Pak J Sci Ind Res 1998 41(4) 186-189

VEHICULAR CONTRIBUTION TO ROAD TRAFFIC NOISE IN KARACHI CITY, *PART-II.* CONTRIBUTION BY CARS, TRUCKS AND HORNS

G H Shaikh

Applied Acoustics Group,PCSIR Laboratories Complex, Off University Road, Karachi-75280, Pakistan

(Received 7 June 1997; accepted 11 May 1998)

Earlier study on the measurement of level of noise emitted from freely flowing individual motorcycles, buses and rickshaws has been extended and noise emission data for cars, trucks and motor vehicle horns collected to assess their contribution to road traffic noise in Karachi city. The data collected has been analyzed for L_{V90}, L_{V50} and L_{V10} and the results are discussed with reference to maximum permissible noise emission limits for motor vehicles as allowed by Pakistani and other national standards.

Key words: Noise pollution, Traffic noise, Motor vehicle noise.

Introduction

The results of traffic noise surveys conducted in different areas and localities of Karachi city (Shaikh *et al* 1987; 1997), show that with the exception of a few occasional peaks, the levels of road traffic noise in the city vary from 61 to 97 dB(A) with L_{90}, L_{50} and L_{10} values in the range of 70.1 - 78.4, 78.7 - 85.3 and 84.5 - 90.8 dB(A) respectively. This indicates that the upper levels are excessively high and much beyond the maximum permissible limits for community annoyance, as allowed by ISO (ISO R-1996 1981) and other national standards. The existing motor vehicle rules in Pakistan (Motor Vehicle Rules 1969) simply restrict emission of high level noise from individual vehicles and National Environmental and Quality Standard for motor vehicle noise emission (NEQS 1993) allows a maximum limit of 85 dB(A) for new vehicles at a distance of 7.5 m from the source without specifying the type of vehicle and measuring technique.

The results of another study (Shaikh *et al* 1990) on the measurement of the level of noise emitted from different types of vehicles plying on city roads, measured by standard method (ISO R-362 1961), show that the level of noise emitted from the cars vary in the range of 73 - 83 dB(A) and the trucks in the range of 85 - 90 dB(A) (excluding new models). But the data generated by this method gives the information on the level of noise emitted from the vehicles under certain specified conditions, whereas, the vehicles plying on the city roads in real situation generally do not follow these conditions all the time and hence the data does not give a realistic assessment of the contribution of vehicles to traffic noise. Therefore, in order to find the actual contribution to traffic noise from different types of vehicles, measurement of the level of noise emitted from individual motorcycles, buses, mini-buses and auto-rickshaws in their normal running state, i.e. irrespective of any specified control on speed, gear and acceleration position was undertaken (Shaikh *et al* 1995). This study has been extended and noise emission data has been collected from freely flowing individual cars, mini-trucks, trucks and motor vehicle horns. The data has been analyzed for L_{V90}, L_{V50} and L_{V10} values (i.e. level of noise emitted by each type of vehicle and horn exceeding by 90%, 50% and 10 % of the vehicles and horns respectively), and the results are discussed with reference to the maximum noise emission limits allowed by EEC and other national standards.

Materials and Methods

The measuring instruments used in this study were the same as used earlier (Shaikh *et al* 1995), i.e. a Bruel and Kjaer Impulse Precision Sound Level Meter (type 2209), and a Condenser Microphone (type 4165). Noise emission data was collected by keeping the microphone at 1.2 m above ground level and 3 - 5 m away from the buildings facing the road side and the meter at 'fast' response. As reported earlier (Shaikh *et al* 1995) all the measurements were conducted at selected locations on tarmac covered double-carriage roads, approximately 100 - 200 ft wide with buildings on either side and uninterrupted by road junctions, intersections and road lights etc. All measurements on individual motor vehicles and horns were made when traffic at these measuring sites was low and background noise levels at least 10 dB(A) below the level of noise emitted by the vehicle under observation. The noise produced by any particular vehicle (or horn) was measured when it went past the microphone, within a distance range of 5 - 10 m (i.e., an average distance of about 7.5 m from the vehicle under test) in the line of sight of the microphone making sure that at the same time no other ve-

hicle was within about 10 m ahead or behind the vehicle under observation.

Results and Discussion

Noise emission data was collected for 1000 individual cars, 300 mini-trucks, 300 trucks and 500 motor vehicle horns. Table 1, gives the L_{V90}, L_{V50} and L_{V10} values for each type of vehicle and horn alongwith the ranges of level of noise emitted by them. The statistical distribution of noise emission levels for cars, mini-trucks, trucks, and horns are presented in Figs 1, 2, 3 and 4, whereas Fig 5 gives the cumulative distribution of noise emission level for these vehicles and horns.

For new vehicles, the Council of European Economic Commission (EEC directives 1970, 1978, 1984) allow a maximum permissible noise emission limit for different types of vehicles, including motorcycles, cars and other passenger or goods carrier vehicles in the range of 77 - 84 dB(A) with an increase of 1 - 2 dB(A) for vehicles equipped with diesel engine. Department of Environmental Control, Chicago (New Noise Regulation 1971) allows a maximum permissible limit noise emission of 81 dB(A) for motorcycles, private cars and vehicles heavier than 800 lbs.

The results in Table 1, show that the level of noise emitted by these vehicles and horns is excessively high and results in annoyance to the roadside traders and dwellers. The reasons for emission of high level noise from individual vehicles and horns may be attributed to (i) few regulatory laws, (ii) poor education of drivers, especially commercial motor vehicle drivers, (iii) old models, (iv) poor maintenance, (v) use of defective mufflers, (vi) rash driving and (vii) blow the horns repeatedly. In the light of Pakistani Standard (NEQS 1993), which allows the maximum permissible noise emission limit

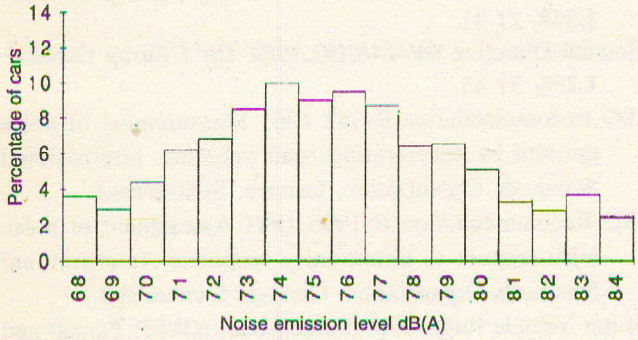

Fig 1. Statistical distribution of level of noise emitted by cars.

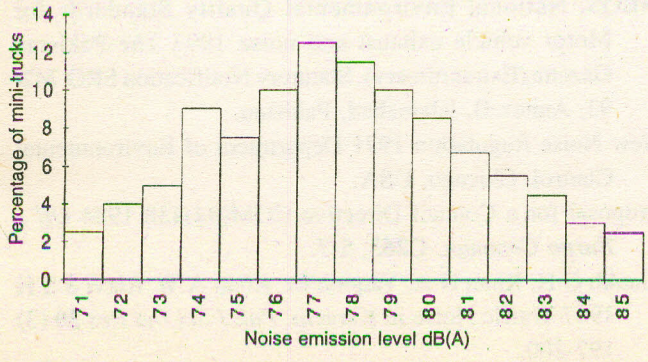

Fig 2. Statistical distribution of level of noise emitted by mini-trucks.

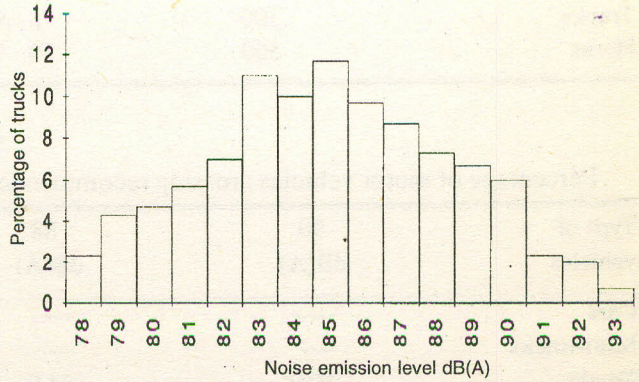

Fig 3. Statistical distribution of level of noise emitted by trucks.

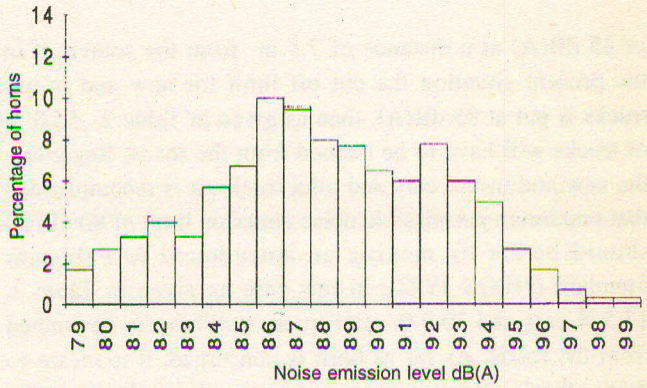

Fig 4. Statistical distribution of level of noise emitted by motor vehicle horns.

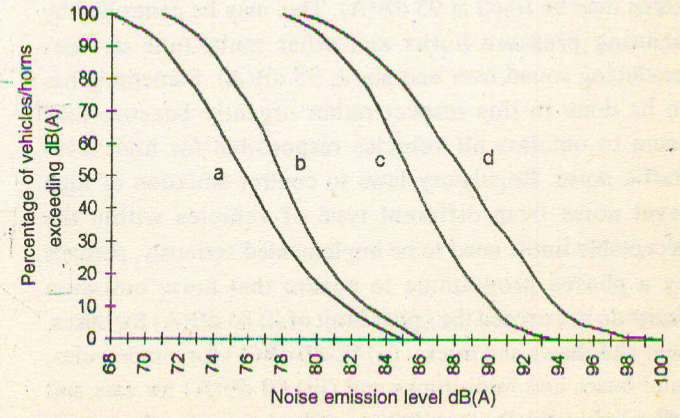

Fig 5. Cumulative distribution of (a) cars, (b) mini-trucks, (c) trucks and (d) horns as a function of noise emission.

Table 1

Range and evaluated L_{V90}, L_{V50} and L_{V10} values of noise emission levels from the vehicles and horns observed

Type of vehicles	No. of vehicles and horns observed	Noise emission range dB(A)	L_{V90} dB(A)	L_{V50} dB(A)	L_{V10} dB(A)
Cars	1000	68 - 84	70.8	75.8	81.7
Mini Trucks	300	71 - 85	73.7	78.1	83.0
Trucks	300	78 - 93	82.5	85.4	90.2
Horns	500	79 - 99	82.5	88.3	94.1

Table 2

Percentage of motor vehicles crossing recommended upper limits of 85 and 80 dB(A) of noise emission levels

Type of vehicles	90 dB(A)	88 dB(A)	85 dB(A)	82 dB(A)	80 dB(A)
Cars	-----	-----	----	9.0	17.5
Mini-trucks	----	----	2.5	15.5	30.0
Trucks	10.9	24.9	55.0	----	----

of 85 dB(A) at a distance of 7.5 m from the source, if in the present situation the cut off limit for new and in-use trucks is put at 85 dB(A), then as given in Table 2, 55.0 % of trucks will have to be banned from the roads. Regarding the new and in-use cars and mini trucks, it is recommended that maximum permissible noise emission limit of 80 dB(A) should be set by making an amendment to Pakistani Standard (NEQS 1993); in this case as given in Table 2, 17.5 % cars and 30.0 % mini-trucks will have to be banned from the roads. As far as horn is concerned, it is meant to draw other's attention over and above the ambient traffic noise. Therefore, it should be at least 10 dB(A) louder than the noisiest vehicle around. The maximum limit for horns may be fixed at 95 dB(A). This may be controlled by banning pressure horns and other multi-tune devices producing sound over and above 95 dB(A). Something has to be done in this respect rather urgently because they seem to outclass all vehicles responsible for high level traffic noise. Regulatory laws to control emission of high level noise from different type of vehicles within the acceptable limits need to be implemented seriously, perhaps by a phased programme to ensure that noise emission limits do not exceed the upper limit of (i) 85 dB(A) for buses, auto-rickshaws and trucks, (ii) 82-80 dB(A) for motorcycles, mini-buses and mini-trucks and (iii) 80 dB(A) for cars and other light vehicles may help to reduce noise levels considerably. Eventually one may hope to set Pakistani Standard close to International Standards.

References

Council Directive 70/157/EEC 1970 *Off J Europ Commun* **L42**, 16-21.

Council Directive 78/1015/EEC 1978 *Off J Europ Commun* **L349**, 21-31.

Council Directive 84/424/EEC 1984 *Off J Europ Commun* **L238**, 31-33.

ISO Recommendation R-362 1961 Measurement of noise emitted by accelerating road vehicles. International Standards Organization, Geneva, Switzerland.

ISO Recommendation R-1996 1981 Assessment of noise with respect to community response, International Standards Organization, Geneva, Switzerland.

Motor Vehicle Rules 1969 Baluchistan, NWFP, Punjab and Sindh, Pakistan.

NEQS, National Environmental Quality Standards for Motor vehicle exhaust and noise 1993 The Pakistan Gazette (Extraordinary), Statutory Notification SRO 742/93, Annex II, Islamabad, Pakistan.

New Noise Regulation 1971 Department of Environmental Control, Chicago, USA.

Proposal for a Council Directive COM(84)438 1984 *Off J Eurpo Commun,* **C263**, 5-7.

Shaikh G H, Khan N A, Yaqoob M, Khan A W, Rizvi S S H 1987 Traffic Noise in Karachi. *Pak J Sci Ind Res* **30** (3) 197-200.

Shaikh G H, Rizvi SSH 1990 Frequency and other parametric analysis of traffic noise in Karachi city. *Pak*

J Sci Ind Res **33** (5-6 & 8), 181-186 & 358.

Shaikh G H, Ahmad N, Rizvi SSH 1995 Vehicular contribution to road traffic noise in Karachi city, Part-I, Contribution by motorcycles, buses and rickshaws. *Pak J Sci Ind Res* **38** (11-12), 457-460.

Shaikh G H,Ahmad N, Shaikh Q, 1997 Traffic noise in Karachi, Part-II. *Pak J Sci Ind Res* **40** (5-12) 51-54.