Institute of Acoustics



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# acoustics BULLETIN

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## contents



The Institute of Acoustics was formed in 1974 through the amalgamation of the Acoustics Group of the Institute of Physics and the British Acoustical Society and is the premier organisation in the United Kingdom concerned with acoustics. The present membership is in excess of two thousand and since 1977 it has been a fully professional Institute. The Institute has representation in many major research, educational, planning and industrial establishments covering all aspects of acoustics including aerodynamic noise, environmental, industrial and architectural acoustics, audiology, building acoustics, hearing, electroacoustics, infrasonics, ultrasonics, noise, physical acoustics, speech, transportation noise, underwater acoustics and vibration. The Institute is a Registered Charity no. 267026.

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*Dear Fellow Member*

*So, two years have passed and by the time you read this I will have handed the chain of office to Bernard Berry. It is particularly apposite that Bernard will be the President of the Institute for Internoise 96, as he is the Congress General Chairman leading a team effort involving many people. Certainly the congress appears to be on course to be a considerable success with at least 1000 delegates expected to attend. The opportunity is too good to miss and I propose to attend this, my first Internoise, and find what it is that persuades people to travel around the world each year. I look forward to seeing many of you in the newly refurbished Adelphi hotel.*

*Forum Acusticum, the triennial research oriented conference organised by the European Acoustical Association, took place in Antwerp at the beginning of April but, judging by the programme and subsequent comments, few of our members found it to their taste. My contacts from Central Europe tell me that they found it a very successful conference.*

*It is my opinion that to some extent it is the breadth of our own activities – meetings, the Bulletin, Proceedings and our educational activities – which diminishes the pressure for participation in a European body. In my own case, my professional interests have always been better suited by small specialist meetings while those who might wish to attend broadly-based research meetings have severely restricted funding these days for conference attendance. Increasingly, our continuing participation in EAA is going to cost money and, as an Institute, we are going to have to decide how much of our available funds we wish to expend in this direction.*

*The Institute is looking carefully at the services we provide for our members and the methods of financing and operating them. To this end Ian Campbell is chairing a Business Review Working Group which aims to report to Council in two years time. Each area of our activities has a representative drawn from the corresponding standing committee and we publish their names in this current Bulletin; you may wish to let the appropriate member have comments about those services that you think are essential, good value, interesting, disposable, etc. There will be a more formal exploration of members' views during the coming months.*

*I am grateful to members of Council and our Committees for their support and help during my term of office and, of course my thanks go particularly to our Head Office staff who have been unfailingly helpful whenever I have called upon them. To all the rest of you, my fellow members, I wish success in your professional activities and happiness in your private lives.*

*Sincerely yours*

Alex Burd

*Alex Burd*

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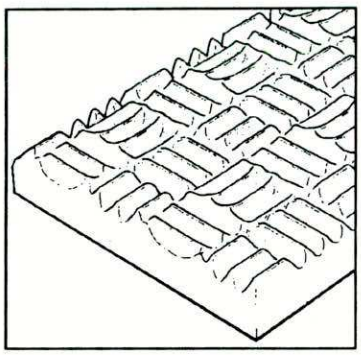

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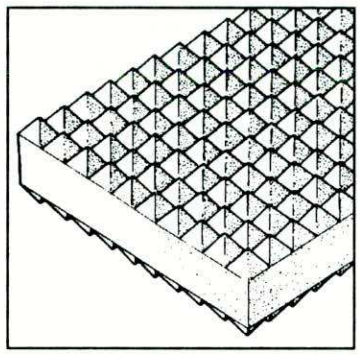

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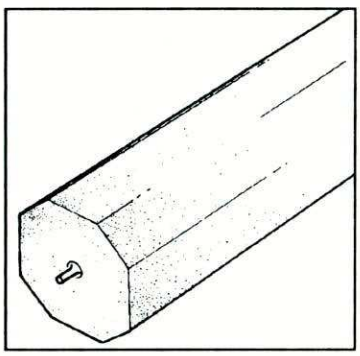

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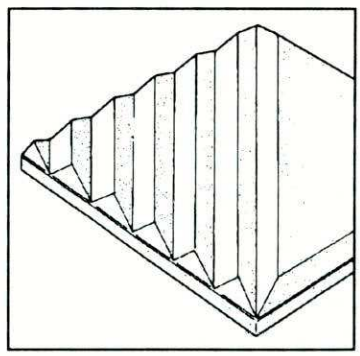

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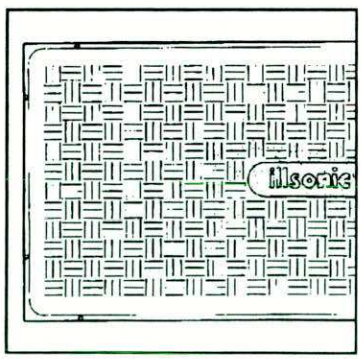


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# SOUND LEVEL METERS – SPECIFICATION STANDARDS AND TESTING

Susan Dowson

## Introduction

Sound level meters are in daily use by acoustical and environmental engineers, who, in many cases will be implementing a measurement procedure defined in a national or international standard. The standard normally contains a clause on the accuracy class (Type) of instrument to be used, and on the calibration of the instrument. Often, for example in legal cases such as compensation claims for hearing damage, or for measurements performed under EC Directives, it is important for the engineer to be able to demonstrate that the instrument is still working to its original specification and that its calibration is traceable to national measurement standards.

But what degree of testing is it really necessary, or cost-effective, to perform on a sound level meter? Nowadays, the majority of sound level meters have digital displays, giving an indication to 0.1 dB, often leading to the misconception that the meter must be 'giving the right answer to 0.1 dB, because it displays to 0.1 dB'! All instruments, acoustic or otherwise, are designed by a manufacturer to meet a set of specifications, usually given in an international or national standard document. In reality, the specifications include tolerances around the design goals, and an instrument's performance must lie within these tolerances to comply with the standard. Some instruments are used for precision measurements and some purely as an indicator, so specification standards usually give various tolerances depending on the accuracy class of the instrument. As an example, the requirement for linearity in the current specification standard for a Type 1 sound level meter is that, over the most accurate part of its range, the meter must read within ± 0.7 dB of the expected level, relative to the reference level, to comply with the standard. This article discusses the various approaches to verifying that sound level meters are properly calibrated and performing to specification.

## Current Specification Standards

There are currently two international specification standards relating to sound level meters. Both were produced many years ago by the International Electrotechnical Commission (IEC) which is the main standardising body for acoustical instrument performance. IEC 651:1979 [1] gives a full performance specification for sound level meters, and IEC 804:1985 [2] gives equivalent information for integrating-averaging sound level meters. The standards give specifications for 4 Types of meter – Type 0, 1, 2 and 3, the Type number increasing as the tolerances around the centre values are broadened.

These standards are wide-ranging and include acoustical tests, for example to verify the directivity of the meter, electrical tests to verify the signal processing features of the meter, and also tests to verify the immunity of the meter to various environmental influences, eg pressure, temperature, humidity, vibration, magnetic fields etc. Some countries require an independent authority to verify the claims of the manufacturer before an instrument can be marketed. This may also apply when measurements are being made for legal purposes. A complete test of a new model of sound level meter to all the specifications given in the relevant IEC standard is termed a 'pattern evaluation', sometimes known as a type test. This full test is very labour-intensive and hence expensive, and whilst this cost can be borne by a manufacturer launching a new instrument, it is not practical for all instruments to be subjected to such a complete test on a regular basis. Pattern evaluation tests are normally performed by national measurement laboratories.

Having established that the basic design of a model of sound level meter meets the standard, individual meters once in service can be subjected to a more limited range of tests to verify that their performance continues to meet the specification. These regular in-service tests are termed 'periodic verifications'. Unfortunately, IEC 651 and IEC 804 do not specify pattern evaluation tests in any detail, nor do they deal with periodic verification. However, there is another organization, the International Organization of Legal Metrology (OIML), that has a general interest in measuring instruments, which has produced Recommendations for sound level meter testing. OIML Recommendations R58 [3] and R88 [4] draw a framework of tests from IEC 651 and IEC 804 for both pattern evaluation and periodic verification of sound level meters. The aim is to ensure consistency in testing around the world and, through the OIML Certificate System [5] using standard format OIML test reports, to encourage individual countries to accept the results of tests performed elsewhere. Again however, these documents give no details of test methods.

## Periodic Verification Testing in the UK

Around 1990, concern was expressed within the UK that there were no test methods described for periodic verification, which is the form of testing likely to be useful to the majority of sound level meter users. At that time the only testing regularly performed in the UK was a free-field calibration of a sound level meter. Here, a sound level meter was placed in a free-field room and its response to pure-tone signals measured over the frequency range required. There were several drawbacks with this test: only one level was measured, no other facilities of the meter were tested, and free-field testing is by

its nature time consuming and hence expensive. A group was therefore set up by the British Standards Institution (BSI) to consider producing test methods for a periodic verification test, and the result was the publication in 1992 of a British Standard BS 7580 'Verification of sound level meters'. This standard follows the framework of tests suggested in R58 and R88, and applies to all Types of meter. It makes the basic assumption that the instrument was originally manufactured in accordance with IEC 651 or IEC 804. The verification should be performed at least every two years unless the meter is subject to other requirements and at present, measurements should be performed either by a national metrology institute (such as NPL) or an accredited laboratory. These categories are to be widened to allow in-house verifications but in this case all relevant instrumentation used for testing must have demonstrated calibration traceability to national measurement standards. All the facilities which a meter possesses and are described in the standard must be tested, and the meter must have a sound calibrator associated with it. This sound calibrator must have been calibrated within the last year and comply with IEC 942 [6] in respect of sound pressure level, frequency and total harmonic distortion for the Class of calibrator specified by the manufacturer.

The tests in BS 7580 fall into two groups – those performed electrically and those performed acoustically. Prior to any measurements the sensitivity of the meter is adjusted using its own calibrated sound calibrator, and then a measurement of self-generated noise is performed with the microphone removed. Various electrical signals as specified in the standard are then applied to test the following:

- linearity
- frequency weightings
- time weightings F and S
- peak response
- rms accuracy
- time weighting I
- time averaging
- pulse range
- sound exposure level
- overload indication.

In the case of peak response the test described for Type 0 meters in IEC 651 is extended to cover all Types of meter, but clearly only Type 0 meters are required to comply. Similarly the overload indication test was altered slightly to make it more meaningful. In cases where the tests are not mandated by the IEC standard a meter cannot fail BS 7580 on those clauses alone, but the fact will be noted on the certificate issued. Full details of the test signals applied can be found in the standard, which is available from BSI.

The instrument complete with microphone is then calibrated using a continuous acoustical signal of frequency 1000 Hz at a sound pressure level in the range 73 dB to 125 dB. The sensitivity of the meter is adjusted, if necessary, so that the meter reads correctly. This acoustical calibration may be performed either in a plane progressive sound field by comparing the response of the instrument with that of a reference microphone substituted at the same position in the sound field, or by application of a standard sound calibrator when corrections for the difference between the free-field and pressure response of the instrument must be applied. It is through this acoustical calibration that traceability to national standards is established.

Finally the complete instrument is verified acoustically at 125 Hz and 8000 Hz, typical of the frequency range of use, to ensure it is within tolerance and that no microscopic hole exists in the microphone diaphragm. In addition to the two methods mentioned above an electrostatic actuator may be used, with appropriate corrections applied. The associated sound calibrator is then re-applied and the indication of the instrument recorded. This value should be used to adjust the sensitivity of the meter whenever it is used in future. If the meter meets the tolerances for the appropriate Type of meter, a certificate is issued stating compliance with the standard. BS 7580 also gives full details of the information to be provided on the certificate.

Verification of sound level meter performance at NPL

Although BS 7580:1992 covers all Types of meter, in reality it has been used largely for the testing of Type 1 meters where the cost of testing is realistic compared with the original purchase price of the instrument. However, many users felt the requirements were excessive for the lower grade Type 2 meters and BSI received requests to draw up a test specification with more limited tests, purely for Type 2 sound level meters. Many organisations that own a reasonable number of Type 2 meters perform their own in-house verifications, often using similar but not identical test methods. Several of these

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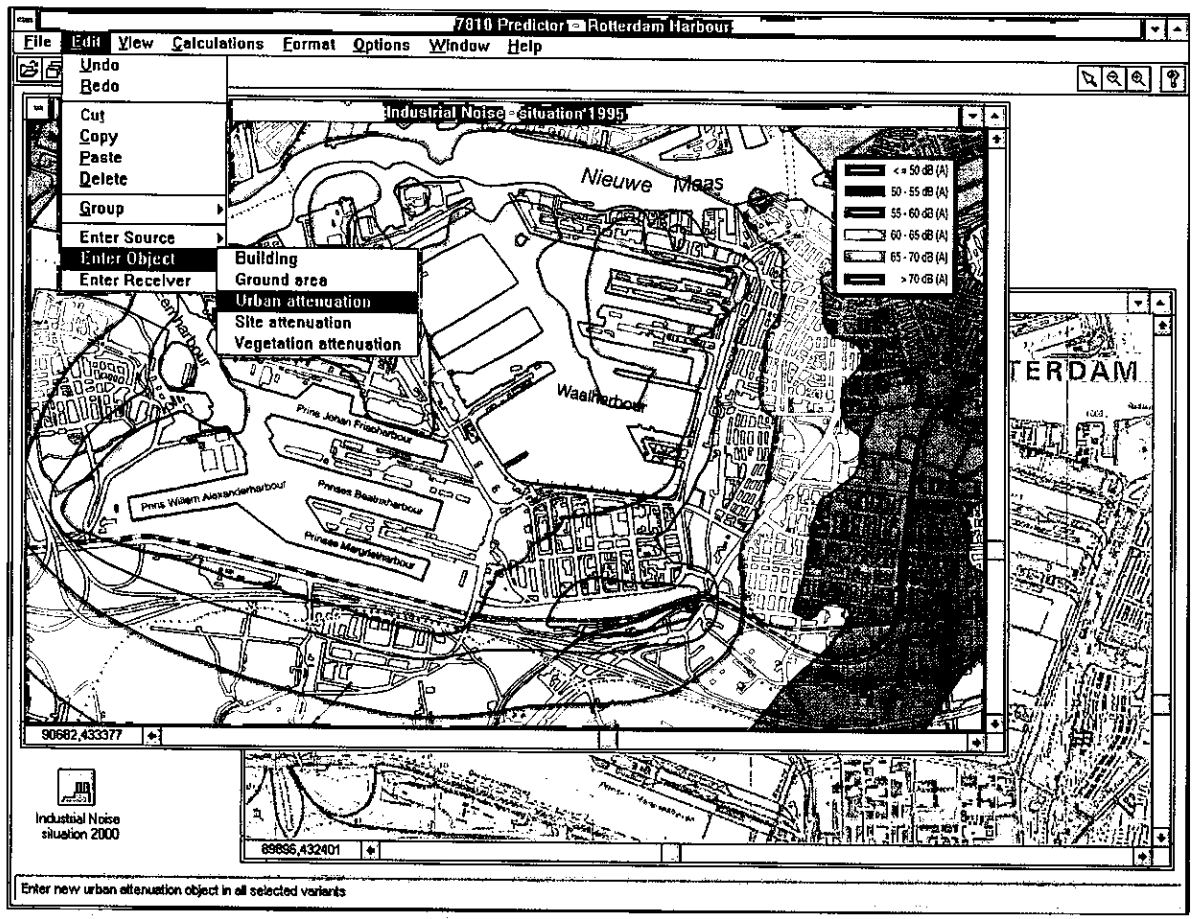


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expressed a wish to have a specified British Standard test procedure, with of course the additional advantage of being able to refer to such a document in court if required.

BSI therefore set up a working group to produce a Part 2 to BS 7580 to deal explicitly with Type 2 meters. The aim of the working group was to produce a set of tests which could be performed in a reasonable time, at a reasonable cost, whilst maintaining a worthwhile test of performance of the sound level meter. The onus has been put on the user to specify the span of sound levels and range settings over which he requires the meter to be tested, rather than testing all levels and all ranges the meter possesses. It is estimated that in most cases the tests described in Part 2 can be performed in about 30 minutes, excluding the paperwork. The tests are applicable to models of Type 2 sound level meters that have successfully undergone pattern evaluation to IEC 651 and/or IEC 804 as appropriate, and to individual sound level meters that have successfully undergone a full verification to the existing BS 7580:1992.

Again the sound level meter must be supplied with a sound calibrator whose sound pressure level and frequency are known, and the initial sensitivity of the meter is adjusted using this calibrator. One of the major differences to BS 7580:1992, which is now to be re-named Part 1, is that all the tests may be performed acoustically if suitable equipment is available, or the tests may be performed partly electrically and partly acoustically. Testing covers the following:

- linearity over span and ranges specified
- frequency weighting A, at 3 frequencies only
- other frequency weightings at 1000 Hz compared with frequency weighting A at 1000 Hz
- rms accuracy
- time averaging, if available
- overload indication

Similar acoustical tests to Part 1 are specified with traceability to national standards again achieved through the calibration at 1000 Hz, but the high frequency acoustical check may be performed either at 4000 Hz or 8000 Hz. Finally the associated sound calibrator is reapplied and the indication of the instrument recorded for future use. If the meter complies with the specifications within the tolerances for a Type 2 meter, a certificate is issued giving the information specified in Part 2.

This BS 7580: Part 2 has now been approved for publication and it is expected to be available in Spring 1996. Simultaneously, and with a few minor changes, BS 7580:1992 will become BS 7580: Part 1.

## New Specification Standard

The need for revision of the main international sound level meter standards became apparent some years ago, not least due to the advances in design and computing technology that have occurred since IEC 651 and IEC 804 were written. IEC TC29 'Electroacoustics' therefore set up a working group to perform this major task. The new standard will deal with conventional and integrating-averaging sound level meters, and will contain two annexes detailing test methods for both pattern evaluation of new models of instrument and for regular periodic verification testing.

It is proposed to reduce the number of classifications to two and many of the tolerances in the standard have been modified compared with IEC 651 and IEC 804. The new tolerances are based on measurements made on existing meters in many different laboratories to ensure that realistic values are included. Also, significant use has been made of the expertise of instrument designers in the Working Group to determine the areas where devices may develop faults or where it is difficult to design within the specification.

The new document will be numbered IEC 1672, and the majority of the specifications have now been written, together with a first draft of the test methods for pattern evaluation. This needs to be completed and the procedures written for periodic verification, so this standard still has some way to go before it is likely to be accepted and recommended for publication. The draft text available at October 1995 was issued by BSI as a draft for Public Comment (document no. 95/213406 DC).

NPL is currently developing its existing facilities, in particular by provision of an interfaceable positioning and rotational system within a free-field room to allow for directivity testing, and improving environmental test facilities, to enable it to provide full pattern evaluation testing of new models of sound level meter following publication of the new standard.

## Conclusion

This article has described the various levels of testing available to the user of a sound level meter, from full pattern evaluation to the limited subset of tests included in BS 7580: Part 2. The level of calibration/verification required depends on the situations in which the meter itself is used, and may be dictated by standards to which the user is working. A more realistic approach to testing has been taken over recent years, particularly with the introduction of BS 7580, in an effort to ensure that the cost of testing is not excessive compared with the original purchase price of a meter. However, regular testing of a sound level meter is essential to ensure that reliable measurements are still being obtained and to satisfy requirements of quality systems. It also gives the user the peace of mind which comes from the knowledge that recognised test procedures have been applied, and that, if challenged, the validity of any results obtained with the meter can be demonstrated.

## References

[1] IEC 651:1979 Sound level meters
[2] IEC 804:1985 Integrating-averaging sound level meters
[3] OIML R58:1984 Sound level meters
[4] OIML R88:1989 Integrating-averaging sound level meters
[5] OIML document:1991 OIML certificate system for measuring instruments
[6] IEC 942:1988 Sound calibrators

**Susan Dowson is at the National Physical Laboratory, Teddington, Middlesex TW11 0LW** ❖

# PCs AND INSTRUMENTS – THE GREAT DIVIDE

John Shelton MIOA

## Introduction

In recent years, there has been much written and said about the use of personal computers in acoustics, both for measurement and results processing. The advances in PCs have been nothing short of phenomenal, driven by the fast moving requirements of information technology in the office environment, and these benefits are starting to filter into our world of acoustics, in the form of more flexible measurement tools.

The pure technologists amongst us would doubtless plunge headlong into building an instrument on a PC, which in principle is not a difficult job, but the resulting system must offer clear benefits to the user before it can be accepted as a true alternative to more dedicated instrumentation.

This article explores the issues facing instrument developers in general, and shows how the modern computer architecture can be harnessed to generate truly accurate and flexible measurement tools for noise and vibration measurements.

## Some History

A simple instrument such as a sound level meter has a long pedigree stretching over decades, starting with heavyweight analogue designs, with the noise readings being displayed on a moving coil meter display.

In principle, these instruments have changed little, except that functions which were performed in analogue circuitry are now found in digital calculations, using firmware, rather than hardware. However, to achieve the large dynamic range and frequency range required for acoustic measurements, careful design is still necessary and often based on years of experience.

A sound level meter can be broken down into its constituent building blocks, as shown in Figure 1. The acoustic pressure is converted into an electrical analogue signal by a precision condenser microphone, and the impedance converter gives a signal which is easily handled by the following amplifiers. Filters may be used to provide an estimate of human response to the sound (eg A-weighting) or for analysing the signal in more detail. The resulting conditioned signal is then 'detected', either using a root-mean-square (RMS) detector, to give an estimate of the energy in the signal, or by using a Peak detector, to give a measure of the raw acoustic over- or under-pressure. The output of these detectors is then fed to a metering device, and to ensure the meter can be read by eye, various time constants (eg F, S, I) have evolved to provide a degree of damping, or simulation of human response.

The first changes into the digital world came when moving coil meters were replaced by digital displays (some still bemoan this fact), which suddenly appeared to give us hitherto unheard of accuracy of tenths of a decibel! Of course the accuracy was exactly the same, but we could now improve the precision of the result. At about the same time, a new measurement parameter emerged, the equivalent continuous sound pressure level, or Leq, and some would argue that this was invented just to make the digital displays readable!

Slowly, the digital calculations replaced the measurement functions, firstly by sampling the output of the analogue detectors, often at slow rates using 8-bit A/D conversion, and then later by replacing the detector itself, calculating the RMS and Peak values from data digitised at high speed from the input amplifiers. Some of the current instruments now sample the signal from the microphone preamplifier directly, and the rest of the chain is achieved using digital signal processing only.

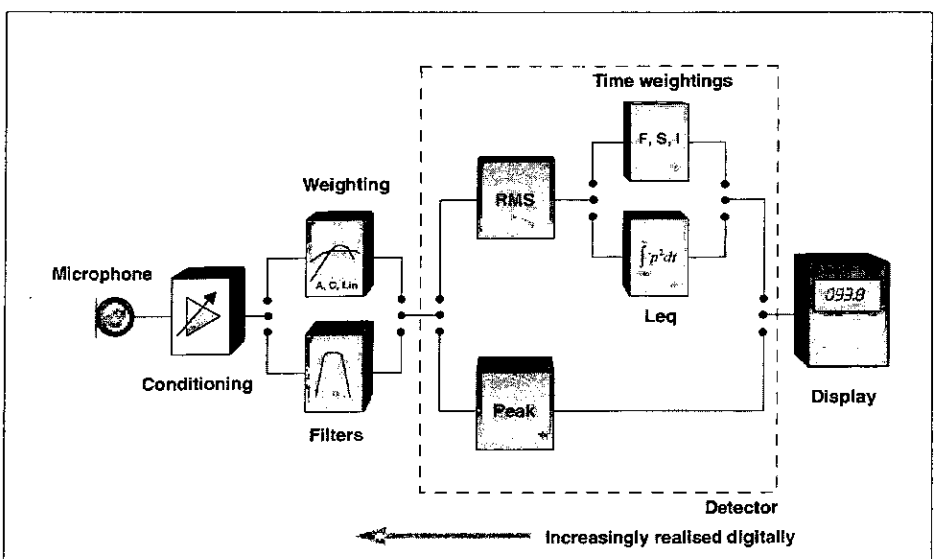


Fig. 1. The basic building blocks of a sound measurement instrument

The use of digital circuitry has allowed digital communication with other devices, such as printers and computers, where, before, a pen recorder or X-Y plotter may have been the only hard copy output from a sound level meter.

## The Great Divide

This is where one of the traditional divides has emerged between instruments and PCs. The dedicated instrument has always been used to provide the measurements, and the computer has been used simply as a storage device for archiving and displaying results, with simple post-processing

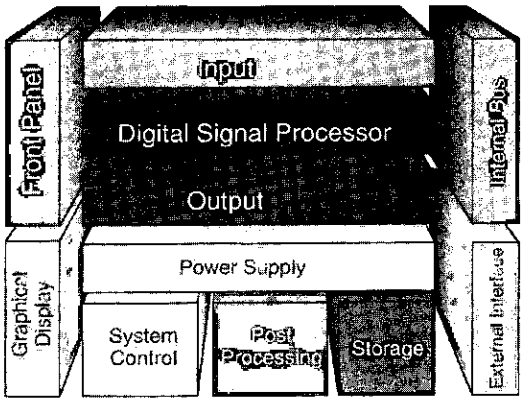


Fig. 2. The traditional architecture of stand-alone measuring instruments

functions. The interface between the two has either been in the form of a simple RS-232C serial communication, or via manual entry of results from a paper printout. This latter in particular has been responsible for many errors, with the tedium of copying numbers into a spreadsheet, for example, from a long roll of silver paper!

It is only relatively recently that computers have moved into the measurement arena, supported by the massive increase in available processing power. But to build a sensible instrument using a PC, we need to consider which processes are better handled by dedicated hardware, and what can be transferred to the PC environment.

## Building the Virtual Instrument

To visualise how we might build a computer-based instrument, we can look at the basic building blocks used in a traditional stand-alone instrument. Figure 2 gives a generic approach, which could be found in any instrument, be it a sound level meter, tape recorder or multi-channel FFT analyser.

Any digital system will have an input and/or output section, the contact with the physical world, with some dedicated DSP function performing the actual measurements. The whole is controlled by a system controller, using a proprietary internal system bus, all supported by a power supply. To control the instrument, a front panel is required, and perhaps the results, such as a spectrum or time history graph, may be presented on a graphical display. Simple post-processing may be provided in the form of, for example, building acoustics calculations, and data may be stored in some sort of storage medium. This can be considered as generalised storage, and may consist of a spectrum memory, or a set of Ln measurements or even raw audio data, in the case of a DAT recorder.

Finally, the instrument may have an interface to, say, a computer for further analysis and reporting.

A host of such instruments are available, which are commonly used with a computer, but when such a combination is made, the duplication of function quickly becomes apparent. Many of the internal functions can be handled just as efficiently by a computer, for example, both the front panel and graphical display might be realised in a high resolution colour display, with a Windows™-style graphical user interface (GUI). The storage can be looked after by the computer hard disk, devices which appear to be doubling in capacity and halving in price every year or so. Even the system control can be done by the computer, and it is ironic that some analysers in particular actually feature an internal x86 PC processor as the system controller!

In principle, the remaining functions could also be lifted, but perhaps this approach is too simplistic. To make sensible decisions about which functions should be handled by a standard PC, another dimension should be considered.

As well as looking at physical building blocks, the actual processes in the measurement chain should also be reviewed. These are illustrated as the four main layers in Figure 3.

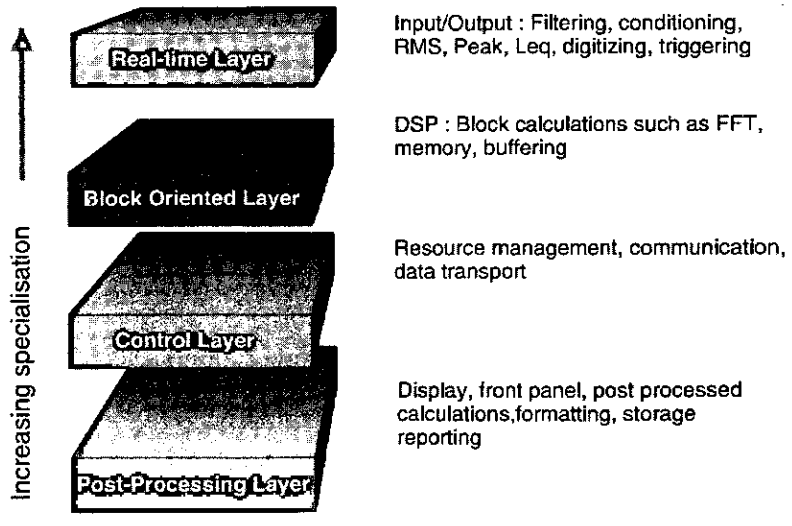


Fig. 3. Processing layers

At the top of the chain is the real-time layer where processes are handled in real-time, with no loss of data, with resources dedicated to particular functions 100% of the time. Examples are A/D conversion and basic filtering, such as anti-aliasing and weighting functions.

The next layer is block-oriented, where data from the real-time layer are handed over, and fast calculations are performed, but not necessarily in real-time, although buffering can protect against data loss. An example is Fast Fourier Transformation, where complete blocks of time samples are transformed into the frequency domain for frequency analysis.

The control layer holds all these processes together, and handles both data transport and system requests, which will be interrupt driven. In other words,

resources are made available when requested, and are often used for many other tasks.

Finally, the post-processing layer has no urgency, and results can be processed at any time, often days after the initial measurements are made.

Computers have been used for the post-processing layer for some time, and already instrument systems are being devised where the computer also provides the control layer. However, because of the tight requirements on timing and real-time considerations, the first two layers still tend to be handled by specialised hardware and firmware.

This combination of hardware and software to create an instrument has been termed the Virtual Instrument in the sense that the measurement functionality does not exist until the combination is brought together. The term VI is often misunderstood as simply a hardware box controlled by a computer, with the measurement functionality still contained purely in dedicated circuitry.

## Distributing the Virtual Instrument

A much more flexible approach is the Distributed Virtual Instrument where the only dedicated resources are Input, Output and DSP functions.

This is illustrated in Figure 4, where the only remaining blocks are the A/D & D/A conversion, and a DSP resource. The system control is performed entirely by the computer; the software is also performing extensive measurement calculations, and programming the DSP on the fly, only for floating-point calculations where real-time capabilities may be required with high dynamic range.

Graphics, user interface, storage and post-processing are also all handled by the PC platform, and the DVI is defined simply by the software running on the computer, which sends calls to the hardware resources as necessary.

This type of approach puts a premium on both computing power as well as the type of bus structure used to co-ordinate the resources. In traditional instruments, this bus has been proprietary and unseen by the user, but in the DVI concept, standardised interfaces can be used, such as ISA (Industry Standard Architecture), SCSI (Small Computer Systems Interface), etc. Even Centronics bi-directional parallel interfaces can handle high levels of control and data transfer in real-time. In the larger world of Test & Measurement, automated test systems are now using new high speed buses such as VXI (VMEbus eXtensions for Instrumentation), from which the original DVI concepts emerged earlier this decade [1–4].

An example of the DVI is the Concerto system (Figure 5) developed by 01dB in France [5], with a long background of PC based measurement systems, where a small battery powered external unit, containing the distributed resources, is connected to a notebook PC, using either a high speed bi-directional interface, or by using PC-cards (earlier known as PCMCIA). The advantage of these interfaces is that they consume much less power, and are therefore well suited to portable instrumentation.

The software runs under Microsoft® Windows™, and defines whether the instrument is an environmental noise analyser, a building acoustics analyser or a signal/frequency analyser. To change the instrument, the user simply calls up a different software 'module'.

## Windows on Acoustics

In parallel with the development of PC computing power, user interfaces such as Windows™ have appeared – some would say that these resource hungry applications have indeed been the driving force of processor development! Originally conceived as a way of making computers more accessible to users, hence avoiding command-line interfaces, various flavours of the GUI now dominate the office environment, in particular Windows™ 3.1 or Windows™ 95. In addition to an easy user interface, however, the new 'operating systems' have also laid down some very strict rules regarding interconnection of hardware as well as data transport. These are manifested in phrases like 'multimedia' and 'plug and play'.

This is an added bonus to the DVI builder, as it allows many types of data to be handled safely, using complex buffering and communications, as well as easy integration into mainstream software.

For example, our DVI might be measuring sound pressure levels over time, and when a level is exceeded, audio data can be streamed to a storage medium (eg hard disk), so the user can later listen to the noise which caused the exceedance. This powerful feature is taken care of by the media control interface (MCI), conveniently built-in to Windows™ environments, ensuring that audio data do not collide with noise data and so on.

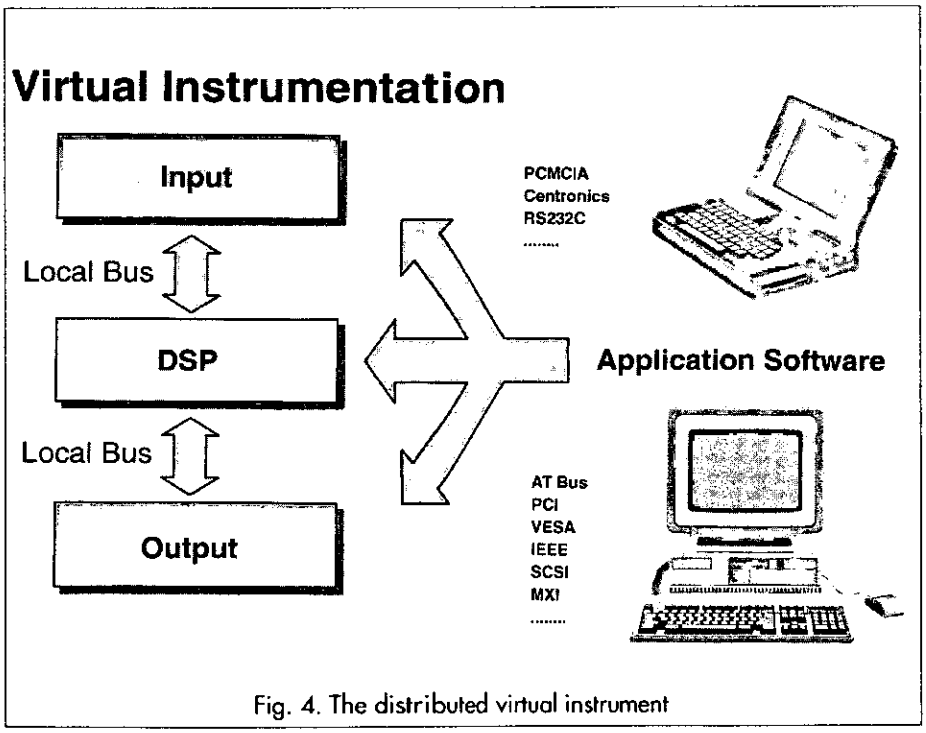


Fig. 4. The distributed virtual instrument


Fig. 5. The Concerto virtual instrument

Once collected, data can be transferred to the office spreadsheet for further crunching, simply by using cut-and-paste, a powerful method of communication between software programs.

Advanced users can use remote control of the DVI by using Dynamic Data Exchange (DDE) to control the system by telephone modem from a remote site, ideal for permanent monitoring systems.

Alternatively, you may wish to illustrate to a colleague in Hong Kong what the new concert hall acoustics sound like. Simply embed an audio file in a document using Object Linking and Embedding (OLE) and send it across the Internet via E-mail. Your colleague can then click on the document to play back the sound.

The benefits in the user interface are obvious; no more tiny monochrome displays, but instead a high resolution colour LCD, with mouse control, and simple menu structures and toolbars for regularly used functions, such as calibration (Figure 6). Measurement results are clearly presented, and with today's huge hard disks on modern PCs, the data storage is almost limitless. An environmental noise analyser on a notebook can run for literally years (if anyone needs the data) before needing more storage space.

## What About Accuracy?

All this might sound like science fiction, but it is available and happening now.

However, the technology may be in danger of taking control, and we could end up forgetting what we set out to achieve; that is, some benefit over the traditional approach to measuring noise and vibration.

No technology is of any use if it cannot measure things as accurately as we expect. With the development of sound level meters, several standards have emerged which lay down minimum expectations for instrument accuracy, for given grades of instrument. IEC651, IEC804 and more recently IEC1043 and their national equivalents, lay down the law in this respect, with minimum requirements for dynamic range, linearity, frequency response and indications. There is no sense in developing a measuring system if it cannot meet these requirements.

So what is the measuring system? Well, in the case of a DVI, it is the complete set of hardware resources, software modules and host computer, which must be subjected to the same approval tests as a standard instrument. Of course, many of the requirements of the standards reflect the use of dedicated instruments, but until they are revised, the new instruments must still comply.

It is reassuring to note, then, that the new instrument systems (particularly Concerto & Aria) have now received type-approval in several countries to Type 1 accuracy, interestingly, using generic computing hardware. In other words, it does not matter which brand of computer is used, as long as it meets minimum requirements relating to clock speed, memory and floating point availability [6].

This allows the user to have a very flexible choice for her/his measuring system, some choosing fast Pentium® processors, others selecting huge hard disks for installing other applications such as modelling software, and so on. It makes much more sense now to use a computer as a sound level meter, rather than the other way round!

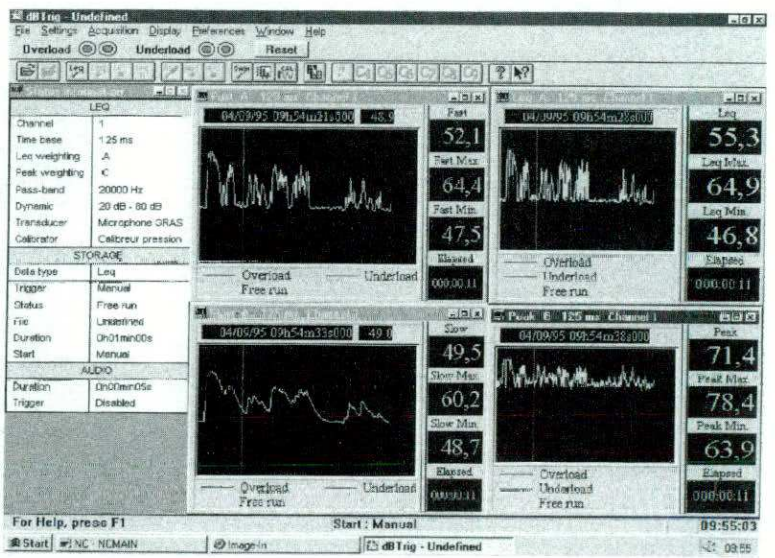


Fig. 6. The sound level meter application in a Windows™ environment

## The Sound Level Meter Is Dead. Long Live The Sound Level Meter!

After reading this, you may be forgiven for thinking that the traditional instruments should be consigned to the cupboard.

Far from it. Manufacturers will continue to produce such instruments according to demand, but they will become more dedicated and 'commodity' in nature. For example, you can now buy sound level meters for industrial use from a mail order catalogue. For industrial noise, where a limited set of parameters is required, such instruments will always be cheaper and easier to use than any computer system, but for the manufacturers, the margins will become smaller. Parallels to this trend can be seen in other markets, eg most people have a digital voltmeter to hand, probably built in Japan, but when more serious electronic circuit analysis is required, the technician turns to the computer.

It is in the area where the acoustician is looking for flexibility, and additional performance, that the computer based instruments are now succeeding. As measurement procedures become more complex (witness the measurement of sound power according to ISO9614-1 using intensity!), and as users demand clearer user interfaces and automated measurements, it makes logical sense to incorporate a computer into the process, and where better than into the measurement process itself.

As manufacturers cram more functions into the dedicated instruments, the user interface suffers in proportion, with complex nested menus and special functions. Windows™, developed specifically to make computers easy, overcomes these problems, with common look-and-feel to software, and use of colour graphics.

## Where Will It All End?

There is no doubt that PC based instruments will continue to eat into the traditional instrument market, and already, most FFT analysers sold in this country are based more or less on PC architectures, either as specialised PCs in boxes or as expansion cards.

Looking in the crystal ball reveals a steady increase in performance of PCs, with corresponding improvements in user interfaces and also portability, which is still a serious issue. When climbing up a cooling tower to measure plant noise, it is a lot easier to pull out a hand-held sound level meter than a notebook computer. But in five years' time, this could just as easily be a Personal Digital Assistant (PDA) with the same power as today's notebooks.

Developments in the PC industry have repeatedly confounded the prophets, with considerable computing power sitting on most desktops today, which would have been unthinkable five years ago.

One interesting development in the context of this article is the use of native digital signal processing. Although we have traditionally used dedicated gate arrays for this difficult function, for real-time digital filtering for example, it is now possible to perform real-time FFT analysis on a Pentium processor, using data from a simple multimedia card. Although it is tricky to run Windows™ at the same time, this exercise shows what may be possible in the near future, where the PC takes over another bastion of dedicated instrument function, the DSP.

## Conclusions

Within the context of traditional instrument architectures, an optimum PC-based measurement system has been described, which is already in use for many acoustics applications. Using the benefits of developments in consumer and office computing, future measurement applications will increasingly find a place on the virtual instrument, in preference to dedicated instrumentation.

Although there will always be a demand for specific, particularly hand-held, instruments, in a few years, accurate PC-based instruments will rapidly become the norm for noise and vibration measurements, rather than exotic toys for technologists.

So what of the Great Divide? Clearly, in a PC based instrument, the divide is no longer physically there, as data is by definition within the PC during measurement, and any transfer to other software is done via a software interface, removing potential errors. The only divide which remains is more to do with historical prejudices and misgivings about using a PC for measurement, which will gradually break down as more systems become available.

## Acknowledgement

The author wishes to acknowledge the inspiration given by the members of the Test & Measurement Division at Brüel & Kjær, who had the bad luck to develop the ultimate virtual instrument ten years before its time.

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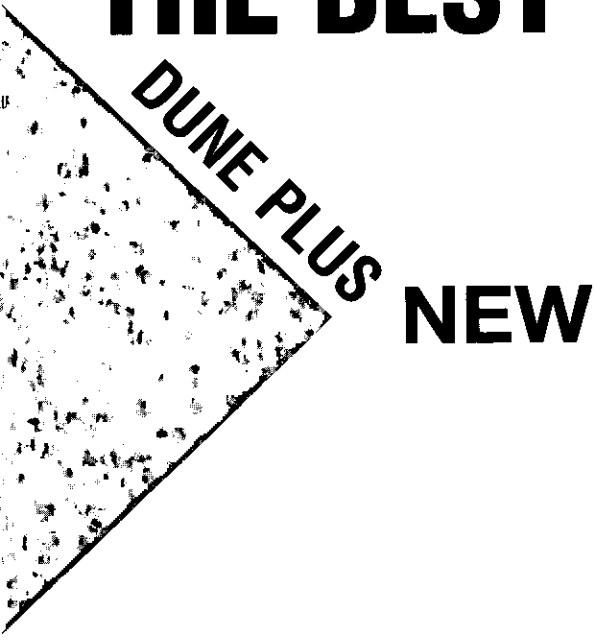


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# THE CAUSES OF NOISE GENERATION IN FRACTIONAL HORSE POWER MOTORS FOR HOUSEHOLD APPLIANCES

Cüneyt Öztürk

## Introduction

The major noise sources are similar in most household appliances. The fractional horse power (FHP) motor is usually the most prominent and is tonal in character. Aerodynamic and airborne sources of higher frequencies are often also present, depending on slots and fans [1]. Mechanical vibration of the structure of the machine gives rise to the third most important noise source. The combination of these sources means that household appliances generally have broad band noise spectra, with discrete tones at a number of frequencies.

This article describes an investigation of the noise and vibration characteristics of a clothes washing machine. A horizontal-axis, front-loading clothes washer can be considered to comprise three main components, the cabinet, suspension units and the washing container, see Figure 1 [2]. The operation of the machine involves an interaction between the fixed and rotating parts, called the tub and drum, respectively. The drum is located inside the tub, which in turn is suspended inside the encapsulating structure of the cabinet. Basic external forces on the tub are spring forces, bellow forces, motor dynamics and out-of-balance-mass forces. The duty cycle can change within a programme and irregular transients may occur. A clothes washer has multi-programme facilities such as the combination of heat and motor speed, and changes can be made in the cycle time. It is therefore necessary to perform noise measurements for separate specific conditions by considering different amounts of water and clothes, cycles, adjusted temperatures, and rotation speeds and direction of the drive motors, etc. Noise levels of a clothes washer can also change over long periods of use.

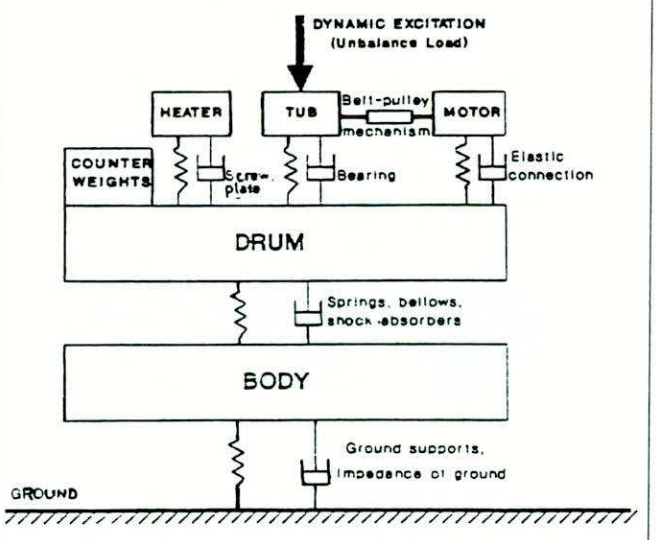


Fig. 1. Physical model of a horizontal axis, front loading clothes washer

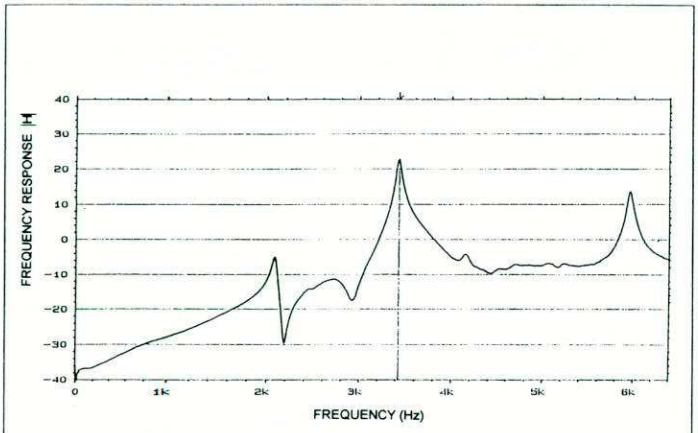


Fig. 2. Impact frequency response of the stator assembly

Investigations were made of the radiated sound power, directivity and frequency spectrum of a machine in a hemi-anechoic room of 200 m³ gross volume with 20 dB background noise level at 125 Hz. Measurements were performed according to ISO 3745 [3], using a hemisphere of radius 1 m with 10 microphone positions.

## Features of Fractional Horse Power Motors

**Operating principles** FHP motors used in clothes washers are series motors, consisting of a stator, a rotor and a couple of bearings at each end mechanically joined to the stator. The stator and rotor each carry a winding and set up two components of the electromagnetic field pattern [4]. They have the convenient ability to run on either alternating or direct current, provided that both the stator and rotor cores are laminated. Such single-phase motors are therefore commonly referred to as 'universal'.

**Sources of vibration and noise** The main energy source in the electric motor is the magnetic field. Maxwell stresses act on the inner stator surface bore, giving rise to a spectral distribution over the stator surface as a function of time. These forces excite the stator's lamination and housing, which have a distributed mass and damping [5]. Magnetic noise depends on the flux distribution and is composed of a series of harmonics travelling at different speeds [6]. Thus, right across the air gap between the rotor and stator there are complex varying forces. The sum of the tangential components of the forces yields the total torque produced. The radial components tend to distort the motor, according to their configuration, and produce noise. Mechanical vibratory forces can also be produced by a dynamic out-of-balance, the condition of the rotor, rubbing and rolling motions of the bearings, and mechanical resonances of the stator core and end shields. These

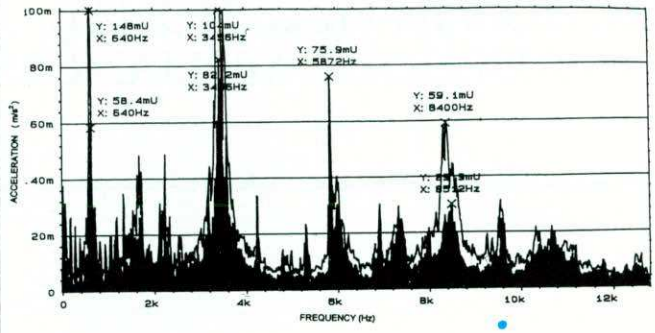


Fig. 3. Effect of changes in the dynamic loading on vibration levels of the series FHP motor

produce structure-borne vibrations, generally at low frequencies. Finally, asymmetric stator and rotor windings and uncovered slot openings can cause broad-band and discrete-frequency airborne sound.

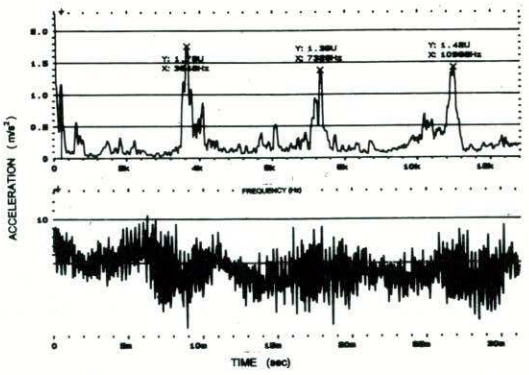


Fig. 4. Vibration measurements on the series FHP motor, running normally, in both the time and frequency domain. motor

**Electromagnetic sources** Electromagnetic vibrations in series FHP motors generally arise in the stator lamination, teeth and rotor, depending on the flux harmonic waves in the machine air gap, stator and rotor [7], and occur at discrete frequencies. The forces acting on the stator and rotor are those of magnetostriction and magnetoattraction. Magnetostriction forces are important in static machinery and arise from the magnetic properties of ferrous materials. Such materials distort in proportion to the magnetic field strength and this gives rise to audible noise at particular frequencies, as in the case of the hum of a laminated transformer. Magnetoattraction is the main cause of vibration in rotating machines. It occurs in the direction of flux and is due to the sinusoidal flux density in the air gap, changing as the motor rotates. It is characteristically harmonic. While radial force vectors are undesirable, they are unavoidable in series FHP motors.

**Mechanical sources** Mechanical forces arise from physical irregularities such as out-of-balance, non-symmetrical mechanical parts, friction, resonances, and loose bearings and brushes [8, 9]. Mechanical resonances of the stator assembly and end shields can cause large displacements and hence increased noise levels when the forcing frequencies match the natural

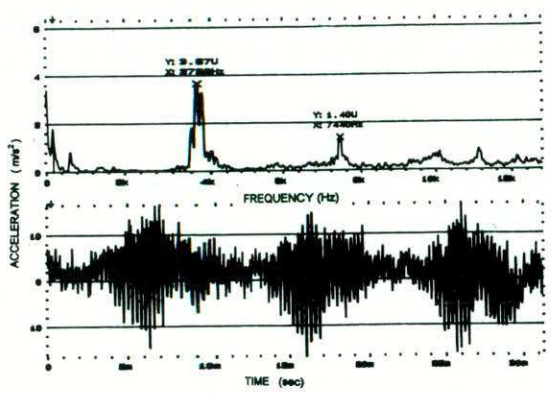


Fig. 5. Vibration measurements on the series FHP motor, with a noticeable peak at the slot frequency, in both the time and frequency domain. The amplitude in the time domain is significantly increased from that shown in Fig. 4.

frequencies of the assembly. The mechanical model of the stator assembly is a structure having distributed mass, stiffness and damping. The model can be defined in detail using modal analysis techniques. Figure 2 shows the transfer function for the stator assembly from the clothes washer under investigation, obtained by impact excitation. A fundamental frequency component at 3.4 kHz is the predominant feature. Out-of-balance can occur statically and dynamically. With static out-of-balance, the centres of gravity of both parts of the rotor are in the same axial plane and gravitational forces act in the same direction. In the case of dynamic out-of-balance, on the other hand, the centres of gravity of the two parts are on opposite sides of the axis of rotation; in consequence, the rotor will reach balance when it achieves a steady speed, but transient centrifugal forces produce alternating loads on the bearings during acceleration. Bearings which allow displacement of the rotor relative to the stator can also contribute to the vibration and noise emissions. Their effect may become more substantial with increased rpm of the motor.

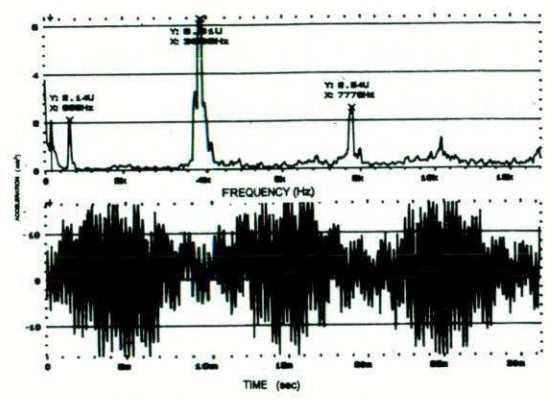


Fig. 6. Vibration measurements on the series FHP motor, with a disturbing peak at the slot frequency, in both the time and frequency domain. The amplitude in the time domain is almost double that shown in Fig. 4.

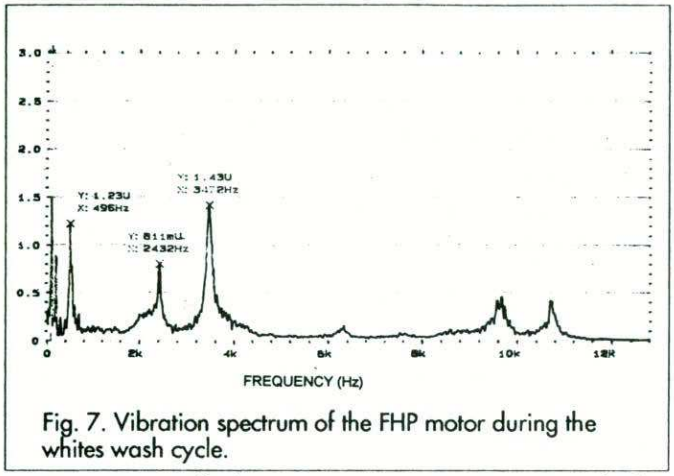


Fig. 7. Vibration spectrum of the FHP motor during the whites wash cycle.

Interaction of the commutator segments and the brushes can give rise to noise around the frequency of the product of the number of segments and the rotation speed. This typically occurs above 8 kHz. Friction between the brushes and commutator ring leads to the formation of a patina, and any damage to this during idling and low current operation can still further increase brush noise.

## Vibration and Noise Measurements

Variations of the dynamic loading of a series FHP motor can cause changes of the magnetic flux densities in the air gap, giving rise to changes in vibration amplitude, see Figure 3. The effects of changes in the characteristics of the magnetic excitation, thermal expansion of the laminations and variations of the magnetic flux in the field are shown in Figures 4–6, in both the time and frequency domains, where the fundamental at the slot frequency and its harmonics are seen clearly. Figures 7 and 9 show vibration spectra of the FHP motor when turning clockwise, the former during the whites washing cycle with the motor turning at 800 rpm and the latter during the whites high spin programme with the motor turning at 12800 rpm. Figures 8 and 10 show A-weighted $^1/_3$-octave-band analyses of the sound power levels of the machine during the same two cycles. The transfer ratio on the drum pulley side was $^1/_{16}$.

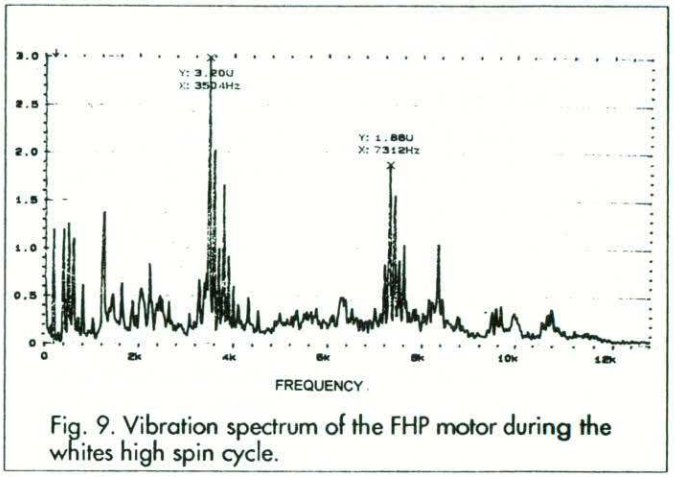


Fig. 9. Vibration spectrum of the FHP motor during the whites high spin cycle.

## Conclusions

The noise sources of a fractional horse power electric motor used to drive a clothes washing machine have been examined using the correlations between acoustic and vibration measurements. Analysis of such measurements is an important machine diagnostic tool. The sources identified in the case of the machine studied are listed in Table 1.

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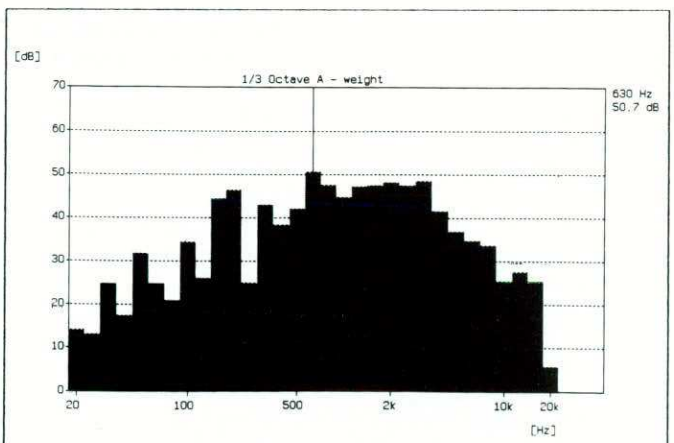


Fig. 8. A-weighted $^1/_3$-octave-band analysis of the sound power level of the washing machine during the whites wash cycle. The total A-weighted sound power level was 58.1 dB.

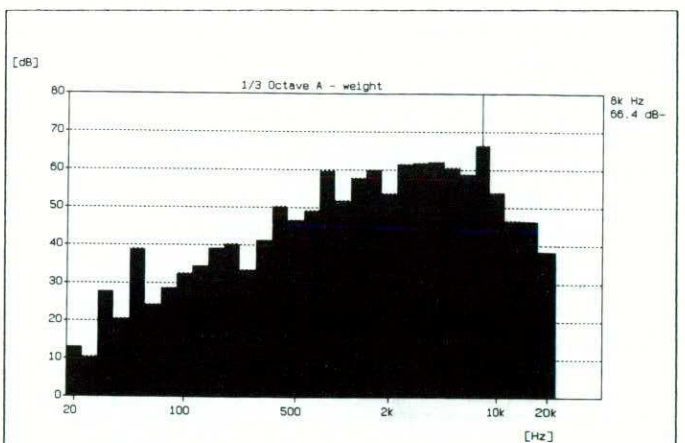


Fig. 10. A-weighted $^1/_3$-octave-band analysis of the sound power level of the washing machine during the whites high spin cycle. The total A-weighted sound power level was 71.5 dB

| Noise sources | Frequency | Cause |
|---|---|---|
| Mechanical | | |
| Out-of-balance | Motor rpm | Out of balance forces |
| End shields | 800 Hz and 1200 Hz | Mechanical resonances |
| Bearings | n x motor rpm | Possible defects, mechanical resonances of rings, roughness of sliding surfaces, dust and dirt, lack of lubrication, temperature |
| Shaft | 630–640 Hz | Mechanical resonances |
| Stator assembly | 3200–3400 Hz | Mechanical resonances |
| Commutator | Motor rpm x number of lamels | Surface roughness, torque variations |
| Brushes | > 8000 Hz | Brush wear, atmospheric conditions, mechanical resonances |
| Electromagnetic | | |
| Hum | 2 x supply frequency and harmonics | Iron saturation |
| Rotor | 640–670 Hz | Radial component of the magnetic forces on the rotor surface |
| Stator | 3200–3400 Hz | Magnetic forces on the stator surface |
| Airborne | | |
| Slots | rpm x number of slots | Rotor slots |
| Windings | > 7000 Hz | Broad band contribution of the rotor and stator windings |

Table 1. Noise sources of the series FHP motor

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*Accredited Centres*

**11 Jun**
Environmental Noise Group – Environmental Noise From Pubs & Clubs Workshop
*Basingstoke*

**13 – 14 JUN**
IOA Diploma exams
*Accredited Centres*

**19 JUN**
London Branch mtg: Assessing Environmental Noise - What's New?
*NESCOT*

**20 JUN**
CPD Committee
*St Albans*

**21 JUN**
IOA CofC in W'place Noise Ass't Advisory Committee
*St Albans*

**5 JUL**
IOA CofC in Env Noise M'ment Advisory Committee
*St Albans*

**23 – 25 JUL**
**Underwater Group Conference - Arrays and Beam-Forming in Underwater Acoustics**
***Bristol***

**30 JUL – 2 AUG**
**inter·noise 96**
***Liverpool***

**19 SEP**
IOA Publications, Meetings Committee
*St Albans*

**25 SEP**
Environmental Noise Group - WHO – Community Noise Workshop
*NESCOT*

**26 SEP**
IOA Membership, Education Committee
*St Albans*

# Building Acoustics Group

# SOUND INSULATION
# THE LAW, THE SCIENCE AND IN PRACTICE
# Building Research Establishment, Garston, Watford
## Wednesday 29 May 1996

**Meeting Programme**

09.15 Registration

10.15 Introduction by Les Fothergill, *DOE Building Regulations Division*

**FIRST SESSION:** Chair Les Fothergill, DOE Building Regulations Division

10.20 POST-CONSTRUCTION TESTING AND SOUND INSULATION PERFORMANCE, Bob Craik, *Heriot Watt University*

10.40 THE BUILDING REGULATIONS - REASONABLE PERFORMANCE, PRACTICE AND THEORY, Paul Goring, *AIRO*

11.00 SOUND PARTITION RATING USING SOUND REDUCTION INDEX, R, AND LEVEL DIFFERENCE, D, Garry Seal, *L B Waltham Forest*

11.20 *Coffee*

**SECOND SESSION:** Chair Jeff Charles, *Bickerdike Allen Partners*

11.45 INTENSITY MEASUREMENTS FOR BUILDING ACOUSTICS, Carl Hopkins & Tina Emmanuel, *BRE*

12.05 DEVELOPMENTS IN THE APPLICATION OF FLEXIBLE OPEN-CELL POLYMER FOAMS FOR IMPACT SOUND REDUCTION IN FLOORS, Robin Mackenzie (1) & Robin Hall (2), *(1) Napier University (2) Sheffield Hallam University*

12.25 MLS IN PRACTICE, Ian Campbell, *Gracey and Associates*

12.45 *Lunch*

**THIRD SESSION:** Chair Tony Jones, *AIRO*

13.40 THE EFFECTIVE SOUND REDUCTION INDEX OF FACTORY CLADDING PANELS, David Oldham & M A Rowell, *Liverpool University*

14.00 RADIATION DAMPING IN PLATES INDUCED BY POROUS MEDIA Robin Wilson (1) & Alan Cummings (2), *(1) Nottingham University (2) University of Hull*

14.20 PREDICTION OF THE SOUND REDUCTION OF COMMERCIAL DOUBLE SKIN PROFILED METAL CLADDING SYSTEMS, Y Lam, *Salford University*

14.40 *Tea*

**FOURTH SESSION:** Chair Nick Antonio, BRE

15.05 RESULTS OF FIELD TESTS ON APPROVED DOCUMENT E WALL TYPES 1 AND 2, Nick Tinsdeall & John Seller, *BRE*

15.25 PRACTICAL PROBLEMS OF SOUND INSULATION TESTS, Steve Wray & Ian Scarr, *Wimpey Environmental*

15.45 FIELD MEASUREMENT OF ROOM ACOUSTICS, Peter Clark & R C Chanaud, *Larson Davis*

16.05 THE REALITY ON SITE: A SUMMARY OF COMMON PROBLEMS, Paul Wornell, *Construction Audit Ltd*

16.25 Summary

16.30 Optional tour of BRE Acoustics Section experimental facilities with tours by BRE staff.

---

I wish to attend the One-day meeting on Sound Insulation The Law, The Science and in Practice

Name:

Organisation:

Address:

Telephone: Fax: email:

☐ I enclose a cheque for the delegate fee as below, made payable to Institute of Acoustics ☐ Invoice me

☐ Member of IOA £75.00 + £13.13 VAT = £88 13 ☐ Others £90.00 + £15.75 VAT = £105.75

☐ I wish to have a vegetarian meal

☐ Proceedings

☐ I cannot attend: send a copy of the Proceedings and invoice me for:

☐ £20.00 (members) ☐ £30.00 (others)

Fees for bookings cancelled after 18 May will be payable in full
Attendance at this meeting may be counted towards CPD
Meeting Organiser Nick Antonio, BRE

Institute of Acoustics, 5 Holywell Hill, St Albans, Herts AL1 1EU. Registered charity no 26702
Tel +44 (0)1727 848195 Fax +44 (0)1727 850553 email Acoustics@clus1.ulcc.ac.uk

## One day meeting

# Low Frequency Noise

## Tuesday 4 June 1996

### The Royal Society, London

**Meeting Organiser: Dr H G Leventhall FIOA, Digisonix Inc**

## Programme

10.00 Registration and coffee

10.30 The study of low frequency acoustic signals using digital seismometers *D M J P Manley, Consultant*

11.00 Low frequency noise emitted by computer disk drives – effect of multiple disk drive installations *D S Gaunt, Xyrtex*

11.30 Coffee

11.45 Low frequency noise and possible increased susceptibility as a function of age *A P L Baldock(1) B M Shield (2), (1) Tunbridge Wells Borough Council (2) South Bank University*

12.15 Low frequency noise propagation from modern music making *K Dibble, Ken Dibble Acoustics*

12.45 Lunch

14.00 Criteria and quality for low frequency noise *H G Leventhall, Digisonix*

14.30 So why are we annoyed by low frequency noise? *S Benton, University of Westminster*

15.00 Discussion on low frequency noise problems

16.00 Tea and further discussion

**Low Frequency Noise: Tuesday 4 June 1996**
**Please register me as a delegate to this meeting**

**Name:**

**Address:**

**Tel:** **Fax:** **email:**

☐ I enclose a cheque, ☐ Please invoice me, for the meeting fee

☐ £75.00 + £13.13 VAT = £88.13 (members) or ☐ £95.00 + £16.63 VAT = £111.63 (non-members)

The meeting fee covers lunch and a copy of the Proceedings

☐ I require a vegetarian meal

☐ I cannot attend, please invoice me for a copy of the proceedings

☐ Members £15 ☐ Non-members £25

Institute of Acoustics, 5 Holywell Hill, St Albans, Herts AL1 1EU
Tel: +44 (0)1727 848195 Fax: +44 (0)1727 850553 email Acoustics@clus1.ulcc.ac.uk
Registered Charity no 267026

# Environmental Noise Group

In conjunction with Southern Branch

## Workshop on

# ENVIRONMENTAL NOISE FROM PUBS AND CLUBS

## Tuesday 11 June 1996

## Basingstoke & Deane BC, Basingstoke

One of the questions posed in a recent Noise Council survey on the use of Codes of Practice asked about the need for additional codes to control environmental noise. The results indicated that local authorities felt that a code regarding the control of noise from pubs and clubs would be the most beneficial.

The issue was discussed in an evening workshop session held at the 1995 Autumn Conference in Windemere with no real concensus of views emerging. The purpose of this workshop, to be held in Basingstoke, is to discuss and develop the ideas for a code of practice which were identified at Windemere by involving a wider audience with a specific interest in the subject.

### Programme

| | |
|---|---|
| 12.30 | Buffet lunch |
| 13.30 | Introduction |
| 13.35 | THE NEED FOR A CODE OF PRACTICE ON NOISE FROM PUBS AND CLUBS – A LOCAL AUTHORITY'S VIEWPOINT, J Hinton, Birmingham City Council |
| 13.55 | THE NEED FOR A CODE OF PRACTICE ON NOISE FROM PUBS AND CLUBS – AN ENTERTAINMENTS' INDUSTRY VIEWPOINT, K Dibble, K Dibble Acoustics |
| 14.15 | Tea |
| 14.35 | Introduction to workshop session |
| 14.40 | Workshop session |
| 16.00 | Feedback |
| 16.30 | Close |

Having set the scene with two short presentations the workshop session will enable small groups with appointed facilitators to consider separately what issues should or could be addressed in a code of practice. The final feedback session will allow for ideas to be shared.

Meeting Organisers: S W Turner FIOA, TBV Science, D Langdown MIOA, Basingstoke & Deane Borough Council and J Hinton MIOA, Birmingham City Council

Please note that the venue can only accommodate 50 persons. CPD certificates will be available

---

I wish to attend the workshop on Environmental Noise from Pubs and Clubs

Name:

Organisation:

Address:

Telephone: Fax: Email:

❑ I enclose a cheque for the delegate fee ❑ Please invoice me

❑ IOA/CIEH Members £35 including VAT ❑ Non-Members £45 including VAT

Institute of Acoustics, 5 Holywell Hill, St Albans, Herts AL1 1EU

Tel 01727 848195 Fax 01727 850553 email Acoustics@clus1.ulcc.ac.uk Registered Charity No 267026

# MEMBERSHIP

The following were elected to the grades shown at the Council meeting on 29 February 1996

**Fellow**
Eghtesadi, K
Mornington West, A

**Member**
Bownass, D A
Braithwaite, R D
Chan, T Y
Cheng, K K
Dye, G M
House, J R
Jones, G H
Kee, D W M
Kerr, F H
Mak, C M
O'Neill, D A
Robinson, S P
Ruff, J P
So, M S
Townend, D J
Varga, A P
Wai, S H
Warrington, D N
Wong, F K
Yan, K T A

**Associate Member**
Chan, F Y F
Darroll, C V
Dixon, A K
Evans, D H
Fuller, J E
Garner, A A
Gilby, A
Jordan, S E
Lambert, A C
Lockwood, E S
McBride, B R
Saville, W M
Solaja, A J
Swan, S J

**Associate**
Sharp, R G

**Student**
Bang, B D
Cormack, R

# EDUCATION

## Certificate of Competence in Environmental Noise Measurement

The following were successful in the March 1996 examination

**Colchester**
Carter, D B
Coates, P
Darnes, T
Edwards, P
Emburey, C
Hewitt, A J
Johnson, A Y
Mellor, S
While, P J

**Derby**
Cornell, J R
Howell, K
Polzin, C D
Smith, S
Tavernor, A J
Wicks, I

**Liverpool**
Critchley, I C
Duncan, M
Hughes, N W
Lee, R W G
Sharp, K
Wells, R H

**NESCOT**
Barbera, C L
Bulger, E M
Castine, J
Dommett, S
Featherstone, M K
Gawen, J R
Herbert, M R
Hooper, P D
Hunt, P S
Jones, J A
Roberts, C A
Rowland, J C
Smith, D J
Stringer, C E

## Certificate of Competence in Workplace Noise Assessment

The following were successful in the February 1996 examination

**Amber**
Downes, M
Peat, D M

**Colchester**
Bray, P
Catchpole, T
Clarke, N
Garrett, P
Read, P
Swanston, P
Thompson, I

**Derby**
Butler, V A
Cleverley, I M
Gayfer, J
Griffiths, N E
Howell, K
Platt, M D
Rouse, O P
Thomas, K B

**Leeds**
Smith, T S
Wright, T J

**Stafford**
Fellows, L P
Galloway, T
Hillier, B E
White, E

## Business Review Committee

**Mr Ian Campbell MIOA** **Chairman**
No. 2 Kings Own, Hatfield Broad Oak, Bishops Stortford, CM22 7JF. Tel. & Fax. 01279 718393.

**Mr Geoff Kerry FIOA** **Treasurer**
University of Salford, Dept of Applied Acoustics, Salford M5 4WT. Tel. 0161 745 5582 Fax. 0161 745 5427.

**Mr Rob Hill FIOA** **Membership Committee**
25 Elm Drive, St Albans, Herts AL4 0EJ. Tel. (w) 01442 247146 Fax. (w) 01442 256749 (AIRO Ltd).

**Mr Colin English FIOA** **Engineering Division**
18 Grosvenor Road, Highfield, Southampton SO2 1RT Tel. (w) 01942 869111 Fax. (w) 01942 867270 (Arup Acoustics).

**Mr Neil Spring FIOA** **Meetings Committee**
360 Reigate Road, Epsom Downs, Epsom, Surrey KT17 4LY. Tel. 01737 356642.

**Mr John Sargent MIOA** **Publications Committee**
BRE, Garston, Watford WD2 7JR. Tel. 01923 894040 Fax. 01923 664088.

**Mr Alex Burd FIOA** **Medals and Awards Committee**
4 Little Borough, Brockham, Betchworth, Surrey RH3 7ND. Tel & Fax. 01737 842323.

**Dr Bob Peters FIOA** **Education Committee**
NESCOT, Longmead Road, Epsom, Surrey KT19 9BH. Tel. 0181 394 3232 Fax 0181 394 3232.

# THE LAUNCH OF THE NEW ENGINEERING COUNCIL

## Susan P Boyle CEng MIOA

The recent launch of the new Engineering Council, on 2 February 1996, heralded what aims to be the start of a new era for the engineering profession. The new Engineering Council brings together the 39 engineering institutions for the first time into one co-ordinating body, with an integral Senate of 54 members – 24 of whom are elected by the Institution Councils, 24 elected directly by registered engineers, and six nominated by the Privy Council. In order to carry out this role, the Senate has two boards:

i) the Board for the Engineering Profession (BEP), which is responsible for the promotion of engineering and for forming a considered viewpoint on issues where engineers can contribute to national debate; and,

ii) the Board for Engineers' Regulation (BER), which is responsible for maintaining the register of engineers and technicians and for defining and reviewing standards for education, training and continuing professional development.

This framework is intended to provide the cohesion necessary between the Institutions, the Council and, most importantly, the registrants themselves, in order for the engineering profession to speak and be heard to speak with one authoritative voice.

The launch took place at the Queen Elizabeth II Centre, Westminster, with contributing speeches including those of His Royal Highness the Duke of Kent (who is President of the Engineering Council), the Deputy Prime Minister Michael Heseltine, leading environmentalist Dr David Bellamy, Eurotunnel co-chairman Sir Alistair Morton, and Professor Alec Broers, vice-chancellor elect of Cambridge University.

The Institute of Acoustics is one of a handful of smaller Institutions to have a representative on the Senate. In my capacity as your Senate representative and as a member of the Board for the Engineering Profession I will endeavour to put forth the view of the IOA and smaller institutions in general – I also have a remit to represent the Institution of Engineering Designers and the Institution of Engineers and Technicians. I strongly believe there is a pressing need in the UK to raise the profile of engineers and engineering in line with the status it deserves and gets in other countries. In doing so, the number of high fliers applying for engineering courses in the UK will automatically increase, as potential students see the benefits of a career in engineering. This will also have the effect of attracting more women to engineering and increasing the number of registrants. At present, many of those who are qualified to register as Chartered Engineers, Incorporated Engineers and Engineering Technicians do not see the potential benefits of doing so. The Engineering Council has a key role to play in the development and regulation of the profession and increasing the recognition of engineering's contribution to national issues.

If you are interested in finding out about the procedures for registering for Chartered Engineer or Incorporated Engineer status, please contact Dennis Playle at the IOA.

Regular updates of Engineering Council actions will appear in future issues of the Bulletin. Meanwhile, if you have any views or comments that you would like me to consider for future Council meetings, please send them to me, via the IOA.

**Susan P Boyle MIOA is at the Building Research Establishment, Garston, Watford, WD2 7JR** ❖

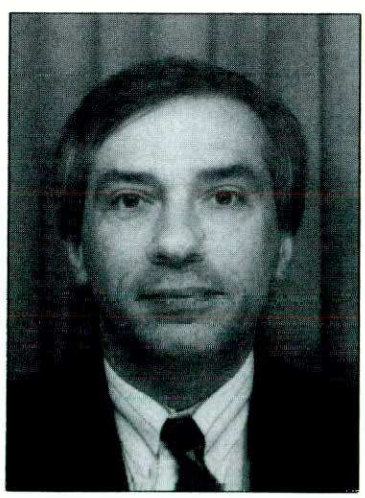

The distinguished panel at the launch of the new Engineering Council

# NEW CHARTERED ENGINEERS

**Leo Beirne** started his career serving an apprenticeship to mechanical engineering in 1967, progressing through the drawing office reaching the position of senior draughtsman after completing his Higher National Certificate and Endorsements in Mechanical Engineering. Whilst studying for his degree in Mechanical Engineering Leo became involved with the control of noise and vibration from large diesel engines, which prompted him to study for a Masters Degree in Applied Acoustics.

Leo has subsequently managed a College Acoustics Laboratory and an Acoustics Division of a medium sized manufacturing group of companies, involved with all aspects of industrial and environmental acoustics, including the design, manufacture and installation of control hardware. He now works for the Health and Safety Executive as HM Principal Specialist Inspector, dealing with noise and vibration matters, eg. European Standards making, enforcing the Noise at Work Regulations, providing engineering means of reducing both noise and vibration exposure.

**John Hustwick** is currently a Senior Consultant with Sound Research Laboratories at their head office in Suffolk. He has spent over 7 years with SRL working on a large variety of noise and vibration projects. However as John is a mechanical engineer by training, having served a traditional apprenticeship with gas turbine maker Rolls Royce, he specialises more on industrial, offshore and marine projects. John does augment this with environmental work and has appeared in court several times as an expert witness on noise nuisance cases.



Prior to joining SRL, John spent 3 years with Lloyds Register of Shipping working as an engineer surveyor for the Technical Investigations Department. This involved travelling on numerous ships, including the QEII, investigating noise, vibration and stress problems.

Between 1979 and 1985 John worked in Montreal for Pratt and Whitney, project managing the design and construction of gas turbine engine test cells and test equipment. Once again, noise and vibration were crucial areas, especially environmental noise to the residential neighbours.

A liking for consultancy work was gained shortly after leaving Rolls Royce, when 2 years were spent with an engineering consultant in Royston. A variety of engineering projects were undertaken by the practice, which showed how interesting and varied consultancy work could be.

**Dusan Lednik** became interested in acoustics as a student through a part-time job in the Department of Acoustics at the Institute for Material and Structures Research (ZRMK) in Ljubljana, Slovenia (formerly Yugoslavia), mainly performing field measure- ments in the areas of building acoustics and environmental noise. In 1978, having obtained a degree in Electronics and Computing at the University of Ljubljana a year earlier, he joined the acoustics group at ZRMK as a full-time consultant engineer. He worked on various research and consultancy projects in building and architectural acoustics, industrial noise and environmental noise and managed the ZRMK Acoustic Laboratories.

In 1982 he obtained a British Council scholarship which enabled him to enroll onto the MSc course in Acoustics and Vibration at the ISVR. He completed his studies in 1984, having won the E J Richards Prize for examination results, and returned to Slovenia. However the same year he accepted an offer by Prof Richards to join the Machinery Noise Group at the ISVR as a research fellow and continue its pioneering work on impulsive noise generation mechanisms. After Prof Richards' retirement he collaborated with Drs N Lalor and R J Pinnington on various research projects, sponsored by industry, mainly on shock propagation in complex structures.

He was awarded the degree of Doctor of Phylosophy for the investigations into the application of the Transient Statistical Energy Analysis and Wave Propagation Analysis in vibroacoustics.

In 1992, Dusan moved to Luxembourg to take up a post of the Staff Engineer in the Noise and Vibration Group in the Goodyear Technical Centre. He is involved in various research and development projects on road/tyre noise, both on environmental and comfort issues, including an European Commission BRITE project on sound quality of cars. At the same time he is maintaining his interest in experimental techniques.

# ROUGHLY HOW LOUD IS THAT – CURRENT ISSUES IN MEASUREMENT

## 14 February 1996, London

The first one-day meeting to be organised by the Measurement and Instrumentation Group was held at The Royal Society, London, on 14 February 1996. The combination of practical workshop sessions and formal presentations attracted 45 delegates.

In the formal session, John Seller (Head of Acoustics at the Building Research Establishment) presented archive photographs and film footage to trace the evolution of measuring instruments and practices up to the modern day, and the parallel advances in the ease of measurement of statistical levels. John drew on examples of new computer technologies to predict easier measurements and better data presentation in the future.

Roger Higginson (Higginson Acoustics Ltd, and formerly of the National Physical Laboratory) described the importance of measurement uncertainties in providing public confidence in, and independent verification of the results of, acoustical measurements. The contrast in the amount of uncertainty information available for noise exposure and noise emission measurements was discussed, and a system for the uniform expression of results with a grade of accuracy and measurement method was proposed.

Richard Tyler (Manager of Advanced Engineering at CEL Instruments) discussed the CE marking of acoustical instrumentation, with particular reference to the implementation of the EC Directive on electromagnetic compatibility. The expense of the routes to compliance with the Directive, and the lack of Product Standards to provide consistent tests of the performance of acoustical instrumentation, are major problems for manufacturers, and costs may eventually be passed on to users.

Gunnar Rasmussen (GRAS Sound & Vibration) reviewed some of the principles and progress in microphone design from his considerable experience at his former employer Brüel & Kjær. Users were also reminded of some potential limitations in calibrating measurement systems with a sound calibrator.

John Shelton (AcSoft) examined aspects of PC-based 'virtual' instruments, including their measurement accuracy and suitability for type approval. Important considerations are the specification of the computing platform, and the method used to test a measurement system that is distributed between hardware and software.

Professor Victor Krylov (Nottingham Trent University) described the methodology and results of an investigation into environmental low-frequency noise. Victor analysed the variety of physical mechanisms which contribute to disturbance, and some measured spectra from recognised cases.

The session concluded with Ian Campbell (Gracey & Associates) presenting a paper co-authored with Ole-Herman Bjor (Norsonic) on a new sound calibrator that employs feedback from a silicon reference microphone. Many features, including the use of feedback in providing level stability, were described.

Two workshops took place after lunch. In one, devised by Richard Tyler, delegates were reminded of the importance of correct use of all the components and corrections required for the calibration of a measurement system. Practical exercises in calibration techniques were used to reinforce the message of good practice in calibration.

The second workshop, led by John Shelton, demonstrated the tests used to verify the performance of sound level meters. Delegates were able to try out the response of their own instruments to test signals, and also to compare the response of meters to 'real' signals.

In a concluding discussion session, the mix of presented papers and hands-on exercises seemed popular with delegates, and the Group hopes to arrange similar meetings around the country in the future.

*Peter Hanes MIOA* ❖

# Diploma Awards

A scientist whose studies helped improve acoustics at a Colchester church has been awarded the Instiute's prize for the best overall performance in the 1995 examinations for the Diploma in Acoustics and Noise Control.

Stephen Blay, a physics lecturer at Colchester Institute, scored top marks in the country and as part of his work undertook an investigative project into the acoustics at Plume Avenue United Reformed Church in Colchester, which was rebuilt a few years ago, and recommended improvements.

'When I started going to the church about two years ago, the acoustics in the new church were not very good and there was concern that when people were singing they felt uncomfortable, individuals feeling that they were the only ones singing. To make a fuller sound, we replaced the whole ceiling. People have actually noticed the difference, and now there are no complaints.'

Mr Blay, of Maldon Road, Colchester, was presented with his award by the President of the Institute of Acoustics, Mr Alex Burd, at an awards ceremony at Colchester Institute. He was one of 20 people who studied in the School of Engineering Technology and Computing at the Institute who received awards sponsored by local companies. The Guest speaker was Mr Colin Marsh, from Royal London Mutual Insurance Company.

My Blay, who graduated from St Catherine's College in Oxford, joined the Institute in 1990 after teaching in Berkhamsted and Luton.

Bertrand Fritsch won the Association of Noise Consultants' prize for the best diploma project.

This annual award was presented by the Association's President, Ken Ratcliffe FIOA, to Mr Fritsch, who is a senior mechanical engineer with Rank Xerox, specialising in and responsible for noise reduction in photocopiers currently under development.

# Group & Branch News

## London Branch

### Channel Tunnel Visit

'Can you be one of the drivers tomorrow?'

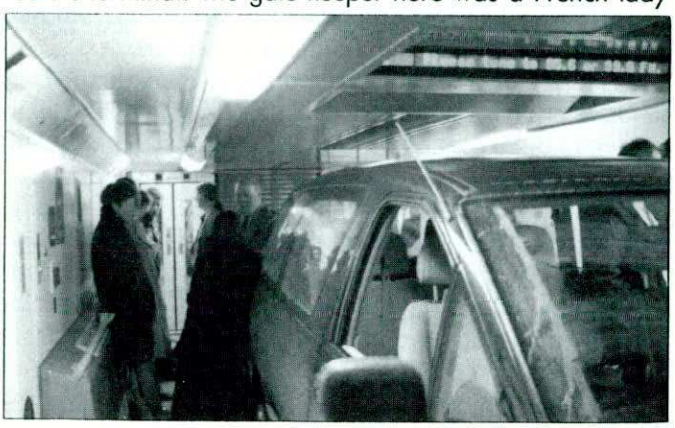
I had already planned to go on the Institute's London Branch trip through the Channel Tunnel so it was easy to agree to Group Chairman John Simson's request to drive one of seven Toyota MPV's laid on by our employer WS Atkins.

So that is how I found myself picking up near neighbour Tom Brodowski on the morning of a frigid 22 February for the journey to the Eastwell Manor Hotel which we reached after passing motorway signs warning of 8-hour delays at the tunnel and negotiating snow and ice. Here we met up with over thirty members and in view of the conditions the decision was taken by Paul Jowers, in charge of Atkins' arrangements, to change plan and press on straight away. The party filled seven identical Toyotas, mine taking on five acousticians from Ealing and Hillingdon.

After some two hours of queuing (services were disrupted by the weather – although it doesn't snow in tunnels, apparently it stops Tunnel staff from getting to work) we were allowed into the Tunnel complex, seeing for the first time the project for which WS Atkins was maître d'œuvre. I innocently drove past an insignificant little hut being stopped by a bellow from the French passport control who ordered us back. Since it was before lunch they were pretty grumpy and gave even more difficulty to Chinese national Shi Shaopei in the following car.

I'm pleased to say that 'le Shuttle' is acoustically very satisfactory with little noise or vibration. As a convenient way of avoiding sea-sickness I can highly recommend it.

After a spirited dash down the motorway and over minor roads we arrived at the Chateau de Cocove where after a glass of champagne we settled down to a 5-course lunch (I understand the French caterers found this easier to provide than a buffet!). The conversation on my table ranged from the correct way to drink vodka to whether the Channel Tunnel really came under the heading of underwater acoustics. After a brief technical presentation on the Tunnel by Neil Porter, some vehicles went to the Hypermarket while others (including mine) set off for the Calais terminal. The gate-keeper here was a French lady



who obviously knew that you had to aspirate in English but didn't quite know where ('alf an hhhour'). The party proceeded to plunder the Duty Free shop (sadly the burghers of Calais seem now to have given way to burgers).

On the return shuttle the English crew's pronunciation of French was even worse than the outward journey's French crew's mangling of English. The journey was even more smooth and trouble free and we arrived back at the Eastwell Manor Hotel late but well satisfied.

After dropping our passengers, Tom Brodowski and I set off on our return journey. We were cruising along on the M26 when we were overtaken by a Ford Sierra being driven at a furious pace. Menacing gestures from a sinister individual in the back directed us onto the hard shoulder. Two brigands emerged from the vehicle and I wondered who would play me on the Crimewatch UK reconstruction. The larger and more formidable of the two loomed up.

'I've left a bag of duty-free in the back of your car.'

*Rhys Owen MIOA*

## Midlands Branch

The Midlands Branch of the Institute of Acoustics held their first meeting of the year on the evening of 6 March 1996. The meeting was addressed by Geoff Leventhall, a past President of the Institute, who now specialises in active noise control with Digisonix Inc.

Unsurprisingly, Geoff's presentation concerned active noise control, addressing both the theoretical aspects of the subject and practical examples where active control has been successfully employed. Geoff also brought along a demonstration rig to show how well the theory can work in practice.

Both the presentation and the demonstration were extremely well received by the audience of 25 people and a lively session of questions and discussion ensued.

The next Branch meeting will be held in Coventry on the evening of 5 June 1996 when Bridget Shield MIOA of the South Bank University will give a talk on concert hall acoustics. Members will be notified of the location.

Finally, many thanks to TBV Science for the free use of their Birmingham offices and their generous hospitality. The Branch look forward to using the venue again.

*John Hinton MIOA/John Magrath MIOA*

## Southern Branch

A meeting of the Southern Branch was held at the Winchester Guildhall on 22 November with nearly 30 members attending. The topic selected for the evening was, 'Barriers – an update' and the two speakers were Colin English of ARUP Acoustics and Jim Johnston of Radian Engineering.

Colin's presentation introduced the subject of barriers and was supported by a very impressive slide collection of barriers from around the world. His talk helped to put the UK situation into the European and International perspective and gave the meeting an idea what could be achieved in the future.

Jim then went on to review the background to the new barriers between Junctions 10 and 11 of the M25. He also described the system, which is an integrated modular system that can contain concrete panels faced with absorbent material, noise absorbent timber panels and tinted acrylic panels.

The meeting concluded with the usual stimulating questions and answers; a debate that covered the deficiencies of CRTN, the problems associated with the UK's traditional approach to road traffic noise and the inadequacies of certain units to describe nuisance and loss of amenity from road traffic noise.

The organisers extend their grateful thanks to Graham Parry for chairing the meeting at very short notice and also helping to ensure that the evening was a particlarly successful one.

*Sara Gandy AMIOA*

## Education Committee News

Dr John Knight has retired from the Committee as the representative of the British Society of Audiology. John has served on the Committee since its foundation, along with that of the Institute itself, in 1974. We owe him a debt of deep gratitude for his long service and good humoured and valuable advice. The Society is presently in the process of re-forming its own Education Committee and discussions are in progress on how best to continue the efficient communication of information between their committee and ours.

Dr John Goodchild has stepped down as Chairman of the Advisory Board of the Certificate of Competence in Environmental Noise Measurement. This was very much John's brainchild and he has acted as Chairman and Chief Examiner since its inception in 1993. It is a valuable part of our educational activities and we are grateful to John for his valuable contributions to it. Dr Mike Fillery, who is Diploma course tutor at Derby University, will be taking over as the new Chairman, although John will continue to be the Chief Examiner.

It has been suggested that we, as an Institute, could be proactive in providing articles on acoustics topics for educational journals aimed at schoolteachers and schoolchildren. I am currently contacting the relevant journal editors, but would be pleased to have ideas (or offers) of topics and potential authors.

*R C Chivers FIOA, Chairman, Education Committee* ❖

# Book Review

**Noise Control: The Law and its Enforcement 2nd Edition**
**Christopher N Penn**
**Shaw & Sons, 1995 432 pp.**
**ISBN 0-7219-08314 paperback £24.95**

This is an extensive, and long overdue, revision of Christopher Penn's book, first published in 1979, on the legal controls over environmental and occupational noise.

The need for this revision is clear considering that well over sixty relevant regulations and statutes have been enacted since the publication of the first edition together with numerous circulars and planning guidance notes. Although aimed at all those involved with noise problems this book is strongly biased towards the work of the Environmental Health Officer in local authorities.

The first chapter, which should be superfluous for the qualified EHO, very briefly describes the nature of sound and vibration, the effects of noise on humans, and noise measurement and reduction. The rest of the book deals with the legal aspects of noise control. There is comprehensive coverage of statutory and common law nuisance including procedures, defences and appeals and, on a practical note, a short section on the investigation of complaints. The laws relating to noise in public places are explained including the control of entertainment and recreation noise, noisy parties and noise in streets.

The chapter on noise abatement zones is almost unchanged from the previous edition, and this is hardly surprising, bearing in mind how little these powers have been used. Further chapters describe in detail the controls governing noise from construction sites, occupational noise, planning and development, road traffic noise and aircraft noise.

The author's style is concise and the book is easy to read. The text contains a wealth of references and is well illustrated throughout with case histories. The book is well presented with a useful (although not particularly thorough) index, tables of law cases, regulations and statutes and a large bibliography. There appear to be very few mistakes or typographical errors but the current noise nomenclature is not always used and some descriptions of noise terminology are a little weak. For example, there is an incorrect definition of the $L_{10\ (18\text{-hour})}$ traffic noise index.

Some areas of the law that are outside the immediate realm of the EHO, such as the regulations governing noise emissions from machinery, are covered only briefly while other topics including military aircraft, waste disposal and quarrying are given no coverage at all. These are niggling matters however, and this book is likely to find wide appeal from the layman, student and practitioner.

For those who found the first edition indispensable this revision is a must. It is the most up-to-date and comprehensive work on noise law available and represents excellent value for money.

*G A A Rock MIOA* ❖

# Hansard

**16 February 1996**
**Noise Bill (Second Reading)**

**Mr Harry Greenway (Ealing, North):** I beg to move, That the Bill be now read a second time.

... This is a Bill:

'To make provision about noise emitted from dwellings at night; about the forfeiture and confiscation of equipment used to make noise unlawfully; and for connected purposes.'

It is my intention that the Bill will curb and, I hope, eradicate the intolerable problem of neighbourhood noise.

... The Noise Bill creates a new offence in England, Wales and Northern Ireland to deal with excessive noise from domestic dwellings at night. The Bill introduces for the first time an objective level against which noise can be assessed. It also clarifies powers to confiscate equipment causing severe noise, under either the Bill or the statutory nuisance regime in the Environmental Protection Act 1990. Enforcing the statutory nuisance regime can be time-consuming and can lead to the dissatisfaction of the local authority and complainants. Concerns about the effectiveness of the existing controls and the rising number of complaints, especially about noise from domestic premises, led me to realise that there was a need for additional legislation. That was also very much the conclusion of the Department of the Environment's review of the effectiveness of neighbour noise controls.

The Bill aims to make it easier for noise complaints made during night hours to be resolved quickly and effectively, but recognises that not all local authorities have the same problems and so might not be able to justify providing a night-noise complaint service for so few cases. Clause 1 therefore allows, but does not require, the local authority to adopt the new offence. I hope that most authorities will adopt it, and I believe that the London borough of Ealing plans to do so.

Where district and unitary authorities have adopted the provisions, clause 2 puts a duty on them to take reasonable steps to investigate complaints of excessive noise from a dwelling house between 11 pm and 7 am. That is an additional duty to the requirements placed on all district and unitary authorities to investigate complaints made under statutory nuisance legislation. If a local authority officer considers the noise excessive and that it exceeds or might exceed the permitted level, he may serve a warning notice. The officer should decide whether the noise may exceed the level and whether to measure it. The permitted noise level is covered in other clauses.

Clause 3 provides for the service of a warning notice. Where possible, the notice must be served on the person responsible for the noise. However, where the person cannot be found, the notice can be served by leaving it at the dwelling where the noise is being emitted. The notice will warn that any person responsible for noise emitted from the dwelling, including its garden, may be guilty of an offence, which can come into effect not less

than 10 minutes after the serving of the notice and is valid until 7 am the following morning.

Clause 4 sets out the new night noise offence. Where a warning notice has been served and the noise exceeds the permitted level in the period of the notice, the person responsible for the noise is guilty of an offence. A person found guilty of an offence can be fined up to level 3 on the standard scale, which is currently £1,000.

Clauses 5 to 7 provide the technical basis for the objective standard and its measurement. Clause 5 enables the Secretary of State for the Environment to give directions to determine the permitted noise level. I am clear that the level should be based on the World Health Organisation guidelines, which in 1980 stated:

'a level of less than 36 dB is recommended to preserve the restorative process of sleep'.

An objective test is necessary because it enables the offence to be proved more easily and quickly than the statutory nuisance offence. The raising of the standard also represents a reasonable objective standard that would confirm a serious neighbour noise problem and be likely to cause sleep disturbance.

Clause 6 ensures that the equipment must be approved by the Secretary of State, which is very important. Clause 7 requires verification that the noise has been measured in accordance with any specified conditions and with an approved machine. Clauses 8 and 9 allow a local authority to operate a fixed penalty notice for an offence committed under clause 4. The fixed penalty sum is set initially at £40.... The sum may be varied by order of the Secretary of State. Anyone who receives a fixed penalty notice has 14 days in which to pay, otherwise he or she will face prosecution. The fixed penalty will be especially helpful to local authorities since they will not have to take every offender to court. It is not however appropriate for gross or persistent cases where prosecution is more suitable.

... Clause 10 and the schedule give local authorities the power to seize noise equipment used in the emission of noise that leads to an offence. If entry to the premises is refused, the local authority may apply to a justice of the peace for a warrant. The schedule provides for the retention of noise-making equipment and allows the court to order forfeiture of equipment. The clause also clarifies the basis of confiscation and forfeiture of noise-making equipment by local authorities in England, Wales and Northern Ireland where that equipment has been used in the commission of a noise offence that is a statutory nuisance under the Environmental Protection Act. I am sure that the Bill will be very welcome for that alone.

The remainder of the Bill is mainly technical. Clause 11 provides definitions and enables regulations to be made. Clause 12 provides protection from personal liability for local authority members, officers and persons authorised to take action under the Bill. Clause 13 relates to financial matters, and clause 14, the short title, deals with commencement and the extent of its jurisdiction.

At present, local authorities handle complaints about excessive noise by using the statutory nuisance controls of part III of the 1990 Act. Domestic premises are the largest source of complaints about noise, accounting for two thirds of all complaints in 1992-93. It is important to note that between 1983-4 and 1992-93, complaints about noise from domestic premises more than trebled; the problem is worsening every day.

Having stated that the Bill is primarily concerned with domestic noise, it is necessary to distinguish further what type of noise I hope that the Bill will address. Although, potentially, all types of neighbour noise at night could be investigated, the major source of complaints is noise made by amplified music and – perhaps – parties. The Bill is necessary because the existing statutory nuisance regime is regarded by many noise sufferers as too lengthy and uncertain a remedy, which is undoubtedly the case.

The number of complaints about noise, especially domestic noise, and public concerns expressed through organisations such as the Right to Peace and Quiet Campaign, the media and public correspondence is growing. In 1993-94, there were 131,153 complaints about noise from domestic premises.

It is vital to balance people's rights to carry out activities in their own homes with the ability to protect those who are affected by the noisy and sometimes inconsiderate action of their neighbours. It is also necessary to underline that the Bill is not intended to be a killjoy. Obviously, tastes vary and one man's music is another man's noise.

Hon Members might be asking themselves why the Bill applies solely to noise emitted from private dwellings and not noise from pubs, audible bird scarers, church bells, and so on. The simple answer is that statutory nuisance legislation will still deal with noise from all those sources. The additional offence is intended to provide a more immediate response to the problems of domestic noise.

All Hon Members will recognise that music systems are much louder and cheaper than they were 10 years ago, and therefore more pervasive. I remind the House that the type of music that is now most popular is very different from the music of 10 years ago. I am talking about dance music, which is characterised by a heavy, loud, repetitive bass drum beat. Not only is this music almost invariably played at an excessively loud volume, but the beat has a strong reverberation which passes easily through neighbouring walls in houses and neighbouring ceilings in flats. Is this music a passing trend that will not be with us in a year's time? No. The music is played widely in clubs around the world and, as a genre, is now indisputably the nation's favourite. It is so popular that different branches of the music have been developed, including jungle, handbag, hard core and techno. [*Laughter*]. One has to have some knowledge of these things. This music and a sophisticated hi-fi operated by a selfish soul are a devastating combination....

... Hon Members may be wondering why the benchmark has been set at 35 dB. Thirty-five decibels is typical of night-time noise levels in bedrooms with single glazed windows fronting busy suburban roads. In addition, information derived from the national noise incident survey carried out by the Building Research Establishment in

1990 suggests that 90 per cent of the population of England and Wales is expected to experience noise levels of less than 35 dB inside rooms on the front aspect of their dwelling at night. That, combined with the advice supplied by the World Health Organisation, shows that an objective standard of 35 dB is a fair and just benchmark. The message of the Bill is clear; noisy neighbours will be prosecuted. I want the Bill to help to eradicate the problem of noisy neighbours, but I do not want there to be any unjust prosecutions. Let us consider a case in which the problem is in the construction of the dwelling. There will be a defence by which people can show a reasonable excuse to explain why they were unable to reduce the noise below the specified level. People will have to give a proper explanation, but that could help them. We must also consider whether the new offence will create a benchmark for all noise cases and so make it difficult to prosecute statutory nuisance cases where the noise is lower, but is still causing a nuisance. To that point, the simple answer is that the criterion for the new offence is quite different from the existing statutory nuisance provisions.

It is not my intention that the general public should have to know when the noise levels have been exceeded. It is for an environmental health officer to assess the noise against the suggested standard for 10 minutes after being summoned by a noise sufferer and, if necessary, to request the noise maker to stop...

What happens if the standard does not work? To answer that, I stress that there has been some research by the Building Research Establishment that suggests that one can devise an objective test to substantiate judgments of nuisance from amplified music. Some trials have been called out on the proposed standard and further work is planned. Different procedures may be needed for the assessment of noises that have significantly different characteristics from those of music, such as the noise that may result from some do-it-yourself activities. That is an important point, bearing in mind that the Bill will apply not only to dwelling houses, but to the gardens of dwelling houses. The Bill is the first step in establishing a standard; the Secretary of State will have the power to vary the standards set.

**Mr Tom Cox (Tooting):** ...I fully support the Bill... Whatever part of the country we represent, we all know that noise has become a real and more complex problem. Clause 1 deals with night noise and clause 2 refers to the night hours – 11 pm to 7 am. During that period, excessive noise from music or from parties causes utter hell not only for people who live adjacent to the noise, but for people in a wide area. Noise travels, so many people, sadly, suffer from the problem.

We now hear a great deal about road rage. I believe that although that problem is serious, noise rage is a far greater problem which is suffered by many more people; we know that the problem exists. Road rage can be seen to take place. Noise rage cannot be seen, but people suffer from it and the consequences are often worse in terms of the length of suffering. Whichever part of the country we represent, we all have constituents who come to our

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surgeries in utter despair about their problems....
... Like the promoter, and like many Hon Members, irrespective of which side of the Chamber they sit, I want the Bill to become law, and I hope that it will be made absolutely clear that local authorities, with their new powers, will be able to do something about stopping that continuing problem.
The Hon Member for Ealing, North touched on another aspect of the problem that many other Hon Members, including myself, have come across in their constituencies.... One goes politely to the person creating the noise and asks, 'Could you kindly turn it down now?'. What is the response? Abuse and threats, and one walks away. At that point the complainant realises that, because the people making the noise are so aggressive, he has lost, and he thinks, 'Well, okay, what can I do about it now?'
The people who make the noise will live in the same area, and they will get to see the people who have complained, and may find out their names and where they live. Constituents of mine have had their windows broken and their flowers ripped up in their gardens. They cannot prove anything, but they know that, shortly after their polite request to 'turn the music down please' – not off, just down – they suffer not only the abuse with which they were initially met but damage to their property. They may not be able to prove anything, but they know that it happened and often who did the damage.
One accepts that legislation already exists, but, as the Hon Member for Ealing, North explained, much of it is not working, and does not do the kind of job that our constituents expect. That is why they look to us for added support, and that is why I warmly support the Bill.
The Library produces many excellent reports on many issues, and in November 1995 it produced one called, 'Noise nuisance and anti-social neighbours'. The introduction says, on page 5:
'For three decades complaints about noise have been steadily rising, and in 1993-4, complaints about noise from domestic premises rose for the seventh consecutive year, to a total of 131,153 complaints'.
It then mentions a problem that I have already raised, the confusion of the general public about the responsibilities of the police. I shall not comment further on that.
The research paper continues:
'Some widely publicised cases have highlighted the misery that can be caused by a noisy neighbour. Often noisy actions are accompanied by other forms of inconsiderate or intimidatory behaviour, which in some cases have driven individuals to violent retaliatory action, even murder and suicide; one newspaper report has listed 17 deaths which have allegedly resulted from noise disputes'.
That confirms what the Hon Member for Gillingham said in his intervention.
Clause 2 defines night hours as those between 11 pm and 7 am. I understand that times must be specified, and that many people may say that noise before 11 o'clock at night is not too bad, but I question that. If people are trying to get their youngsters off to sleep, loud noise is absolute hell. We also know that many people are shift

workers and work varying hours. So to ask for restrictions from 10 pm to 7 am is not unrealistic.
I do not suggest that music should not be played at all. The Bill would simply restrict its volume during the night hours. If I happen to serve on the Standing Committee I shall seek to amend the time, because the period between 10 pm and 7 am is not an unrealistic goal....
... When we consider the financial effects of the Bill, I start to get worried. We know that with major legislation – in my view the Bill will fall into that category – the key issue that determines whether it will succeed not only in the House but in being properly implemented in the country, is its cost.
I listened with interest to what the Hon Member for Ealing, North said about seizures and the disposal of equipment. Nevertheless, many Hon Members here who have been in the House a while and have served on Committees will know what happens when a Bill gets into Committee. The Government – I do not single out the present Government; all Governments do it – say, 'Yes, it is a wonderful Bill and basically we support it, but there are the costs, and we do not know whether we should get too involved with it'. I hope that such an attitude will not delay the Bill's real effects.
I have found another problem in my constituency and I am sure that, wherever our constituencies are, we can all tell similar stories. Properties in my constituency – generally lived in by young people – have been sublet, and I have been told that some of the youngsters play music hour after hour at the highest possible volume. A neighbour may have been to see them, but, frankly, they do not want to know. But if the neighbour knows either the owner of the property or the person who is officially renting it, he may try to take it up with them.
I have been involved in five such cases in three months, and have written polite letters either to the landlord or to the person who has sublet the property. Some, to their credit, do reply, but they are neither interested nor sympathetic. Their attitude is, 'Look, it may be a problem, but I do not live there and I do not suffer from it. My relationship with the tenant is very good, and I am not going to get in the tenant's bad books. I am sorry, but I am not interested in doing anything.' One can politely ask a person to turn his music down and be greeted by abuse. In those cases, one has lost. Sadly, in cases where landlords fail to act, one has lost again. We must look at that issue in detail in Committee.
The Hon Member for Ealing, North referred to the role of local authorities. The House of Commons research paper on the subject, which produced a great deal of valuable information, says:
'Local authorities in England and Wales do indeed vary in the way in which to implement the statutory nuisance legislation that exists; the powers are there for all of them, but of course local authority policies depend on resources and the importance they attach to noise complaints. Some authorities give noise a high priority and have 24 hour noise lines and officers on hand at all times to deal with noise nuisances.'
That relates to a comment that I made earlier about the varying attitudes of local authorities. Some agree that there is a problem and state that they are tackling it. We welcome that. But there are others who say – the hon Gentleman referred to this – that noise is a part of modern living. While it may be a bit unpleasant, we have to put up with it as we cannot have everything in life. We are not asking for everything in life, Mr Deputy Speaker. We are asking for a reasonable period during which people will be able to live in their homes without disturbance. If the Bill is passed and becomes law, I hope that local authorities are made clearly aware of the wishes of the House.
The research paper goes on to comment 'In 1993/4 – I understand that that was the most up-to-date figure available when the report was prepared in November 1995 – '180 out of 300 local authorities who submitted returns to the Chartered Institute of Environmental Health . . . ran out-of-hours noise teams'.
Of the 180 authorities that replied, 86 ran a 24-hours-a-day service, seven days a week; 19 ran a weekend service, that is, Thursday to Sunday; 74 ran other unspecified services; and one authority had no response.
The other crucial point is the speed of an authority's response. Of the 382 authorities surveyed on this issue, nine had an immediate response and 51 responded within 24 hours. But the response of 206 authorities varied from two to seven days. Someone suffering the absolute hell of excessively loud music will expect a speedier response from their local authority than that. Indeed, nine authorities took more than seven days to get round to the problem. I wonder how concerned some authorities are about this matter.
The problem affects not just inner-city constituencies such as mine, but rural areas. I have a sister who lives in a small town in Norfolk, and that town suffers from the same problems as my south London constituency. This is a nationwide problem, and I give credit to the hon Gentleman for getting the Government to agree to include Northern Ireland in the proposals of the Bill.
... Some of us know that the problem exists; it does not matter if one is the local Member of Parliament or not – if people want to play loud music, they will do so. I congratulate the Hon Member for Ealing, North on promoting the Bill and I certainly support it. I hope that Opposition Front Bench Members will also give the Bill their full support, because I genuinely believe that the Bill will help to overcome the problems to which the hon Gentleman and I have referred.
**Mr Warren Hawksley (Halesowen and Stourbridge):** In following the hon Member for Tooting (Mr Cox), may I say that I agree not only with the concerns that he expressed, but with some of his concerns that the Bill perhaps does not go far enough and may result in some problems? I apologise to the House, as a constituency engagement this evening means that I may have to leave before the debate finishes. I have explained to my hon Friend the Member for Ealing, North (Mr. Greenway) that that may be the case.
I congratulate my hon Friend on having chosen for a private Member's Bill such an important issue, and one that

seems to have cross-party support.

The problems that are reported to us as Members of Parliament by our constituents are massive. One point that has not yet been made is that the problem of noise becomes worse during the summer months, as it did over the hot summer of last year, and over such periods, we receive even more complaints. That summer, I received regular surgery complaints about not only noise, but general public order. The windows of houses are left open more frequently at that time of year and more drink is consumed – perhaps as a result, people make louder noise. There are considerable problems, and the present system is found to be wanting. Like the Hon Member for Tooting, I have slight reservations about the implementation of the proposal, whether it goes far enough and whether, once it is on the statute book – as we hope that it will be – it will be effective.

... The Dudley metropolitan borough area covers Halesowen and Stourbridge constituency, and I am told by my officers that, during the past year, 27 blues parties have led to complaints and problems and, overall there have been 900 complaints. Of those complaints, 200 were what my officers called hard-core complaints for which there were serious grounds for follow-up action. As we all know, some people who are elderly and particularly nervous may make complaints that, on investigation, one would accept as perhaps not entirely justified.

On a national scale, the figures for complaints are probably even more alarming, particularly as they show the terrific increase of the past 20 or more years. In 1967, only 976 complaints were made to local authorities about noise. According to the figures published by the Institution of Environmental Health Officers, the figure had soared by 1992 to 111,515. In between those dates, there was a steady increase, with a figure of 25,000 in 1979 and 33,014 in 1982. I do not think that it is just that people are complaining more willingly; it also has a lot to do with the fact that people have less respect for their neighbours.

... The Government's Building Research Establishment. found that, after sunset, two thirds of the population were exposed to noise above the 35 dB limit recommended by the World Health Organisation. It found on a sample survey that between 60 and 70 per cent of people who endure noise from neighbours never complain. It has already been explained to the House that on many occasions people may be frightened to complain; they may be worried that relations with their neighbours will deteriorate and they may be worried about intimidation.

The Building Research Establishment undertook a survey of 14,000 adults in 1986-87 in England and Wales. Neighbourhood noises that disturbed people were shown in percentage terms and amplified noise came top of the list, at 34 per cent. Noise from dogs generated 33 per cent of the noise nuisance; domestic activities – I suspect that that is what my hon Friend the Member for Harrogate (Mr Banks) was referring to when he talked about domestic disputes – created 9 per cent of noise disturbance; voices created 6 per cent; do-it-yourself activities generated 5 per cent; car repairs generated 3 per cent and a variety of other noises generated 10 per cent. That survey shows that there are a variety of causes of noise even within the home.

Apart from the damage to people's health caused by acute stress and sleep deprivation, regrettably, noise pollution from neighbours often leads to violence....

... In conclusion, I must move on to a few concerns about the legislation. We have already heard about the £40 fine and whether it is adequate. I do not think that it is. If it is going to be an effective deterrent, it must be more than £40. If three or four people are at a private party, which they are not paying for, they will all give 10 quid and be quite happy. That fine is not high enough and I hope the Committee will consider raising it to £100 or something in that region, as suggested...

... If I criticised the Bill in any way, it is not because I disagree with its purpose. I wholeheartedly support the Bill and think that it is very necessary. I question to varying degrees, whether it goes far enough and does what we want it to do. I hope that it will be speedily accepted today in the House...

**Mr Simon Hughes (Southwark and Bermondsey):** ... I am pleased to be a sponsor of this Bill. The only interest that I have to declare is that I am the Hon Member who represents the Institution of Environmental Health Officers, which has just a bit of an interest in this issue. However, I should add that it is always a bit cautious about such legislation. I do not want to misrepresent the situation and say that all these proposals have its full support.

In common with many colleagues, particularly those from the London constituencies with whom I have discussed the matter, I am a great supporter of the campaign that has led to this Bill's Second Reading. The National Society for Clean Air and the Right to Peace and Quiet campaign – which now feels that it can wind down because it has made its mark – and its leader, Val Gibson have been great campaigners....

... We have moved relatively quickly, for this place, in bringing the Bill to this stage. We legislated in 1990, under the Environmental Protection Act 1990; we legislated again in 1993, in relation to such matters as car noise; the working party was set up, after a bit of pressure, in 1994; it reported in 1995; and we have a Bill in 1996. Although that might appear slow to the public, for this place we have moved very quickly....

... The three penalty options in the Bill are a warning, a fine and then confiscation. I take a very hard line on this and believe that most people who live in the middle of the inner city, surrounded by estates, do too. I agree with the 'two strikes and you're out' view.

... I said that the Bill needed to provide the right procedure. The working party left the matter open, so I pay tribute to the Government for being persuaded that a criminal procedure is likely to be far more efficient and effective than the current statutory nuisance procedure. The current process is very lengthy. Someone has to keep diaries and give evidence, but there are no immediate implications for the person who is creating the nuisance, who can then serve counter-notices. That is often not effective.

One of the problems is that the time that elapses between the commission of a crime or anti-social activity and its punishment is that the two appear unrelated. Kids often feel that they have got away with something because they are not dealt with until a year after the offence. Society's response to anti-social activity needs to be much quicker. I reaffirm the hope that we can add to the Bill a proposal to deal with noise from private property such as estate roads, rather than from houses alone....

... Finally, we must ensure that the resources necessary for the job are available. The proposals will have an impact on local authorities and the police. The Government might come up with good ideas but, often, others, whether local authorities or the police, are left to pay for them out of their own resources. The Bill will not work if we do not give police and local authorities the resources to do the business.

I welcome the Bill.... Let us hope that 1996 will be the year in which peace will begin to return to our far too many noisy, and therefore devastatingly unpleasant, estates.

**The Parliamentary Under-Secretary of State for the Environment (Mr James Clappison):**

... The Government welcome the Bill, which is an important piece of legislation.... The measure has been debated in a good and constructive way and has been met with a well deserved general welcome.

The Government recognise the extreme distress that can be caused by domestic noise, particularly at night. We also recognise the potential cost to the country of the lost sleep, illness and disrupted lives that result from such noise. Today, we have heard many examples of individual suffering. I hope that the Bill will help people who suffer from the problem, especially noise at night....

... At present, local authorities have a range of powers to abate noise nuisance in premises, including land, and from vehicles, machinery and equipment in streets, but it has become increasingly apparent that the controls on domestic noise are not working as well as they might.

The number of complaints to local authorities in England and Wales about noise from domestic premises continues to rise steadily. In 1993-94, there were more than 130,000 such complaints more than a threefold increase over the past decade. That concern is reflected by the large number of letters received by my Department asking that more be done to address the problem....

... We should like local authorities to examine the noise problem seriously. If they think that it is a problem, we would encourage them to find methods of best practice. We shall certainly do what we can to disseminate best practice and professional guidance and to adopt a graduated service standard that will clearly identify the appropriate type of service....

... I hope that I am not going into too much detail, and I appreciate that there are many matters still to be debated in Committee, but the Bill has been warmly received, and I am sure that, as the Hon Member for Belfast, South (Rev Martin Smyth) said, it will benefit many

people in the real world who suffer from the problem. The Government warmly welcome the Bill and I again congratulate my hon Friend the Member for Ealing, North on introducing it.

**Mr Harry Greenway:** With permission, Madam Deputy Speaker, I should like to say a few words in reply to the debate.... It is clear that the Committee stage will be extremely important, as my Hon Friend the Minister said. I am grateful to him for the comprehensive points that he made in picking up matters raised today.

I am also grateful for the consistent support of the Hon Member for Tooting (Mr Cox) and note that he would like the relevant time to be brought forward from 11 pm to 10 pm. This is something that will have to be debated, but we can come back to it. I am also grateful for the support of my hon Friend the Member for Halesowen and Stourbridge (Mr Hawksley) who asked whether dogs barking in the garden will be covered. My hon Friend just responded to that question and said that particular difficulty is already dealt with under existing legislation, so the Bill cannot be extended to cover it.

I understand that the Hon Member for Southwark and Bermondsey (Mr Hughes) would put people in cells if they made too much noise. Clearly, the mood of the House is very tough, and rightly so. My hon Friends have spoken in a similarly forceful way....

... I am anxious that the Bill should be capable of being as widely applied as possible if it becomes an Act, as I hope it will. My hon Friend the Member for Colchester, North (Mr. Jenkin) drew an analogy between my Bill – and its hoped-for effect – and the Clean Air Act 1956. I agree with that analogy and my Bill is, like that Act, an attempt at an absolute. My hon Friend made an inspired point and we should all bear it in mind.

The advice of the National Society for Clean Air and Environmental Protection suggested measures for preventing noise nuisance. We must remember, for the purpose of the Bill and everything else, that prevention is better than cure. The society's advice included suggestions to site noisy household equipment away from partition walls. It suggests performing noisy DIY jobs during normal working hours when other people are making a noise; apologising to neighbours in advance for disturbance caused by DIY; and telling neighbours in advance about parties and inviting them, and keeping noise to a minimum. It also suggests that, if a dog barks when left alone, arrangements should be made to leave it with a friend. If people do not do that, they might be caught under existing legislation.

I thank the House for an excellent debate and I hope that it will give my Bill a Second Reading today.

Question put and agreed to.

Bill accordingly read a Second time, and committed to a Standing Committee, pursuant to Standing Order No. 61 (Committal of Bills).

**Abstracts provided by Rupert Taylor FIOA** ❖

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## CAPE BOARDS LTD

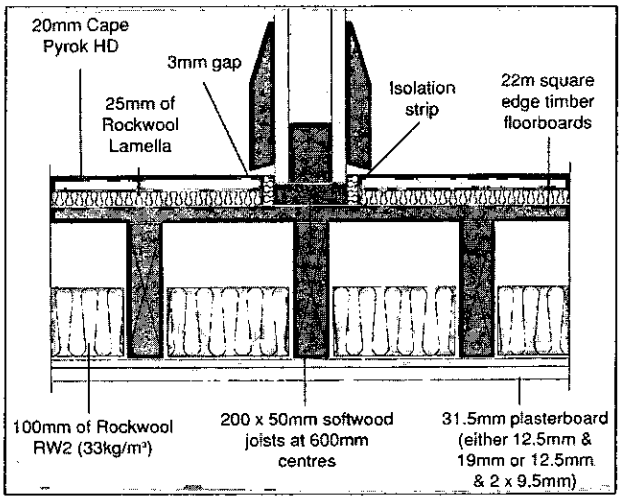
**Acoustifloor**

In response to the growing need to upgrade timber floors, for example in multi-occupancy applications, high performance boards manufacturer Cape Boards has launched Acoustifloor, a unique floating floor system designed to provide acoustic separation and other benefits between adjacent dwellings. The tongued and grooved board is simply laid over the existing wooden surface and the resulting floating floor both absorbs impact sounds and provides insulation against airborne sounds.

Aimed primarily at the refurbishment and conversion markets, the new Acoustifloor system is said to provide excellent sound insulation, and also one-hour fire protection to the original floor as well as thermal insulation and many other benefits. Cape Boards claim that it even exceeds the recommendations made in Approved Document E of the 1991 Building Regulations for both airborne and impact sound.

At the heart of the system is Cape Boards' Pyrok HD, a high performance, high density, 20mm flooring panel comprising engineered wood filaments and cement. The board comes ready bonded to a 25 mm resilient layer of high density mineral wool which contributes considerably to the enhanced acoustic performance. The fibres of this mineral wool layer are perpendicular to the plane of the board, thereby helping to provide a high resistance to compression.

The ease with which the board can be laid down is a real advantage over other floating floor materials and since Pyrok has a lower




moisture absorption, the floor surface is far more dimensionally stable and free of creaks and squeaks.

The system consists of the composite Pyrok/mineral wool panels, which are laid on the existing floor, and 100mm deep mineral wool between the joists with the ceiling below being a 30 mm calcium silicate board with staggered joints. Alternatively, where moisture is not a problem, 30 mm plasterboard can be used.

Pyrok achieves a Class 1 spread of flame and Class 0 fire performance ratings. The system using a plasterboard ceiling will provide one-hour fire protection but when calcium silicate boards are used, significantly longer periods will be achieved.

For further information please contact: Dr Bob Moore at Cape Boards Ltd, Iver Lane, Uxbridge, Middx UB8 2JQ. Tel: 01895 237111 Fax: 01895 259262.

## DIAGNOSTIC INSTRUMENTS LTD

**DI-2203 Structural Analyser**

The DI-2203 Structural Analyser is aimed primarily at users who wish to perform tests on mechanical and civil structures. Both single and dual channel measurements are available in the time and frequency domains. In addition cross channel functions can be computed including frequency response (aka transfer) function and coherence as well as correlation and difference functions.

Typical applications of the DI-2203 include: measurement of operational vibration level and analysis of frequency content, studying the instantaneous difference between responses at two locations, measurement of phased response for Operational Deformation Shape (ODS) analysis, acquisition of frequency response (transfer) functions and coherence for modal surveys, and structural integrity surveys for civil structures.

Some of the key features and benefits of the DI-2203 are:

- full support for modal data acquisition and data transfer to all leading 3rd party modal analysis packages,
- direct connection of Integrated Circuit Piezoelectronic (ICP) transducers (acceleration, force etc), with no need for external signal conditioning devices,
- measurement of frequency response functions with coherence to ensure data quality,
- pre-triggered data acquisition and a force/exponential window combination for impact testing, with a 'windowed time' display to ensure effective window setup,
- options for automatic rejection of overloaded data blocks or manual preview of time data prior to inclusion in the measurement average,
- 'baseband' frequency analysis for 'panoramic overview' of frequency characteristics, with full alias-protection as well as 'zoom analysis,'

to help separate closely spaced vibration modes,
- support for both metric and imperial measurement units, with acceleration in base units or in 'g',
- single and double integration for conversion between formats (Receptance/Mobility/Accelerance),
- 'QuickSETUP' for single-action setup of Bode (magnitude & phase) or Nyquist (real vs imaginary) displays,
- automated file naming and storage into DOS-readable directories in internal memory or on removable PCMCIA memory card,
- direct transfer of data to a PC environment via PCMCIA memory card – RS232 transfer is also available as standard if preferred,
- conversion of data files into industry standard Universal Format Files using a stand-alone PC utility program.

For further information please contact Anne McSherry, Sales Administrator, Diagnostic Instruments Ltd, 2 Michaelson Square, Kirkton Campus, Livingston EH54 7DP. Tel: 01506 470011 Fax: 01506 470012.

## INDEX DATA SYSTEMS LTD

**IDS/nVision**

IDS/nVision is a visualisation tool which has been optimised for rapid handling of large multichannel datasets. It features data acquisition, data processing, dynamic data display and report generation elements, takes full advantage of the power and flexibility of the Microsoft® Windows™ environment and contains specific acoustic and vibration enhancements.

New modules added in the latest release include:

A sound quality system which can do serious work at a very reasonable price, providing order filtering using Kaiman technology together with fast acting, on line digital filters allowing the engineer to experience first hand and immediately the likely results of an engineering change.

Digital order tracking algorithm implemented to allow the accurate realisation of machinery order related spectra with very fine resolution and precision.

Integration of multi-channel PC acquisition cards enabling a fully featured eight channel genuine hand carryable acquisition and analysis system to be supplied for mains, battery or DC operation.

Further information is available from Alan Bennetts, Sales and Marketing Manager, IDS Sales & Marketing Office, Crysnal House, Main Road, Westhay, Somerset BA6 9TN. Tel: 01458 860393 Fax: 01458 860693.

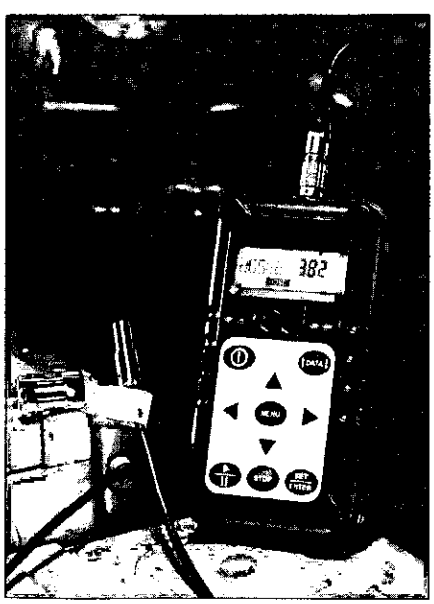
## CEL INSTRUMENTS LTD

**CEL-420 and CEL-460 Logging Noise Dosimeters**

The CEL-420 and CEL-460 Logging Noise Dosimeters are the first products to be announced in the CEL 'Millennium' project. This is a series of products that have been designed using the latest processing and memory technologies to deliver the flexibility needed to meet the requirements of noise measurement legislation into the 21st century.

The range includes noise dosimeters and sound level meters available in standard and intrinsically safe (IS) versions.

The noise dosimeters are compact instruments (about the size of a cigarette packet), lightweight but rugged due to the choice of construction materials and easy-to-use with an icon-based keypad layout. The detachable plug-in microphone lead, which is fitted as standard, can be replaced with a sound level meter microphone providing a simple dual-functionality product.



Both dosimeters are of a dual-detector design which permits the simultaneous measurement of frequency-weighted noise exposure and the logging of linear peak decibel levels. In European Union Health and Safety Regulations, noise exposure levels are the first and second Action Levels and linear peak is the third Action Level.

Both instruments can be connected directly to printers to produce hard-copy reports from formats held in the instruments memory

Stored data can also be downloaded to PCs for further data manipulation using CEL software or for exporting to proprietary software packages.

The instruments are highly resistant to knocks and abrasions since the case material is the same as is used in vehicle bumper construction.

A single 9V battery is all that is required to operate the instruments for over 40 hours in dosimeter mode. For further information on CEL dosimeters contact CEL Instruments Ltd, 35–37 Bury Mead Road, Hitchin, Herts SG5 1RT Tel: 01462 422411 Fax: 01462 422511.

**CEL Instruments is a Key Sponsor of the Institute**

# News Items

## SOUND ATTENUATORS LTD

**Music Practice Rooms at Kings College**

Noise and vibration control specialists Sound Attenuators Ltd have recently completed an installation of six individual music practice rooms at Kings College.

Problems arose with the proposed location of the music rooms which were on the ground floor. There were noise-flanking problems above and around the area, together with the problem of considerable traffic noise from the Strand. There was also the added difficulty of a Music Library and a Study area situated below, both demanding very low noise levels.

To achieve the best acoustic integrity, it was decided that the College should have six music practice rooms accessed from a common corridor. A full Kinetic isolated floating floor would be installed to cope with the high point loading imposed by the grand piano and the low frequency noise from the piano or percussion instrument. This was completed, air conditioning and electrical services were installed within four months.

By using traditional decor, the high performance acoustic rooms were made to appear as normal as possible to the students. Carpet, walls faced with stretch fabric and concealed lighting were all used to help create this impression. The rooms were kept at a comfortable temperature by a central station air conditioning system with silencers to attenuate any noise from the air conditioning equipment, and also to address the risk of any crosstalk.

The performance of the final installation is claimed to be excellent, allowing students to practice in an environment without any distraction from the adjacent rooms, and which also does not allow others to be disturbed in the University.

The work was carried out as a turnkey package for the Music Department at Kings College Estates Department Surveyors.

For further information, please contact Sound Attenuators Ltd, Eastgates, Colchester, Essex CO1 2TW.

## PLANNING AND NOISE

### DOE Study On Need For Additional Technical Guidance

The Department of the Environment has appointed a consultant to carry out an assessment of the technical aspects of Planning and Noise, the Department's planning policy guidance note PPG 24.

The objectives of the work are to study the application of PPG 24, to identify any need for additional Guidance and to make recommendations on possible methods that could be developed and adopted in the guidance. It is not intended to make any changes to polices and principles contained in the PPG.

Rupert Taylor, the noise consultant appointed to carry out this research contract, is asking all those in the field of planning and noise assessment who may have views on the need for additional technical guidance in the use of the advice given in PPG 24 to contact him to discuss the issues raised.

Topics likely to arise are circumstances not covered by the advice, need for clarification of technical procedures used in the noise assessment of development proposals, interaction with the requirements for Environmental Statements, possible ambiguities and uncertainties in determining Noise Exposure Categories, the roles of measurement and prediction and interfaces with statutory noise prediction methods, potential contradictions and ways of applying conclusions reached using other documents referred to in PPG 24.

There is to be an Institute of Acoustics one-day meeting on Planning Policy Guidance and Noise on 17 April 1996 at Church House Conference Centre in London This will include a workshop discussion introduced by Rupert Taylor. As part of the DOE contract he will also be organizing other workshops in different parts of the country according to the strength of response to the consultations which are in progress. Those interested in participating should contact him on 01825 712435, Fax: 01825 712542. Email100675.1765@compuserve.com.

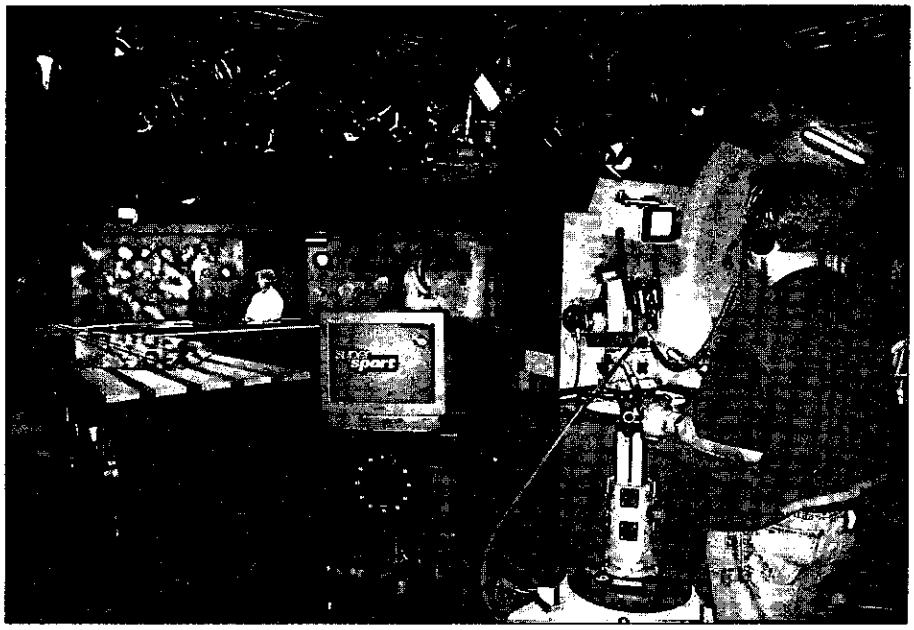
## INDUSTRIAL ACOUSTICS COMPANY

### Builds New TV Studio For Benelux Broadcaster Filmnet

Pictured here is a brand new TV production studio, designed and built by Industrial Acoustics Company (IAC) for Belgium-based broadcaster FilmNet Television. Measuring 17.6 metres x 13.5 metres x 8.3 metres high, the studio, located in Brussels, is used to transmit both live and recorded programmes on FilmNet's premium Benelux movie service and two new premium sports channels ('Super-sport').

IAC built the studio's walls, ceiling and floating floor using its own system of modular pre-fabricated steel acoustic panels. A demanding NR20 acoustic specification was achieved, despite the studio's very close proximity to Brussels Zaventem airport and a motorway. In addition to having a proven acoustic performance the modular panels are rapidly assembled, the studio taking just four weeks to build. FilmNet also chose the modular construction approach because it gives them the flexibility to dismantle the structure and move it to a new location in the future.

The studio's modular panel floating floor was assembled initially at IAC's UK plant to check flatness toler-



ances and a loadbearing capacity of 250 kg/m². Once installed, the floor was coated with epoxy resin to give it the smooth finish needed for TV camera tracking. To increase sound insulation above the studio, a layer of acoustic panels has been used to create a second acoustic roof, above that of the main studio. Also important to the overall acoustic specification was the inclusion of several high performance IAC Noise-Lock acoustic doors. The largest of these, at 4 metres high, provides access for scenery, furniture and other bulky items. IAC's contract included the supply and installation of all of the steel lighting grids fixed to the studio ceiling and the decoration – using black, fire-resistant paint – of the studio's walls and ceiling.

This is not the first time FilmNet has invested in IAC modular studios. In 1993, the Belgian company ordered a voice-over booth from IAC's standard range. The booth has recently been dismantled and re-erected in a different part of the building, proving, says IAC, the portability of its modular structures. A number of cosmetic improvements – new carpet, wall coverings etc – have given the booth a new lease of life at a fraction of the cost of starting from scratch.

For more information contact Simon White, Industrial Acoustics Company (IAC) Tel: 01784 456251 Fax: 01784 461731.

**Industrial Acoustics Company is a Sponsoring Organisation of the Institute**

## SALEX ACOUSTIC MATERIALS LTD

**New Technical Director**

Bill Frame has recently been appointed as Technical Director of Salex Acoustic Materials Ltd, a member of the Salex Group of Noise Control Engineers.

Bill joined the Salex Group in 1984 having previously worked as an engineer with General Motors and Roll-Royce. After studying acoustics at Heriot Watt University, Bill specialised in noise vibration and harshness (NVH) control in all vehicle types, and he can now boast 21 year's experience in this field.

He has a strong interest in the development of acoustic materials for improved performance and is an active committee member of the Institute of Acoustics.

For further information please contact Salex Acoustic Materials Ltd, Crown Gate, Wyncolls Road, Severalls Park, Colchester, Essex CO4 4HT Tel: 01206 852525 Fax: 01206 854445.

**Salex Acoustic Materials is a Sponsoring Organisation of the Institute**

## AcSOFT

**UK Distributor For Head Acoustic Systems**

Leighton Buzzard-based AcSoft is now sole UK distributor for Head Acoustics. AcSoft took on Head Acoustics' telecommunications measurement system last year, and now offers the company's complete range of systems for applications in product development and quality control, noise diagnosis and analysis, architectural acoustics, environmental and workplace monitoring, and studio recording and reproduction.

Head's unmatched expertise in binaural measurement technology can provide a subjective evaluation of complex sound situations, enabling sound quality to be improved to boost perceived product performance.

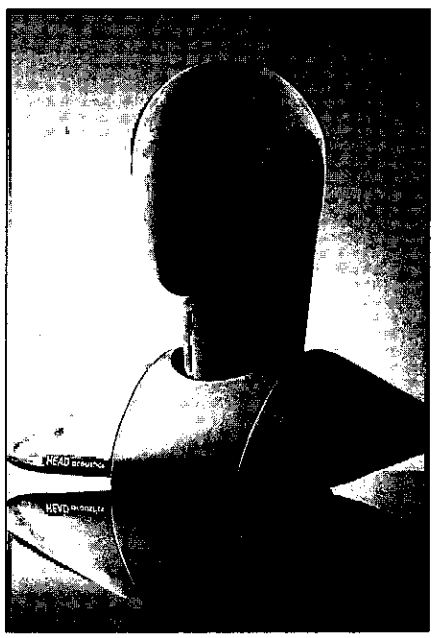
Centrepiece of the range is the Artificial Head Measurement System, which provides an anatomical simulation of the essential human acoustic feartures and is supported by a variety of advanced binaural recording, analysis and playback options.

AcSoft supplies a wide range of noise and vibration measurement solutions customised, if required, to the user's specific needs.

For further information contact John Shelton, AcSoft Ltd, 6 Church Lane, Cheddington, Leighton Buzzard LU7 0RU Tel. 01296 662852, Fax. 01296 661400.

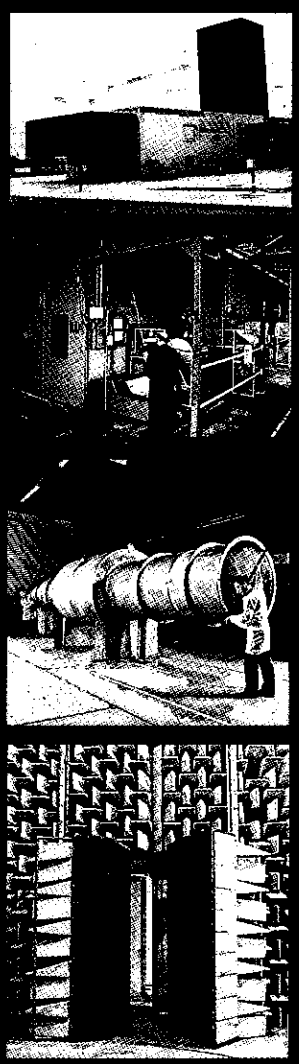
**AcSoft is a Sponsoring Organisation of the Institute**

**Items for inclusion in the New Products section should be sent to John Sargent MIOA at BRE, Garston or via the Institute office** ❖



The Salex Group Limited

Noise Control Engineers



# Quietly in control

30 years' comprehensive practical experience has gained the Salex Group the status of leader in all aspects of noise and vibration control for all applications. This has given the Salex Group a name and reputation second to none, not just in the U.K, but Worldwide.

## Noise Surveys

## Acoustic & Aerodynamic Laboratory

## Product & System Design

## Product Development

## Manufacturing

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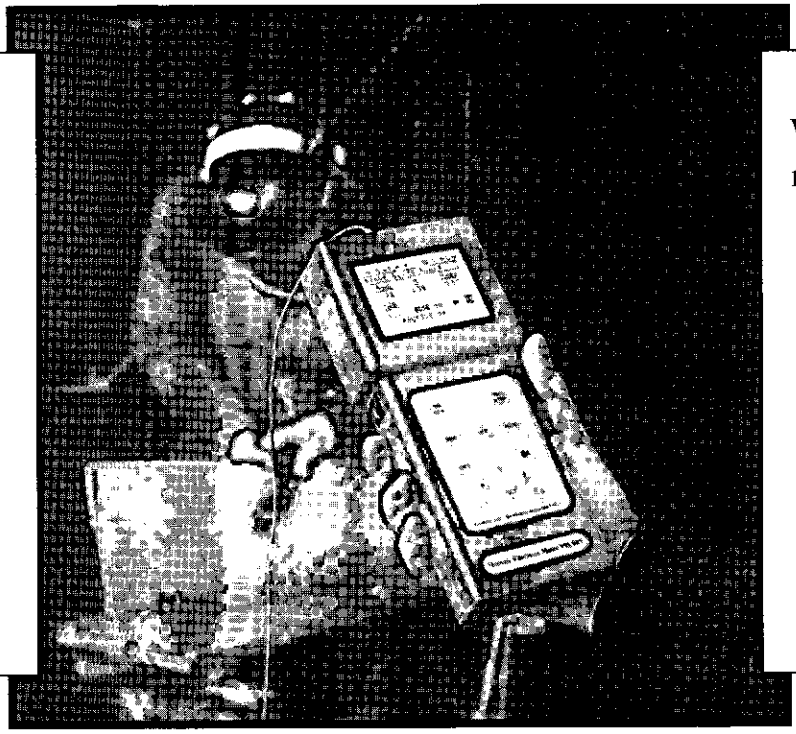
# The World's First

## Dedicated Hand Arm Vibration Meter.

E.P.M. is proud to announce the world's first dedicated Hand Arm Vibration Meter. The VIS-015 is designed specifically to meet the proposed European Union Physical Agents Directive.



Frequency Weightings to the requirements and accuracy of ISO 8041

Displayed in accordance with ISO 5349

Three Measurement Ranges

Designed to measure Hand Arm Vibration levels in accordance with Health and Safety requirements and the E.U.P.A.D., the Human Vibration Meter will give measurement of both instantaneous vibration levels and the equivalent 8 hour exposure.

Includes Real Time Clock and Profile.

Allows 7 separate vibration measurements to be collected in each Run then gives the user options to enter exposure time for all relevant measurements and combine them to give the overall daily exposure in an easy to use program routine.

**European Process Management Ltd**
Newby House, 309 Chase Road, Southgate, London N14 6JL.
Tel 0181 882 6633 Fax 0181 882 6644