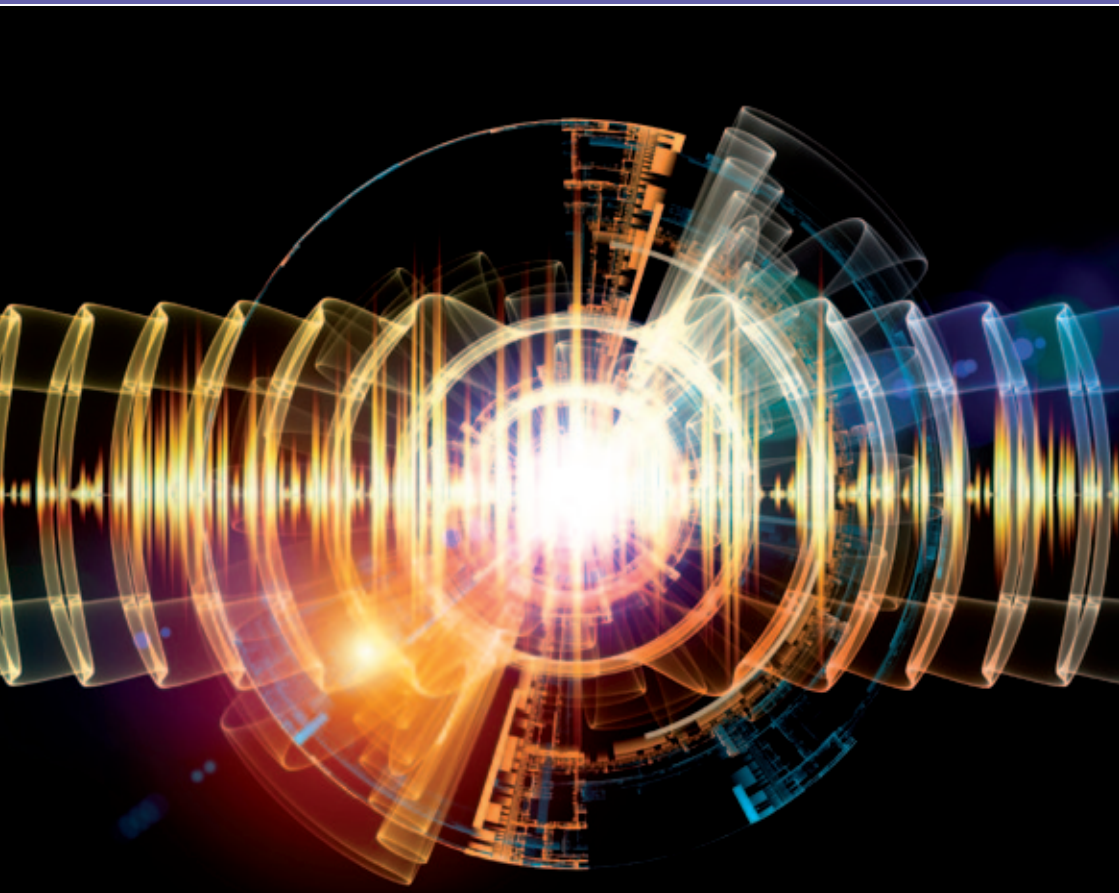
ISCE

The magazine of the Institute of Sound and Communications Engineers

June 2013



Inside this issue

Introduction from our President

Terry Baldwin *HonCompInstSCE*

Well, we have just had our June Council meeting and, as you will remember, we are publishing the magazine after each meeting so we can tell you some of the amazing decisions made.

Regional meetings were mentioned and we were disappointed at the lack of response from previous pleas for members to arrange some in their own area. If you can help, do give me a call. I can tell you that plans are afoot to hold a regional meeting in the north of England in the near future.

Talks continue regarding the idea of supporting contractors. Jeff Vaudrey raised this at the last AGM, supported by a number of others. As a learned society, the ISCE cannot be seen to be associated with, what in effect is, a trade association. These are the rules and there is little we can do about it. We can, and will, support individual members and companies in training and education and the many other benefits available.

In fact, we have had correspondence from Ron Annible, stating much the same as Jeff. On large contracts, the installation of cables will invariably be done by large electrical contractors, who know little about audio. Why not employ an ISCE member? If not, why not invest in their help prior and during installation? The answer is there aren't many members who could fund the installation of such a project, plus 60 to 90 day payment is the norm, and it is not the manufacturers who appoint installers, but the winner of the audio contract. I reckon Ron and Jeff should get together!

I had a very interesting meeting with our local headmaster of our community college. He positively encouraged me and discussed ways in which we could interact with schools. He said that pupils of around 14-16 years of age would really benefit as they are still unsure of their future and can be quite turned on with science. Why not take a simple amplifier and speaker or two and explain their roles? This will help educate, and could be a means of employing youngsters.

You will read about an invitation from DNH to visit their factory in Norway. Many of you will recall we did this many years ago and it was a great, great success. Due to flight changes, it is now necessary to stay overnight, which does push the cost up. If you wish to join Keith Golds and myself, contact either of us, and we will arrange a date.

I can also confirm that Thursday 24 October 2013 is our AGM and will be held at the Park Inn Hotel in Watford. Ros will send you further information about this soon.

I hope we can now enjoy some warm summer months.

Terry ◆

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Baldwin Boxall celebrate 30 years

Celebrating their 30th anniversary at Firex International, Baldwin Boxall commissioned a bespoke label for a bottle of ale from their local brewery – Harveys of Lewes. There was a great atmosphere on the stand with visitors enjoying the hospitality they have come to expect from the company's staff.

Baldwin Boxall was formed in 1982 by four directors – Terry & Patricia Baldwin and Dave & Dawn Boxall – in 1982 in a shed at the bottom of Terry's garden and Dave's home. A direct 'communication link' was set up between the two properties – an unofficial product invention.

They proved to be a great team and, within a couple of years, the shed was upgraded to a railway cottage near Crowborough rail station. A short while later a 'sales office' (caravan) was added to the site for Terry and Neil Jarvis. This was followed by the addition of a small mobile style building, for storage and packing. In 1990, twenty staff, ongoing expansion (and no more space for further caravans), the company moved into a purpose built factory just 500 yards from this site.

Left
Doubleby House – Baldwin Boxall's base before moving into the current premises in Crowborough. The site became known as 'Doubleby House'.

Above
Dave & Terry, early product – Dave Boxall (left) and Terry Baldwin (right) admiring an early design.

Right
Dave Boxall's offices today.

First product - Martlett

Set up to design and manufacture 'wired communications' the company developed public address amplifiers, intercom, hotel communication systems and other specialist products. The first product was the Martlett – a 20W stand-alone PA amplifier. There will be some people in the industry today that may well remember (or even still using, such is the quality) early Baldwin Boxall products, which include the 'Micro' data management system and 'Communicall' two way speech communications system.

The Adept, a modular range of amplifiers and routing for PA introduced in 1983, was extremely popular and proved to be a real workhorse (in common with many of the company's products, which are 'built to last'). Indeed, it is known from calls to our technical line, and the occasional return for repair, that Adept systems are still in use today.

Current product ranges include the VIGIL2 voice evacuation system, OmniCare and CARE2 emergency voice communication systems, Eclipse3 stand-alone public address/voice evacuation system, microphone ranges and touchscreen control.

With R&D, sales, projects, specials, assembly, test, quality, packing and despatch teams all based on the one site in Crowborough, the company is able to work efficiently and effectively. Knowledgeable staff, working together as a great team, proud of what they do, are committed to retaining the company's reputation as one that cares. ◆

Why doesn't my loudspeaker produce sine waves?

John Woodgate *HonFInstSCE*

No doubt many people have put a microphone in front of a loudspeaker fed with a sine wave signal and looked at the output waveform of the microphone amplifier on an oscilloscope. Sometimes the output waveform is a sine wave and sometimes it clearly isn't. So what is going on?

Simplify!

First of all, we can dispose of two things - reflections and resonances. Reflections do occur, but the signal coming back is still a sine wave at the same frequency as the input signal (unless it's coming back from a rattling Venetian blind or something similar). Now, adding two sine waves at the same frequency always produces another sine wave, not a distorted waveform. We can also look at timing. Sound travels in air at roughly 1 foot in a millisecond (and light at 1 foot in a nanosecond – a million times faster). A single cycle of a 40 Hz signal lasts 25 ms, so for a reflection to come back after a fifth of a cycle (5 ms) the 'go and return' path must be 5 feet, which means that the reflecting surface is 2.5 feet away – not the inside surface of a small enclosure.

Note *For people who can't cope with 'feet', an alternative simple rule is that sound travels 30 cm in a millisecond and light travels 30 cm in 1 nanosecond. So '5 feet' can be replaced by '1.5 m' and '2.5 feet' by '75 cm'.*

A resonance is a condition in a system where reactances of opposite type (inductance and capacitance, mass and compliance, acoustic mass and acoustic compliance) are equal and opposite, so that the system impedance is purely resistive. This occurs at a single frequency, although the resonance has observable effects over a narrow band of frequencies – how narrow depends on the ratio of reactance to resistance, the electrical Q (not to be confused with directivity factor). Resonances in loudspeaker systems do not create new frequencies, they only emphasise or de-emphasise frequencies already present in the input signal. If we put in a sine wave, that is a single frequency and it can only excite a resonance if the resonance frequency is close to, or equal to, the input signal frequency. In that case, the output waveform is not distorted.

To find the real cause of waveform distortion, we simplify the experiment by eliminating the enclosure and use a single drive unit suspended in free air, preferably in an anechoic room or in the open air (a free field if the landowner doesn't charge for using it). We have to make sure that the microphone and its amplifier do not introduce any significant distortion.

The experiment gives results

What we find is:

- at low signal levels, the output waveform is sinusoidal at all frequencies; this tends to confirm that reflections and resonances do not introduce waveform distortion as they are present whatever the signal level;
- at frequencies well above the main (bass) resonance of the driver, the signal remains substantially sinusoidal up to high sound pressure levels;
- from somewhat above to well below the main resonance frequency, waveform distortion becomes increasingly evident as the signal level is increased and the frequency reduced.

How are these effects related to the construction of the driver?

We can see the root causes if we look at the behaviour of the cone of the driver. As we increase the signal level OR reduce the frequency, the cone moves further; this is usually called 'excursion'. How does that produce distortion? Figure 1 shows a cut-away view of a driver, which may make it easier to understand Figure 2, which shows a cross-section.

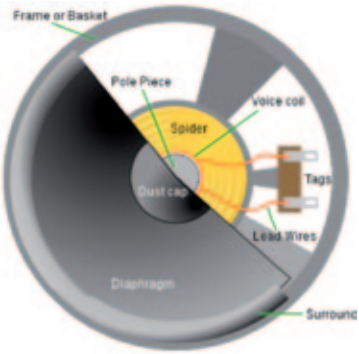

Figure 1 Cut-away front view of a driver

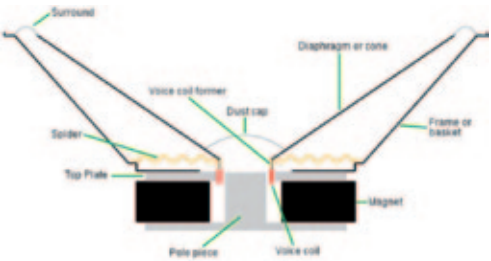

Figure 2 Cross-section of a driver
Loudspeaker cut-away and cross-section diagrams by Iain Fergusson - iain@iainfergusson.co.nz

The 'spider' and the surround (also together called 'suspension') provide the restoring forces that return the cone to its rest position after it has been moved by the force generated by the current in the voice-coil interacting with the magnetic field of the permanent magnet. Figure 2 shows the construction used since ferrite magnets were introduced in the 1960s. Rare-earth magnets (first samarium-cobalt and now neodymium-iron-boron) permit different structures, e.g. the magnet forms part of the pole-piece.

As the cone moves in and out of the basket to move air and produce the sound, two things occur:

- the spider and surround bend, and they can't bend to an unlimited extent; at some point the force needed to bend further greatly increases, as happens when you stretch a rubber band;
- the voice-coil, shown at rest lying symmetrically in the hole in the top plate, moves in or out, into regions where the magnetic field strength is lower than in the central region. The force generated by the voice-coil current is proportional to the magnetic field strength, so it reduces towards the extremes of excursion.

Both of these effects are examples of non-linearity – the excursion is no longer linearly related to the instantaneous current in the voice-coil, and this causes the production of harmonic frequencies, i.e. harmonic distortion. Various methods are used to reduce non-linearity, most notably in attempting to make the region of (fairly) constant magnetic field strength larger. The pole piece may be extended beyond the level of the top plate and it may be shaped below the gap region. The top plate may be made thicker or the voice-coil may be made deeper, but both have disadvantages - a thick top plate requires a more costly magnet and a long voice-coil reduces sensitivity. Typically, linear excursion is limited to about half the top-plate thickness, which is easily measured.

Note *I say 'sensitivity', not 'efficiency', because drivers are actually badly-designed room heaters. Most of the input power just heats up the voice coil, only a small fraction being radiated as sound power. Efficiency is conspicuous by its near-absence.*

A well-designed suspension reaches its 'in' and 'out' non-linear positions quite symmetrically, and it can be shown that the resulting non-linearity produces largely third (and other odd-order) harmonic distortion. But the magnetic structure is inherently unsymmetrical in the 'in and out' direction, so it produces largely second (and other even-order) harmonic distortion. By analysing the distortion products, we can see what is causing them.

So what do the results of the experiment show?

Figure 3 shows the input signal to the loudspeaker and the distorted output measured by the microphone (a Brüel & Kjær measurement microphone, so beyond reproach). The loudspeaker is a good quality 8 Ω 125 m bass driver having a free-air resonance ▸

frequency of 80 Hz. The waveforms were obtained at 40 Hz, with 4 V applied, i.e. just 2 W! We can see that the distortion is much the same on positive and negative half-cycles, so we can infer that most of the distortion is third harmonic and therefore due to non-linearity of the suspension and surround.

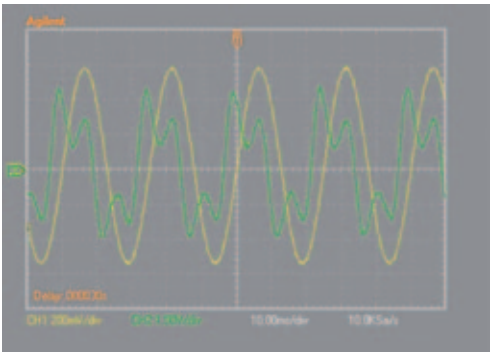

Figure 3 Input (yellow) and output (green) signal waveforms

We can extract the spectrum of the distorted signal using CoolEdit2000 (or Audacity, but its less flexible) and the result is shown in Figure 4.

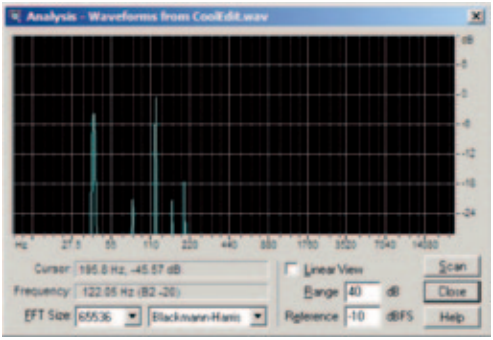

Figure 4 Harmonics of the 40 Hz output signal

The frequency scale is not labelled nicely, but the two tall lines are at 40 Hz and 120 Hz – the third harmonic. The 40 Hz line is attenuated by the computer's sound card – the third harmonic distortion component isn't really larger! The other lines are at 80 Hz, 160 Hz and 200 Hz, corresponding to the second, fourth and fifth harmonics.

Higher frequencies

Because the cone excursion is so much smaller at high frequencies, the non-linearity is also very much less. In fact, distortion proves to be a rather small but uneven function of frequency, and this is due to cone 'break-up' – the cone doesn't behave as a rigid body, which is just as well, because if it did, the useful frequency range would be greatly reduced. Nonlinearity arises from local bending of the cone material. Figure 5 shows what happens at 1 kHz (but doesn't indicate the deafening sound level!).

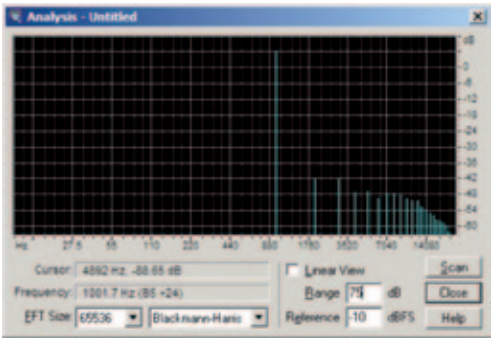

Figure 5 Harmonics of the 1 kHz output signal

The harmonics march off towards 20 kHz, but the total harmonic distortion is around 2.5 %, which is fairly typical. The waveform isn't noticeably non-sinusoidal.

Low-cost loudspeakers with paper surrounds can suffer from rather high distortion caused by the cone vibrating at some frequencies in 'bell modes'. These occur when the inner edge of the surround is not stiff enough to prevent standing waves being set up around its perimeter, the cone bulging in at some places and out at others. This results in the compliance of the surround being non-linear, and non-linear compliance can create sub-harmonics as well as harmonics. So, for example, an 800 Hz input signal can produce an output that has an audible 400 Hz component. The effect of sweeping the input frequency through one of these bell modes is to produce a sound which is almost like a cat's meow, and the effect is called 'cone cry'. ◆

Your charities – now on the web

Ron Walker Charities Administrator

Both of the registered charities can now be found on the ISCE website. The details of the Public Address Engineers Benevolent Fund can be found under *Membership* and is listed as a benefit to members. The Alex J Walker Memorial Fund can be found in the member section and under *Training*. Despite the present hard times, these charities both need and deserve your support. We will continue to have donation buckets at ISCE main events for you to drop you donation into.

The Public Address Engineers Benevolent Fund (216648), was set up in 1962. Any bone fide person engaged in the sound industry can apply for assistance, which will be vetted by a board of independent trustees.

The Alex J. Walker Memorial Fund (262085), with a separate list of trustees and named after the founder of our predecessor organisation, the Association of Public Address Engineers (APAE) was established in 1969 to provide help with education and training in the industry. During the last few years, money from this fund has been used to subsidise some of the training courses run by the ISCE which otherwise would be too expensive for members to attend.

Please earnestly consider making a donation, however modest. Where possible, please Gift Aid your donation – turning, for example, £100 into £125, courtesy of the Chancellor of the Exchequer.
Please send your contribution to one of the Trustees, or Ros Wigmore at ISCE or by post to myself as Charities Administrator, Ron Walker,
132 High Street North, Stewkley, LU7 0EP.
(Please nominate preferred charity, and if transferring funds by BACS ask Ron at ron@stewk.co.uk or phone 01525 240444.

For further information, quote either of the above charity registered numbers on the Charity Commissioners website, or pick up a leaflet at ISCE events where the Trustees will be happy to answer any questions. ◆

FIREX International

FIRE PREVENTION, DETECTION & PROTECTION

13-16 May 2013, NEC Birmingham, UK

The bi-annual Firex Exhibition took place at the NEC for the last time in May 2013, before changing to an annual three-day event at ExCel in Docklands next year.

Firex International is the leading event for professionals involved in fire protection, prevention and detection, and many ISCE members exhibited and visited the exhibition.

Some exhibitors in the field of voice alarms included:

ASL who launched their new range of Voice Alarm equipment, including the Vipedia-12 IP enabled scalable routers, plus new MPS microphones with IP functionality and fully programmable features and also the EMS fire microphones with new expansion capabilities . This all-new range is EN54-16 certified and available immediately.

Baldwin Boxall who celebrated their 30th anniversary in usual style at the Plug & Socket pub, displayed their EN54 certified voice evacuation, emergency voice communication, public address systems and IP30 rack enclosures and EVC system.

C-TEC and its sister company, **SigNET (AC**), one of the UK's leading manufacturers of life-safety equipment, exhibited their fire alarm control panels, voice alarms, call systems, power supplies and disabled refuge systems.

Cooper Fulleon leading manufacturer of alarm signalling devices and producing audible and visual units worldwide, exhibited their traditional products like bells and call points, to state of the art devices, such as the new EN 54-23 compliant LX range.

DNH World-Wide Ltd displayed their range of EN 54-24 certified loudspeakers

Fuzion, who distribute an extensive range of high quality professional audio and PA/VA equipment for a wide range of applications were also exhibiting. For the PA/VA sector, Fuzion represents the ATEIS brand exclusively in the UK and Ireland. System design, technical support and full after-sales service are an integral part of their package and they work closely with clients to ensure efficient execution of every project.

Formed in 1968, **Protec** are a privately owned business and all products are designed and manufactured in the UK. The products are LPCB/BSi tested and certified. Protec have a very impressive and prestigious project portfolio and export to over 40 countries, spanning five continents.

TOA Corporation is an audio provider, dedicated to the design and manufacture of communications equipment, notably: public address; professional audio; voice evacuation and intercom systems. At Firex, visitors saw the full range of TOA's EN-54 certified voice evacuation systems. ◆

Events diary

9 July 2013
Flare Audio demonstration,
Brighton, UK

11 July 2013
ISCE Training – Design & Installation of Induction Loops
Warrington, UK

12 July 2013
ISCE Training – Measurement & Certification of Induction Loops
Warrington, UK

17 July 2013
ISCE Training – Design & Installation of Induction Loops
Tunbridge Wells, UK

18 July 2013
ISCE Training – Measurement & Certification of Induction Loops
Tunbridge Wells, UK

10–11 September 2013
ISCE Training – Basic training for sound system installers and technicians
Leeds, UK

24 September 2013
SoundPro 2013
Pinewood Studios, UK

5–7 October 2013
3rd International Hearing Loop Conference
Eastbourne, UK

6–9 October 2013
PLASA
London, UK

23–24 October 2013
The Showman's Show
Newbury, UK

24 October 2013
ISCE AGM
Watford, UK

5 March 2014
ISCEx2014
Birmingham, UK

Emergency voice communications systems

Frequently asked questions

Which British Standards do I need to refer to?

BS 9999:2008 – for refuge area definitions and specifications.

BS 5839-9:2011 – for design, installation, commissioning and maintenance guidelines.

BS 8300:2009 – for disabled toilet alarm code of practice on accessible buildings.

Is BS 5839-9:2011 statutory?

BS 5839-9 is a guideline, however, follow carefully due to the fact that it is a life safety system.

What is the difference between Type A and Type B remotes?

Type A – an outstation using a telephone handset for communication. Fire telephone / steward telephone.

Type B – an outstation using an intercom and normally mounted on the wall. Disabled refuge remote.

What is a refuge area?

- a temporary waiting area of relative safety
- it should be protected from a fire for a period of time sufficient to enable the evacuation sequence to be completed
- commonly located within fire protected stairwells (should be accessed in the same direction as the escape flow)
- can be a protected lobby, protected corridor or protected room. can also be a flat roof, balcony or similar space sufficiently protected or remote, with its own means of escape.
- should be accessible by a person in a wheelchair
- as a minimum a refuge area should be 900 mm x 1400 mm (clear entrance of at least 850 mm with a corridor width of not less than 900 mm).
- should not be used as a place to leave a disabled person to await rescue by the fire service.

When do I need a refuge system?

A refuge system provides two-way voice communication between a refuge area and building control.

EVC systems are generally needed in the following situations:

- buildings/venues where there are people who may have difficulty self-evacuating in an emergency
- buildings with phased evacuation
- buildings without phased evacuation but where size/type/shape necessitates communication between locations and to facilitate evacuation/firefighting
- sports venues, or similar, where stewards may need to control an evacuation.

What are the intended uses of an EVC system?

- use by management of the building or complex, for its initial evacuation
- use by the fire service during an evacuation
- use by the fire service after an evacuation
- use by disabled people. ◆

Courtesy of Baldwin Boxall Communications Ltd

ISCEx2014 news update

We have a number of exciting plans to announce regarding our annual exhibition and seminar day.

In response to our members' requests for a more central location, we have a new venue for ISCEx2014, in Britain's second largest city, Birmingham. We have booked the Holiday Inn Hotel, which is a slow five-minute walk from Birmingham New Street train station. The date is set for 5 March 2014 and keep an eye on the ISCE website, which will unfold further information as it becomes available.

Methods and accuracy in acoustic modelling

Chris Hales *MInstSCE*

Acoustic modelling of PA/VA and other sound systems has become an accepted requirement of any major system installation contract. Yet the potential for error in modelling remains high, especially if carried out by the inexperienced, and the consequences of failing to achieve the required standards for speech intelligibility and audibility can be costly. This article outlines some of the pitfalls and limitations of acoustic modelling, with some advice on how to increase accuracy and improve confidence in modelling results.

There are several well established software packages for acoustic modelling available on the market, each with its own strengths. Regardless of the package used, the old adage of 'garbage in, garbage out' applies. The output results are only as accurate as the data input to them. These include the loudspeaker data and the acoustic absorption / scattering coefficients of the materials that comprise the space being modelled. Even with careful consideration of these parameters, an allowance for some tolerance in the accuracy of any calculation is advised. Therefore, for the sound system designer it is important to carefully define all parameters in a model. This is especially important when the final system performance forms part of a contractual agreement.

Methods and models

Whilst some modelling packages allow a quick 'statistical' calculation of sound pressure levels (SPL) and speech intelligibility (speech transmission index, STI), this kind of calculation can often be limited in its accuracy and usefulness. For non-diffuse spaces and applications involving complex loudspeaker layouts, ray tracing is the accepted method for providing the most accurate results, as well as offering more detailed analysis.

Ray tracing methods approximate the spherical propagation of sound waves by emitting thousands of rays from each sound source and calculating the losses and reflections (and in some cases diffraction) at each surface that the rays strike. The calculation can then account for the room geometry, individual surface reflections/scattering and the effects of echoes on intelligibility. The reverberation time (RT), which can vary significantly throughout a space, can also be calculated at different positions and for different assessment methods (eg T20/T30, early decay time).

Getting the RT accurate is one of the most important aspects of any model, yet it is easy to select inappropriate materials when defining the acoustic absorption coefficients of the various surfaces in a space. Inaccurate selection of absorption coefficients can lead to overly-optimistic STI results if the predicted RT is lower than it should be. Conversely a loudspeaker system may be over-engineered to achieve the desired performance if the RT is over-estimated.

For new build projects, there is more likely to be laboratory test data available for materials, however this is normally limited to products with specific acoustic performance properties. For other surfaces, standard lists of coefficients for common materials are usually provided with the software or can be found in acoustical reference books. Again care is needed when using any reference data; consideration should not only be given to the surface finish of a material, but also the thickness of the material and structural build-up / air gap behind it, which can lead to significant variations in absorption at different frequencies.

If the building already exists, there may be an opportunity to increase the accuracy of the model by carrying out acoustic testing on site. Measurements of reverberation times, or even of the intelligibility of an existing sound system, can provide the designer with invaluable data. The measured RT or system STI can then be simulated in the model by varying the absorption coefficients of the model's surfaces until the predicted RT or STI agrees. The subsequent modelling results for the new sound system design can then be relied on with much greater confidence.

In the following example of a large, historic hall, the mid-frequency RT (Tmf) predicted by the initial acoustic model was in the region of 5 seconds, based on the information known about the materials used in the space; stone walls, stone floor and a wooden roof. Given the harsh acoustic conditions, it was not surprising that several solutions trialled in the model

failed to produce a result complying with the required standard of intelligibility for voice alarms, ie an STI of 0.50. Restrictions on the loudspeakers' size, appearance and placement, owing to the building's grade I listed status, made the challenge even greater.

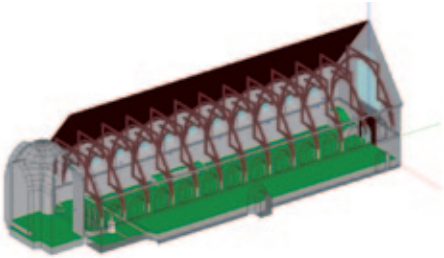

Figure 1 Acoustic model of historic hall

However, acoustic measurements on site revealed a different story, with an RT of just 3 seconds. It was deduced that the error was likely to be that the absorption coefficients modelled for the wooden roof were too low: maybe years of decay and woodworm had acted in the acoustician's favour! With little absorption present in the original model, a slight adjustment in the coefficients of the wooden roof made a substantial change in the predicted RT.

Further site tests involving the long throw performance of small test speaker were also simulated in the model, the results tying in well with the measured data. With the model effectively calibrated, a solution was subsequently found based on long-throw, high-directivity horn loudspeakers placed above the doorway.

Intelligibility – optimising and accuracy

There are several factors that affect speech intelligibility of a system; echoes and reverberation, signal to noise ratio and frequency response / bandwidth being among the most critical. If there is no scope to reduce reverberation by introducing additional acoustic absorbing finishes into the space, then the key to optimising intelligibility usually lies with the correct selection and positioning of loudspeakers.

Loudspeaker coverage patterns should be closely examined to ensure that consistent coverage can be maintained at all critical speech frequencies, with minimal variations in direct sound levels. This can often be difficult to achieve, with a tendency for many loudspeakers to focus sound more tightly at higher frequencies.

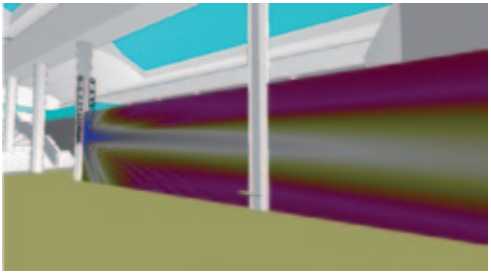

Figure 2 Modelling of loudspeaker coverage pattern

Higher directivity (Q) loudspeakers can offer improved intelligibility by focussing sound output more effectively at the intended target area, thus minimising unwanted reflections. Yet higher Q loudspeakers are often associated with narrow beamwidth; again, careful choice of loudspeaker types and positioning is essential to ensure that optimal coverage of the audience area is achieved.

An understanding of signal to noise ratio is also crucial, as high noise levels can drastically reduce the effective STI. If a site already exists then measurements of the typical ambient noise should be taken and then incorporated into the calculations. Alternatively representative noise data from similar sites can be used with some caution. Yet there are other noise sources that often get overlooked – is there a smoke extract system on site and will it activate as soon as the fire alarm system goes into alert / evacuation condition? The predicted STI under noiseless conditions might look perfectly acceptable until the real-life noise conditions are factored in.

Loudspeaker data

When determining whether a system will deliver the required sound levels, just as much care needs to be taken to ensure a valid prediction. Inaccuracies can arise owing to misleading loudspeaker data provided by manufacturers, or misinterpretation of their data by the user. Different sources of data for the same loudspeaker, whether taken from the software's own database or independent test reports, can often reveal differences in the reported frequency response and the maximum SPL achievable by a loudspeaker.

The following data was found from three different sources for the same commonly used PA/VA loudspeaker:

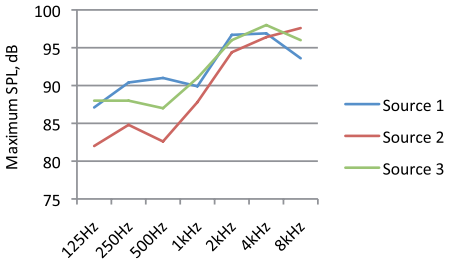

Figure 3 Comparison of loudspeaker frequency response data

Clearly there is a need to verify the loudspeaker sound pressure level data used in the model before deriving a result. Additionally, the designer should consider the maximum SPL achievable by a loudspeaker based on its sensitivity to a speech-based signal. This can often be lower than its sensitivity to a pink noise signal, with the final system levels achievable on site potentially falling short of the target for speech broadcasts. As a minimum, the implications of over-estimating the sensitivity of loudspeakers could mean needing to physically adjust loudspeaker power tappings on site. At worst, the contractor could be left with an ineffectual loudspeaker installation and/or an insufficient amplifier power allowance.

Finally, the directivity data of a loudspeaker needs to be accurate as this will determine not only its coverage pattern but the number of reflections / echoes that result from its use. Whilst manufacturers' data is generally quite reliable, it is worth checking how the loudspeaker was originally tested, eg in free space or mounted in/against a baffle, full sphere or half sphere directivity pattern? This modelled arrangement should tie in with how the loudspeaker is actually intended to be installed.

Acoustic modelling software packages have developed a long way in the last 10 years, with more sophisticated calculation techniques and loudspeaker data becoming available to the designer. There remains a huge potential for error if the data is misunderstood or incorrectly used, but with careful consideration of the key parameters of the model and an understanding of the electro-acoustic theory behind the calculations, modelling software can be a highly accurate and valuable tool to the sound contractor and consultant alike.

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The Purple Guide

The Purple Guide to Health, Safety and Welfare at Music and Other Events (draft) has been drawn up by the Events Industry Forum in consultation with the UK events industry, including representatives from regional and national Government. This publication is designed to replace the original 'Purple Guide' (HSG195) which was originally published by the Health & Safety Executive (HSE) in consultation with the industry.

Covering both legislations and good practice, the new guide has been designed to signpost event organisers and suppliers to the practices and issues that need to be considered when events are being organised. The contents are not designed to be prescriptive and those using the guidance should undertake appropriate risk assessments and evaluations to evaluate the specific requirements of the specific events they are organising or involved with.

The chapters available on the website are currently in draft format and should be used purely for guidance. If you have comments on the drafts, please register and use the comment form at the bottom of each chapter page or submit them to admin@thepurpleguide.co.uk, stating clearly the chapters they relate to as well as a paragraph reference number. All comments made, with the correct paragraph reference, and received by 31 October 2013, will be considered by the editorial/working groups in the Autumn of 2013 before the final publication is launched. ◆

Apprenticeships

Helen Goddard *FInstCE* **Principal of AMS Acoustics**

Facts

- In our industry we have a real shortage of young people
- 958,000 16–24 year-olds are unemployed in the UK as of March 2013
- our industry has been deeply affected by the recession
- employers have reticence to employ full-time staff due to cost, contractual obligations and market uncertainty
- the Government has an apprenticeship scheme in place.

This article explains what has been learnt about the Apprenticeship Scheme from the perspective of an employer who is desperate to recruit a pair of young technicians.

At AMS Acoustics we believe in 'home growing' our technical staff and have previously taken on young technicians through local job centres. Until now, the stumbling block has always been the reluctance of the young people to enter into or apply themselves to formal education as part of their working duties. It is an irresponsible employer who does not action the career progression of its staff but as they say 'you can lead a horse to water…'. The difference with the Apprenticeship Scheme is that formal education is a mandatory requirement imposed on both the employer and the apprentice by the Government.

So, how does it work?

The employer has to undertake their due diligence as they would with any vacancy; job description, package offer etc. There also has to be a training provider in place that could be a local provider that the employer identifies with a suitable offering or one that is assigned to the employer. The training provider is responsible for delivering education to the apprentice through the vocational pathway, such as NVQs, and B-Techs. The training provider will have first call on the apprentice to attend college on either a day release or block release scheme. In all other aspects the apprentice is required to be treated as and behave as a full-time employee.

There are three levels of apprenticeships available:

Higher level:	degree level
Advanced level:	post 'A' level
Intermediate level:	post GCSE

These cover a multitude of job roles through 250 difference types of apprenticeships. Of interest to the ISCE members may be the number of young people who are currently on electro technical or electrical and electronic servicing apprenticeships. These courses focus on installation and maintenance of systems, skills that are transferable to our industry with supervision and additional teaching. There is also an advanced apprenticeship in building services engineering technology that would also be relevant. Perhaps the IT, software, web and telecoms professional apprenticeships exist at all three levels and would offer useful skills for digital transmission of audio such as VOIP. It is for the employer to utilise the transferable skills of the young people to mutual benefit.

There are several routes to employing apprentices:

- **directly** – you can find your own apprentice, find your own training provider and register your company for the scheme.
- **training provider** – you can identify a college running an appropriate course and ask them to supply you with candidates.
- **agency** – you can sign up with a private agency who will then supply you with candidates.
- **local authority** – most local authorities have departments that are ready to match employers and training provider.

What does it cost?

The minimum hourly rate that apply to apprentices in England is £2.68 and for the rest of the UK there is a minimum weekly rate of £95. Of course the employer may elect to pay more than the minimum.

The Government bears the education costs for any apprentice aged between 16–24 and currently awards a £1,500 grant to employers that is a one off payment made at the start of each apprentice's tenure. If you are a London-based organisation there is also an additional £1,500 available from the London Enterprise Panel and Greater London Authority.

How to attract the right apprentice

We were given some pointers in drafting our advert and how to attract the most suitable candidates based by our London Borough of Enfield Apprenticeship Programme Manager that may be useful if this article has whet your appetite.

Sell your company

- we were advised to stop being so modest in the way that we described ourselves
- talk about career development
- mention key projects that young people would be interested in.

Wages

- offer above the apprenticeship minimum to attract the right candidates
- identify incremental increases related to milestones
- consider paying travel expenses.

Interview

- recognise that this is a scary undertaking for a young person
- think of ways that you can determine technical aptitude
- layout your workplace requirements firmly.

Visual communication

- include photographs in the advert that say something about your company
- provide an organogram so applicants can see where they fit in.

AMS Acoustics' experience

We became aware of the scheme after I received several cold calls from training providers trying to find placements for their apprentices. We were offered trainee administrators and sparks, none of which seemed to quite fit the bill. Undeterred, we decided to investigate the scheme, I went straight to Google and up popped the official website: www.apprenticeships.org.uk that has the phone number: 0800 150600 in very large bold font. After 2 days of ringing it periodically I concluded that perhaps they needed some apprentices of their own to answer the phone!

As I was now a bit peeved, I decided to look on our local authority website and found out that we have an apprenticeship programme manager. It took five attempts for the council to connect my call and I was promised a call back the next day. Three weeks later… I received an email from the Programme Manager requesting a meeting at our offices. Well, you can imagine that I was ready to vent my frustration, however, I was disarmed by the very competent, professional who duly arrived. The meeting was very useful and productive and it was reassuring to hear that the council have 80 apprentices of their own. We are now being 'matched' with a service provider, our advert is being placed in all the right places at the Council's expense and we are on track to have our apprentices in place by the autumn.

The future

We recently had a visit from a local MP. When I recounted my experience with the apprenticeship help line he said with a wry smile: "Well, how stupid are you? Ringing the help line!". This has got me thinking that with this level of cynicism perhaps it is time to give young people the chance they deserve and just maybe Britain will become great again. ◆

ISCE supporting member appoints new technical sales manager

Audio distributors, Commercial Audio Solutions would like to announce the appointment of Marc Ogier TechInstSCE as their new technical sales manager. Sales Director Bill Mackie said "we are very excited about Marc joining us. Marc has a wealth of knowledge gained over twenty years as a pillar of the audio community " Bill went on to say "Marc's appointment comes in our tenth year of trading and represents a firm commitment to offer the best service and technical support in the audio industry." ◆

Trip to Norway

DNH World-Wide Ltd are looking to organise a trip for ISCE members to their factory in Kragero, Norway in September 2013. If you are interested in going along, please contact Keith Golds on 01908 275000 or email keith@dnh.co.uk for further details and costs.

An approximate itinerary would include

11.00	**arrive Stansted Airport**
13.00	**depart Stansted Airport**
16.00	**arrive Torp Airport**
18.00	**transit to Kragero, home of DNH**
	overnight stay in Victoria Hotel
	meal out in Kragero
09.00	**visit DNH factory and tour**
12.00	**small visit to Kragero Town, possible trip on fjord**
14.30	**depart for airport**
17.05	**depart Torp Airport**
18.05	**arrive Stansted**

ISCE is delighted to welcome two new supporting members

DJ Kilpatrick & Co Ltd, Belfast
Distributors of public address, pro sound, CCTV, door entry & conference equipment

Sarabec Ltd, Middlesbrough
Providers of products for those with hearing difficulties

New Members
June 2013

Affiliate Member
Ross Sharples
Rossco Ltd

Senior Technican
Martin Pilton
Freelance Sound Consultant

Member
Luke Kenny
Sound Systems UK

CAN YOU BELIEVE IT?

Because lights don't have ears

If you have any strange or funny snippets to add to this column, we would love to include them in future issues of the magazine.

Supporting Members

A K Barns Ltd, Cambs
www.soundplayback.com
Mr A Barns *MInstSCE*

ADS Worldwide, Manchester
www.ads-worldwide.com
Mr J Houldcroft *MInstSCE*

Alarm & Communication Systems Ltd, Tyne &Wear
www.alarmcommsys.co.uk
Mr M Jefferson

Ampetronic Ltd, Nottinghamshire
www.ampetronic.com
Mr J Pieters *MInstSCE*

AMS Acoustics Ltd, London
www.amsacoustics.co.uk
Ms H Goddard *FInstSCE*

Arup Acoustics, Manchester
www.arup.com/acoustics
Mr D Hiller

Audio-Technica Ltd, Leeds
www.audio-technica.com
Mr H Roberts

AViD Installation Solutions Ltd, Birmingham
www.avid-isl.com
Mr A Hayden

Baldwin Boxall Communications Ltd, East Sussex
www.baldwinboxall.co.uk
Mr T Baldwin *CompInstSCE*

BL Acoustics Ltd, Essex
www.blacoustics.co.uk
Mr B Larcombe *MInstSCE*

Blaydon Communications Ltd, Tyne &Wear
www.blaydoncomms.co.uk
Mr P Dougherty *MInstSCE*

Bosch Security Systems, Middlesex
www.boschsecurity.co.uk
Mr P Ward *AMInstSCE*

Canford Audio Plc, Tyne & Wear
www.canford.co.uk
Mr P Vickers

CIE Group Ltd, Nottinghamshire
www.cie-group.com
Mr K Sherwood *MInstSCE*

Clarity UK Ltd, Essex
www.clarityuk.co.uk
Mr G Palmer *AMInstSCE*

Cloud Electronics Ltd, Sheffield
www.cloud.co.uk
Mr S Curtis

Commercial Audio Solutions Ltd, Derbyshire
www.commercialaudiosolutions.com
Mr W Mackie *AMInstSCE*

Communication Technology, East Sussex
www.communication-technology.co.uk
Mr L Pannett

Contacta Systems Ltd, Kent
www.contacta.co.uk
Mr R Dungan *MInstSCE*

Cooper Fulleon Ltd, Gwent
www.cooperfulleon.com
Mr P Regan

Cooper Lighting & Safety Ltd, Doncaster
www.cooper-ls.com
Mr B Walder

CPC
www.cpc.co.uk

C-TEC, Wigan
www.c-tec.co.uk
Mr A Green

CUK Ltd, Glasgow
www.cuk-audio.com
Mr S Thomson

Current Thinking Assistive Listening Ltd, Tyne & Wear
www.current-thinking.com
Mr S Binks

DJ Kilpatrick & Co Ltd, Belfast
www.djkilpatrick.com
Mr J Hooks *AMInstSCE*

Delta Telecom Sound & Security Ltd, Stockport
www.deltatelecom.co.uk
Mr S Ratcliffe *TechInstSCE*

DNH Worldwide Ltd, Milton Keynes
www.dnh.co.uk
Mr K Golds *AMInstSCE*

Duran-Audio UK Ltd, Cardiff
www.duran-audio.co.uk
Mr N Screen

d&b audiotechnik GB Ltd
www.dbaudio.com
Mr S Hogg

Edworthy Audio Consulting, East Sussex
www.edworthyaudio.com
Mr D Edworthy *HonFInstSCE*

Electronic Audio Systems Ltd
www.electronicaudiosystems.co.uk
Mr B Latham *MInstSCE*

Fuzion Ltd, Surrey
www.fuzion.co.uk
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Gordon Morris Ltd, Somerset
www.gordonmorris.co.uk
Mr G Morris *MInstSCE*

Grainger Communications Ltd, Co. Tyrone
www.graingercommunication.com
Mr M Grainger *MInstSCE*

Mongey Communications, Co. Kildare
www.mongey.ie
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Nebula Audio Ltd, Worcestershire
www.nebulaaudio.co.uk
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Newtech Southern Ltd, Hampshire
www.newtechsouthern.co.uk
Mr A Bradshaw *TechInstSCE*

Northern Light, Edinburgh
www.northernlight.co.uk
Mr J Allen

NSR Communications Ltd, Hertfordshire
www.nsrcommunications.co.uk
Mr P Walker

Peavey Electronics Ltd, Northants
www.peaveycommercialaudio.com
Mr J Kennedy

Penton UK Ltd, West Sussex
www.penton.org
Mr P Alberry-King *MInstSCE*

Principle Link, Huddersfield
www.principle-link.com
Mr R Cooke

Provoice, Lancashire
www.provoice.co.uk
Mr J Gilroy *MInstSCE*

RCF Audio, Essex
www.rcfaudio.co.uk
Mr P Price *MInstSCE*

R K Sound Engineering Ltd, St Albans
www.rksound.co.uk
Mr J Raper *MInstSCE*

Romers Electronics Ltd, Blackburn
www.romers.co.uk
Mr J Caton *MInstSCE*

RW Salt Communications Ltd, Manchester
www.rwsalt.co.uk
Mr J Nibloe

Sarabec Ltd
www.sarabec.co.uk
Mr C Foxton

Sennheiser UK, High Wycombe
www.sennheiser.co.uk
Mr A March *MInstSCE*

Simcol Communications Ltd, Newport
www.simcol.biz
Ms C Hurditch

Shure Distribution UK, London
www.shuredistribution.co.uk
Mr T George-Tolonen

SigNET (AC) Ltd, Tyne & Wear
www.signet-ac.co.uk
Mr A Scott *FInstSCE*

Simpson Sound & Vision Ltd, Warwickshire
www.simpsonsoundandvision.com
Mr D Simpson *MInstSCE*

Solent Sound Systems Ltd, Southampton
www.solentsound.com
Mr R Gatehouse *MInstSCE*

Sound Directions Ltd, London
www.sounddirections.co.uk
Mr S Boivin-Champeaux

Sound Productions, Dublin
www.soundproductions.ie
Mr D McGlynn *MInstSCE*

TOA Corporation (UK) Ltd, Surbiton
www.toa.co.uk
Mr B Downing

Tyco Integrated Systems, Cambridge
www.tycoint.com
Mr K Blackwell

Univox Audio Ltd
www.univoxaudio.co.uk
Mr K Hollands

Vaughan Sound Installations Ltd
www.paigroup.com
Mr R Vaughan *MInstSCE*