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INVESTIGATION IN THE INTERRALATION BETWEEN STATIONARY NOISE EMISSION AND RUNNING NOISE EMISSION FROM ROAD VEHICLES

R Wentang, Xiaoping Li & Xiaokuan Li

Noise and Vibration Control Key Point Laboratory, Beijing Municipal Institute of Labour Protection

INTRODUCTION

Many reports from different countries, including developing countries,show that main noise pollution in city is road trafficnoise and main noise sources is different kind of road vehicles.The important practice for controlling road traffic noise in most countries is regulations for different kind of road vehicles. The most important measurement methods are the running noise emission regarding maximum noise level based on ISO362 and the stationary noise emission based on ISO5130. The measurement method for running noise emission requires very strict test field and acoustical environment, and it's difficult to apply the method to in-use-vehicles. Obviously the method for stationary noise emission is suitable for in-use-vehicles. The key for introducing the method and limits for stationary noise is how about the interrelation between stationary noise emission and running noise emission from road vehicles and how about effectiveness of the regulations based on the method for road traffic noise control in city.

STATISTICAL CHARACTERISTICS OF STATIONARY NOISE

In the research project about 1000 road vehicles,including 8 types of new vehicles and in-use-vehicles,had been measured.Types of vehicles include heavy trucks,light trucks,buses and passenger cars. When the samples measured forvehicles of a type are enough the statistical characteristics of noise emission appears a canonical distribution. The statistical characteristics of noise emission for one type vehicles can be stated clearly by mean

value and standard deviation of the distribution.The statistical characteristics can be expressed as follows:

$$P(L) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(L-\bar{L})}{2\sigma^2}}$$

where P(L)—statistical probability for noise emission level L

$\bar{L}$ —mean noise emission level of a type vehicles

σ —standard deviation of noise emission level

The statistical parameters of stationary noise emission from new vehicles and in-use-vehicles are shown in table 1 and table 2.

Table 1 Statistical parameters of stationary noise emission from new vehicles

dB(A)

Type of vehicle	Statistical parameters		
	Mean noise level L	Standard deviation σ	Maximum difference δ
Small wagons	85.8	0.5	2.1
Passenger cars	81.7	1.5	4.7
Buses	93.0	1.9	3.1
Light trucks	88.3	2.0	3.0
Medium trucks	91.1	2.0	3.2
Heavy trucks	95.4	0.9	2.5

Table 2 Statistical parameters of stationary noise emission from in-use-vehicles

dB(A)

Type of vehicle	Statistical parameters		
	Mean noise level L	Standard deviation σ	Maximum difference δ
Small wagons	85.9	1.7	6.5
Passenger cars	84.1	3.1	18.0
Buses	94.4	3.0	10.6
Light trucks	91.1	3.2	11.5
Medium trucks	95.0	3.0	10.0
Heavy trucks	96.2	2.6	12.0

Typical distribution curves of passenger cars,light trucks are respectively given in Fig1 ~ Fig2. From the statistical distribution characteristics above we can get the following conclusions:

The mean stationary noise emission from in-use-vehicle is usually higher than the noise emission from new vehicles about 2 ~ 4dB(A). The standard deviation and maximum difference of noise emission level of new vehicles are respectively 1 ~ 2dB(A) and 2 ~ 3dB(A),and they for in-use-vehicles are respectively 2 ~ 3dB(A)and 7 ~ 12dB(A).From the conclusions above we can see

that some noisy vehicles with lose effecacy muffler or noisy engine can be distinguis-hed by the measurement method of stationary noise.The difference of accelerated running noise emission between new vehicles and in-use-vehicles is quite small.

INTERRELATION BETWEEN STATIONARY AND RUNNING NOISE

From the statistical characteristics of stationary noise emission we obtained a important information—the measurement method of stationary noise emission is simple and easy to apply to in-use-vehi-cles, and also can distinguish noisy vehicles.

In order to know effect of regulations regarding limits of statio-nary noise emission,it's necessary to know the interrelation between stationary noise and running noise emission.The comparison between stationary noise emission and running noise emission is given in Fig3. From Fig3 we can find out that stationary noise emission has good interrelation with steady running noise emission and not with acceler-ated running noise emission. The difference between stationary and steady running noise emission is 10 ~ 13 dB(A).

LEGISLATION PRACTICE IN CHINA

The regulations for accelerated running noise have been practic-ed since 1979. The regulations is revising according motor-car indus-try development and road traffic noise situation.The genaral tendency is strengthened step by step. In order to control noise emission from in-use-vehicles,stationary noise limits will be practiced in China acc-ording the investigation. The limits can restrict 15 ~ 20% in -use-veh-icles which have to adopt new muffler system.Some research projects and new products in muffler field can satisfy the limits practice. The restriction proportion of in-use-vehicles by the limits is small, but ve-hicles restricted by limits are very noisy vehicles and mean stationary noise level can be reduced in 3dB(A). Sound power level of whole road vehicles flow and road traffic noise can get reduction in 2 ~ 3 dB(A).

CONCLUSION

According measurement results of 1000 vehicles the statistical distribution parameters of stationary noise emission for 8 type veh-icles is obtained. The statistical parameters shows that some noisy vehicles with lose effecacy muffler and noisy engine can be distin-guished by measuring stationary noise emission. The regulations for statio-nary noise are simple, easy and effective for controlling noise emissi-on from in-use-vehicles and road traffic noise.

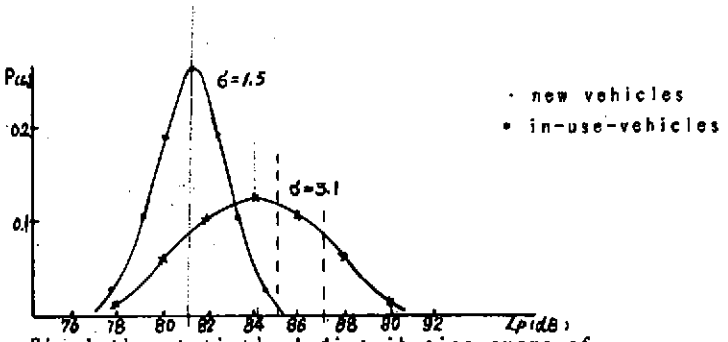

Fig 1 the statistical distribution curve of stationary noise emission from passenger cars

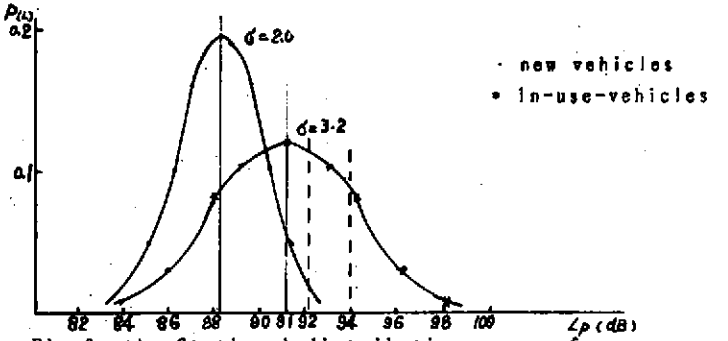

Fig 2 the Statiscal distribution curve of stationary noise emission from small-sized trucks

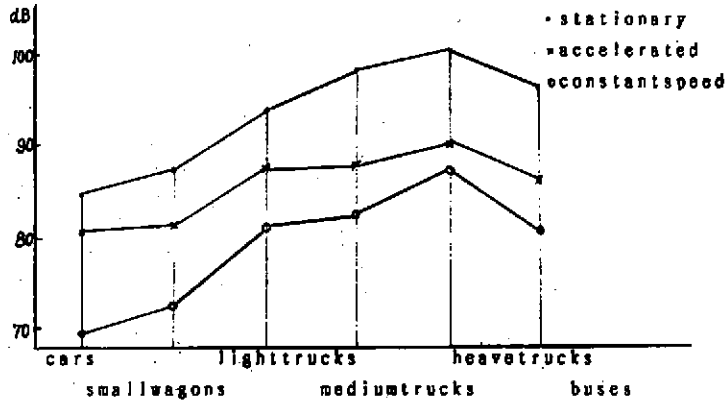

Fig 3 Comparison between Stationary and running noise emission