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AUTOMATIC MONITORING OF ENVIRONMENTAL NOISE

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1. BACKGROUND

With increase in public awareness of noise pollution, there is considerable emphasis on noise studies [1]. The increased interest in environmental studies has also resulted in increasing necessity to include the monitoring of environmental noise. Research carried out has shown that in almost all cases involving noise annoyance and hazards, averaged units are required such as Leq's, LN's, etc. In some cases, long measurement periods are involved and in some cases, 24 hour monitoring is now required in environmental noise studies. This often entails significant time spent by skilled personnel much of which may not be absolutely necessary once the equipment is located at suitable sites and properly set up. Moreover, it can sometimes border on a considerable waste of time such as when waiting for the noise event. It is therefore highly desirable to be able to carry out accurate and meaningful automatic monitoring of environmental noise.

Where previously there were few enquiries to Local Authorities concerning noise nuisance, the situation has generally altered and recently there has been an enormous increase in the number of enquiries and complaints received which totalled more than 1200 in Doncaster last year.

Increasing awareness has also caused a great change in people's attitude to the perception of noise nuisance and the number who consider they suffer such a nuisance is shown in a recent BRE publication [2]. In following this trend in public opinion, the media are also noticeably giving more publicity to this area.

To deal with this problem in Doncaster, a system was introduced by the Local Authorities where every complainant was sent a covering letter and information booklet as well as a noise record form. Where the noise record form was returned completed, an officer would visit the complainant on three occasions at approximately the times the noise nuisance was stated to have taken place.

There were several weaknesses to the system adopted:-

1. It was very time consuming for officers.
2. It rarely resulted in confirmation of the complaint.
3. Many complaints were received relating to noise out of normal working hours where no service was available.

This resulted in many people being unhappy with the system of services provided, and the Local Authority being unable to confirm in many cases the existence of a statutory nuisance under the Environmental Protection Act 1990 [3], and so the service of few such notices. The Local Authority were anxious to provide a more comprehensive service and to provide details of such a service on the Citizens' Charter questionnaire relating to noise complaints [4].

2. INSTRUMENTATION

The instrumentation used in environmental noise monitoring systems preferably includes an audio tape recorder so that the actual sound is recorded for subsequent playback. This may be used either for further analysis or for recognition of the actual sounds recorded. The latter is often invaluable in most studies where unattended monitoring is employed. The recording may be analogue or digital and in this case the Doncaster Local Authority decided to use the latter. The DAT (digital audio tape) recorder provides greater accuracy and is much smaller and lighter than most analogue systems.

In line with environmental noise study recommendations, a minimum Type 2 or preferably Type 1 Sound Level Meter is used. This is often fitted in a suitably sturdy, secure and weatherproof case in such a way it can be operated automatically at pre-set times or when pre-set sound levels are exceeded or by the complainant by the use of a remote control switch to record the noise.

In environmental noise studies, the noise is often measured remotely and most of the above equipment may be kept indoors or in a suitable vehicle or mobile laboratory and the sounds monitored by means of a suitably weatherproofed and shielded external microphone.

3 METHODOLOGY

It is important to understand that very often the information obtained in noise studies may be required for subsequent review or perhaps used in Court following an appeal against a statutory nuisance served or a prosecution taken by a Local Authority [5].

This information could determine the decision of a Court.

In this case it is vital that the relevant Standards and calibration procedures are properly observed and a standard methodology adopted in all such investigations. A system was devised by Doncaster Metropolitan Borough Council which laid down procedures for operation of the equipment through all stages of the exercise.

4 RESULTS

The initial results of the procedure employed by Doncaster Local Authority using the monitoring equipment have helped provide clear information to resolve noise complaints, either by the service of a Statutory Notice or by informing the complainant that their enquiry cannot be pursued.

It has confirmed the existence of noise nuisances at night, where previously no investigation was possible and has been well received by complainants. The tape recordings were of high quality and easily stored and retreived. From the recordings obtained, further data analyses were easily obtained and the actual noises can be ascertained if required whereas previously only measured or already processed noise data were available.

5 CONCLUSION

The initial conclusion on the new system adopted by Doncaster Metropolitan Borough Council is that it is necessary if the Local Authorities are to take seriously complaints from the public concerning noise nuisance. The equipment has been found to be easy to use and manageable by members of the public. The instructions were found to be brief and clear and the resulting monitoring generally successful.

6 OBSERVATIONS

The implementation of the system has been welcomed by the Doncaster Local Authority and has proved so successful that there is now a long waiting list for use of the equipment.

A further system has been ordered and another is being considered. The results, with one exception, has been accepted by the complainants even when the complaint itself was not eventually validated.

Modifications made to the system following early teething troubles include:-

1. Amendments to the original instruction sheet for use of DAT equipment.
2. Additional information affixed to the equipment case.
3. Use of graphics to show levels of noise recorded in dBA Leq (Appendix 1).
4. Use of octave band analysis for noise nuisance recorded and plotted graphically.

7. REFERENCES

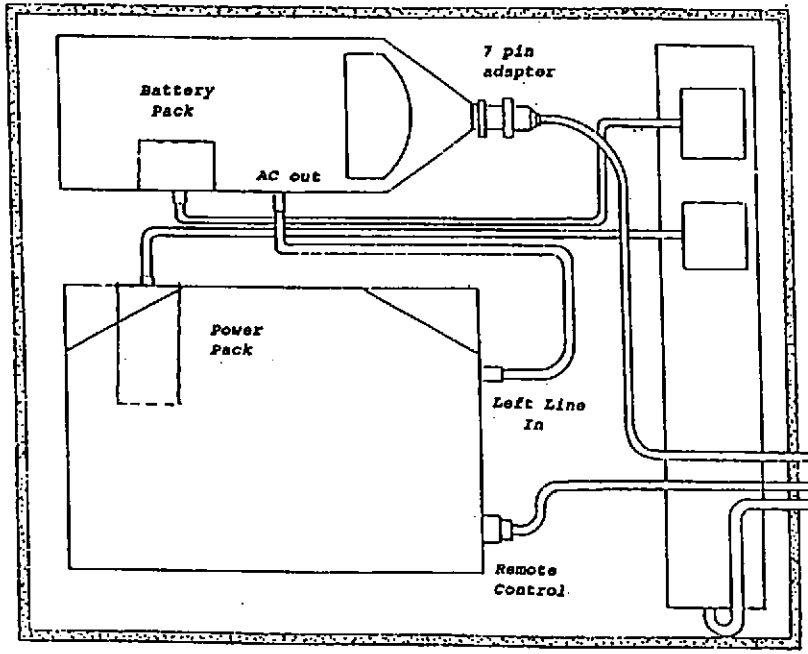
1. Heng, R B W, A Noise Survey of the Public Housing Estates in Singapore, Acoustics Letters, Vol 1, 198, 1978
2. Effects of Environmental Noise on People at Home - Building Research Establishment, December 1993.
3. Environmental Protection Act 1990, Sections 79 and 80.
4. Citizens Charter - Audit Commission on Citizens.
5. Police and Criminal Evidence Act 1984.

8. APPENDICES

1. Layout of equipment case
2. Procedure for operating noise measuring equipment.
3. Instructions for operation of equipment.
4. General Instructions - fixed on case.
5. Questionnaire to be completed by complainant.
6. Equipment list

Appendix 1

BRUEL & KJAER 2231 SOUND LEVEL METER



A/C Out (SLM) To Line In (DAT

To Pre-amp & Microphone

To Remote Control Handset

To Power Supply

SONY TCD-D10 DIGITAL AUDIO TAPE RECORDER

Multi-Socket

Appendix 2

PROCEDURE FOR USE OF DAT

RECORDING

1. CALIBRATION OF SLM

2. SETTING UP SLM/DAT
   - 2:1 Connections
   - 2:2 Parameter Check - in office

3. RECORDING CALIBRATON TONE/ NOISE EVENTS
   - 3:1 Parameter Check - on site
   - 3:2 Record Calibraton Tone
   - 3:3 Record Noise Events

4. COLLECTING DAT
   - 4:1 Parameter Check
   - 4:2 To Pack Away Equipment

PLAYBACK

5. SETTING UP DAT/SLM/AMPLIFIER
   - 5:1 Prepare SLM
   - 5:2 Connections

6. CALCULATING CORRECTION FIGURES (K FACTOR)
   - 6:1 Set up SLM for playback
   - 6:2 To find K
   - 6:3 Calculating K Factor

7. SETTING UP SLM FOR MEASURING NOISE EVENT
   - 7:1 Parameter Check - for playback
   - 7:2 Comparison of First and Second Calibration Tones

8. LISTENING TO THE NOISE EVENTS
   - 8:1 Cross Reference Noise Events/Monitoring Sheet
   - 8:2 Noting dB levels on Playback
   - 8:3 Underload on Calibration Tone

9. EXISTING RECORDS
   - 9:1 To Check Existing Records
   - 9:2 To Delete Existing Records

10. STORING RECORDS
    - 10:1 Setting Manual Store Function
    - 10:2 Real Recorded Date/Time
    - 10:3 To Store Records
    - 10:4 Check Number of Stored Records
    - 10:5 Playback of Noise Events

Appendix 3

INSTRUCTIONS FOR THE USE OF THE NOISE RECORDING EQUIPMENT

1. *To help enable the officer dealing with your case, to decide if the Environmental Services Directorate is able to take action against the person causing you noise disturbance, you have been provided with this noise recording equipment.*

2. *The digital tape is 1½hr/2hrs [illegible]g and upon it we want you to record representative samples of the noise. You should continue to keep a log of the times and dates when you are disturbed (on the sheets provided) noting, especially, the instances when to make a recording.*

TO START A RECORDING

1. *Ensure that all sources of noise in the room with the equipment (for example, the TV or music system) are turned off.*

2. *Using the remote control handset (2) press and hold down the RED button marked REC (3) and, keeping this button held down, press the PLAY button (4). Release both together. The recording has now begun and the circular red light and triangular green light should be visible through the case panel.*

3. *Make a note on the diary sheets of what you are recording and remember to indicate clearly with an R that this refers to a recorded instance.*

4. *LEAVE THE ROOM for the duration of the recording, closing the door behind you and being quiet in the rest of the house.*

TO STOP THE RECORDING

1. *Once you have recorded a representative sample of the noise - for 5 minutes - press the STOP button on the handset.(6)*

OTHER POINTS

1. *If at any time you believe that the recording is not working repeat all steps in the section titled "To start a Recording".*

2. *If you are still experiencing difficulties, then contact the*

   Investigating Officer ..... on Doncaster 737568.

3. *YOU SHOULD NOT AT ANY TIME UNPLUG OR SWITCH THE EQUIPMENT OFF AT THE MAINS.*

4. *If, by mistake the mains is disconnected, or if you have a power cut, you must contact the Officer who will need to revisit in order to reset the equipment.*

5. *If you have any other queries, then please contact the officer dealing with your case on the number above.*

Appendix 4

RECORDING INSTRUCTIONS

GENERAL

DO NOT MOVE ANY OF THE EQUIPMENT ONCE INSTALLED

DO NOT AT ANY TIME UNPLUG OR SWITCH OFF THE EQUIPMENT AT THE MAINS

TO OPERATE

SWITCH ON : Press RED REC button, hold down
Press PLAY button
Release together

CHECK the panel on the side of the case,
BOTH the red circular and the green triangular lights
should be lit as below.

SWITCH OFF : Press STOP button.
No lights should be lit.

WHAT TO RECORD

5 minutes 'Background' ie period with normal noise levels at similar time when nuisance occurs.

Typical examples of the noise nuisance for 5 min periods.

WHAT TO WRITE DOWN

WHITE SHEET : All noise events that cause you a nuisance.

BLUE SHEET : Date and time of actual recordings made.

Appendix 5

MKA Reference number : _____

Name : _____ *Date :* _____

Address : _____

_____

_____

1. Was equipment easy to use?

2. Were instructions easy to understand?

If not why not, what problems

_____

_____

_____

_____

3. Do the recordings made represent normal level of nuisance?

If not explain why.

_____

_____

_____

_____

Appendix 6

Equipment List

Sound Level Meter:
Bruel & Kjaer Type 2231
Bruel & Kjaer Type 2236
Bruel & Kjaer Type 2209
CEL Type 393
Quest Type 1800

Tape Recorder:
Kudelski Nagra III
Kudelski Nagra IV
Aiwa A1 DAT
Sony TCD D3 DAT
Sony TCD D10 DAT