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Assessment of Noise Variation on Different Pavements with Four Wheeler Vehicle

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ABSTRACT

Outcome of noise pollution and urbanization near highway were seen in last some year, but incremental increase in transportation vehicle in last some decay it is arise a big problem for people are living near highways. Due to increasing in noise level real-estate property value were also be decreases. The aim of this exploration study is to break down the varieties in noise delivered by a four wheeler vehicle at various speed, on two different pavement, namely NH56 (Rigid pavement) & NH31 (Flexible pavement).controlled pass by method were used for measuring noise level generated by four wheeler vehicle.Five unique readings at ensuing interims of 10 km/hr, are taken and the average is utilized in to do near examination of noise created among both kind of pavement.Noise generated due to four wheeler vehicle is directly proportional to the speed of the vehicle and type of the pavement also. It is found that rigid pavement are generated more noise level in respect of flexible pavement also difference are increasing when we moving low to high speed.

Keywords-controlled pass-by method, Rigid pavement, Flexible pavement, tyre-pavement noise, regression analysis, four wheeler vehicle

1. INTRODUCTION

Noise is undesired sound likely to be unlovable, ear piercing or disturbing to hearing.Human form an opinion of sound on four characteristics which is loudness, frequency, duration, subjectivity.Sound pressure(N/M2) and sound pressure levels(decibels) refers to unit of loudness. A man limitations of hearing sound from lowest to highest is 2*10^-5 N/M2 to 63 N/M2. Noise duration are explain with the help of L_{max} and L_{xx}. L_{max} is maximum noise level which is occurring in a given time period and L_{xx} is that particular noise level in which there is more chances to occur xx% of the time.subjectivity of noise are different for different person. Person belongs to different age groups have different response to various sound.a sound that is pleasing to someone, may be a noise for other person. Degree of noise unpleasantness, matter of time and place where it occurs.

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Pavement surface is the surface where the vehicle deals with the road. It imparts major role in pavement function properties, but not capable to minimizes to resistance and noise. Road traffic noise one of the mean source of environment noise. Noise emission is dependent of different type of vehicle and their rang of speed. The emission of noise produces intensity at more than 40 km/hr speed.

2. STUDY AREA

Jaunpur region is one of the prime locale in the Indian condition of up. It is found 228 km south east from state capital Lucknow. To play out the test two area is chosen, first is NH-56 (Rigid Pavement) close Lakhauan and other one is NH-31 (Flexible Pavement) close Sikarara. Lakhauan and Sikrara is the two area where urbanization and traffic burden increments at the same time.

3. STUDY METHODOLOGY

In this investigation controlled pass by technique (CPB) are embraced. It is a technique for estimating noise at a specific area in a controlled way. Controlled way suggests that the vehicle is fixed and the estimation of noise is taken at wanted speed. In CPB technique all kind of noise created by a running vehicle is mulled over, for example, fumes, motor, streamlined noise and tire-asphalt noise.

In this technique noise level was estimated w.r.t. immediate velocities. noise level was estimated with the assistance of sound pressure level meter where estimating amplifier was put at a separation of 7.5m from the focal point of side path of street and 1.2m over the ground level. Advanced speedometer introduced in the vehicle was utilized to decide the speed of the vehicle at the area. The perception were taken when the vehicle precisely go from the midpoint of site area and SPL meter estimated Lmax around then.

Fig. 1. test section.

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4. TEST CONDITION

Limit of 5 dB unsettling influence in readings because of wind was endured while taking readings with the assistance of sound pressure level meter. Temperature at the season of estimation changed between 5 to 30ºC. In thisexamination paper uniquely four wheeler vehicle were utilized once at once at chose street area and max sound pressure level was gathered for each pass – by utilizing sound level meter. While taking perusing there ought not be any vehicle inside chosen region. For managing this circumstance two volunteer were available at 500m separation from the area where the perusing were required and additional exertion was laid on taking perusing with no outside unsettling influence like as wind and other vehicle

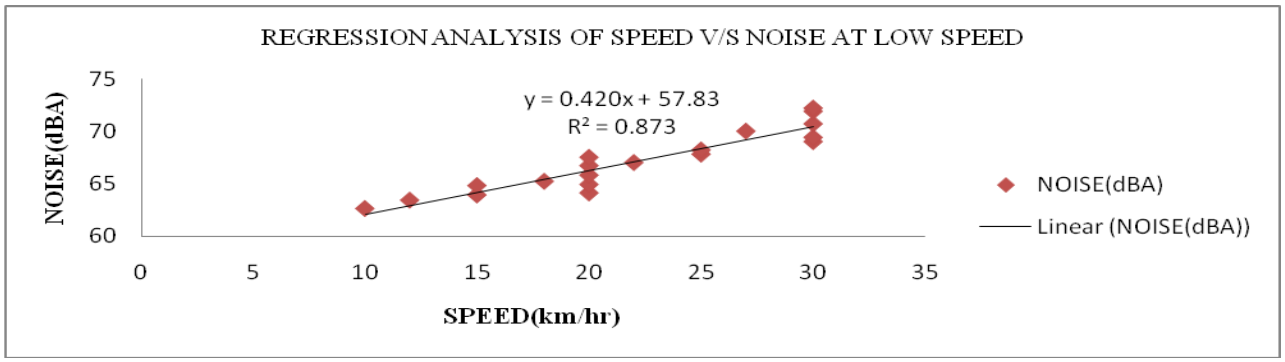
5. RESULT AND ANALYSES

All the controlled pass - by data were inspected and dismembered according to the set up, and legitimately based strategy as of late discussed in the examination approach. A linear regression was fit utilizing Lmax gathered by max sound pressure level meter and speed of the vehicle for four wheeler vehicles to understand the association between the noise pressure level and vehicle speeds.

For rigid pavement noise pressure level was taken from the national highway NH-56. Lmax was taken for particular four wheeler vehicle and linear regression analysis was done between these Lmax values and speed at the time of measurement. After the regression analysis it was seen that the coefficient of determination (R^2) is near about .8and it helped us to conclude that the noise is dependent on vehiclular speed. The slop of regression equation is also shows that Lmax was increasing with increasing vehicular speed.

For flexible pavement national highway NH-31 was used for data collection and all analysis done as previously discussed in rigid pavement.In any case, all things considered, for both the asphalt types, noise pressure level extended with growing vehicle speed. The associations among Lmax and v were analyzed particularly for low, medium, and high speed conditions.

(a)



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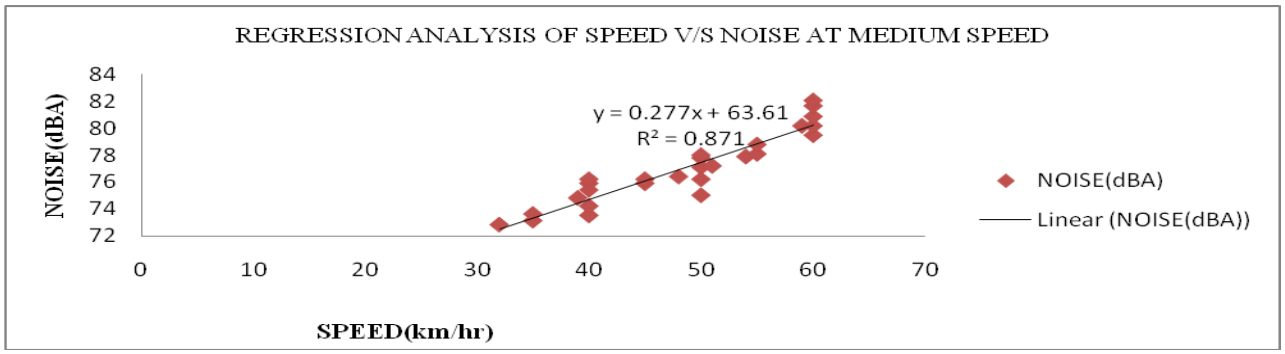

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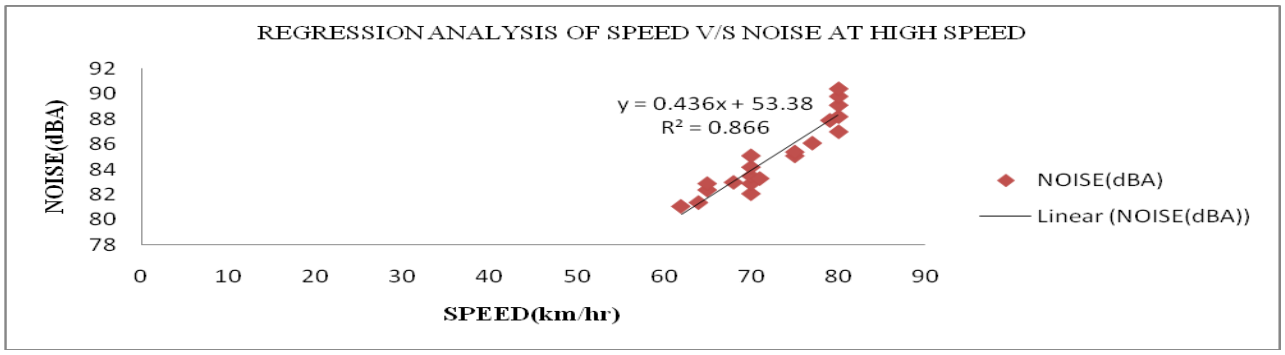
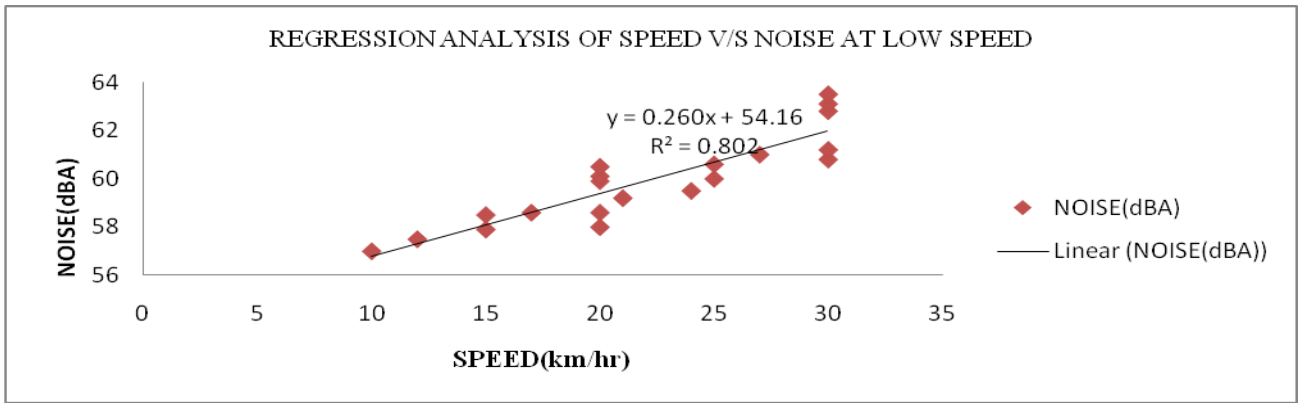


Fig.2. Sound pressure and speed relationship for rigid pavement on NH-56 at: (a) low speed; (b) medium speed; (c) high speed

(a)



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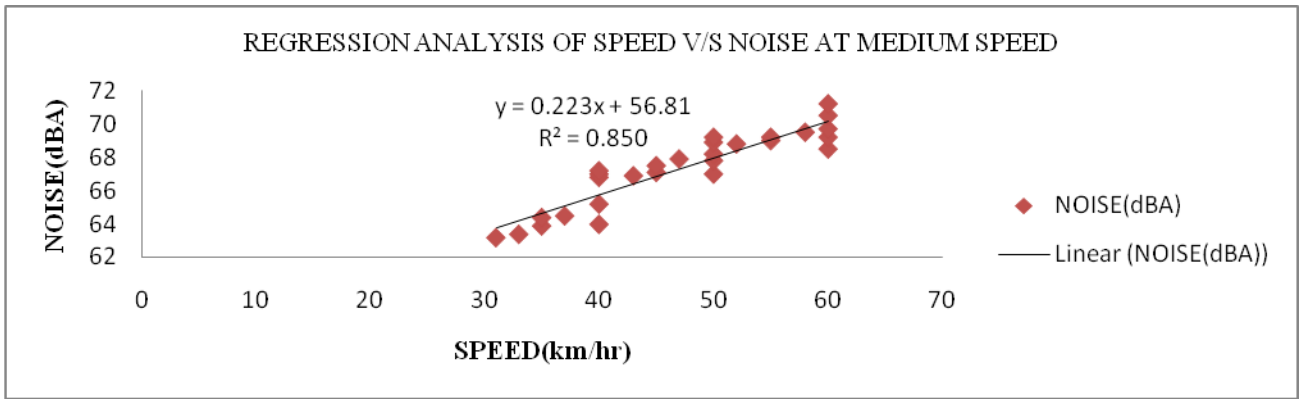

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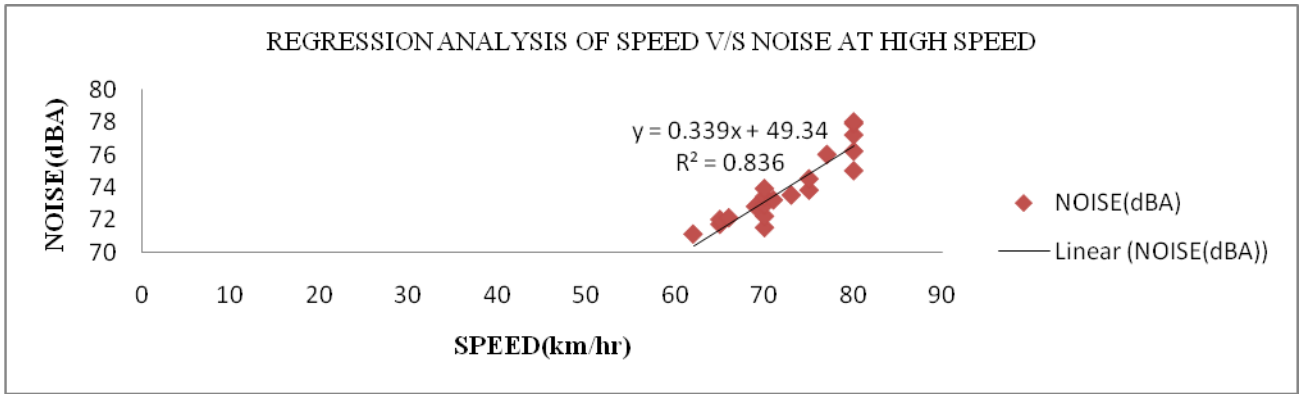

Fig.3. Sound pressure and speed relationship for flexible pavement on NH-31 at: (a) low speed; (b) medium speed; (c) high speed

In the table no 1 differentiation was shown between rigid and flexible pavement with the help of five noise level readings at a different particular speed and domain of all five noise readings was presented in this table.

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Table 1

Noise levels (four wheeler vehicle)

SPEED(km/hr)	LA_{max} (dBA)						
	20	30	40	50	60	70	80
RIGID PAVEMENT	64.1/67.5	69/72.2	73.5/76.2	75/78	79.5/82.1	82.1/85.1	87/90.4
FLEXIBLE PAVEMENT	58/60.5	60.8/63.5	64/67.2	67/69.2	68.5/71.2	71.5/73.9	75/78

In the above table five noise readings was shown at a fix speed and now average noise level meter was calculated by L_{avg} formula and shown in table number 2.

$L_{avg} = 20 \log [1/N\sum(10)^{L/20}]$

Where:

L_{avg} = Average noise levels (dBA)

N= Number of reading available

L = maximum sound pressure level

Table 2

Average noise levels (four wheeler vehicle) calculated by above mechanism.

SPEED(km/hr)	LA_{max} (dBA)						
	20	30	40	50	60	70	80
RIGID PAVEMENT	65.8	70.3	75.1	78.6	80.9	83.8	88.9
FLEXIBLE PAVEMENT	61.1	62.3	66.1	68.3	69.8	72.4	76.9
DIFFERENCE	4.7	8.4	9	10.3	11.1	11.4	12

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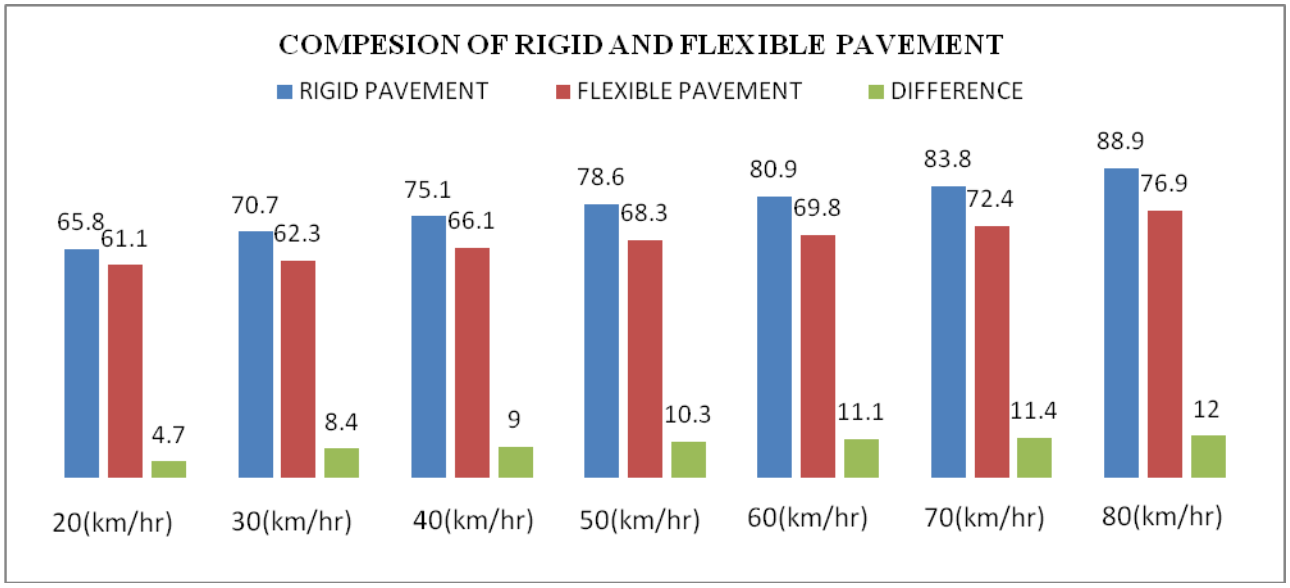

In the above chart normal noise of five perusing and there distinction at every specific speed are plotted for both pavement. The above outline speak to that the degree of noise delivered is legitimately reliant on the speed of vehicle and the idea of pavement also. There was a average difference of 11 dBA in sound level in two different pavement.

6. CONCLUSION

On the basis of regression analysis especially slop of the regression equation and coefficient of determination (R^2) we are able to conclude that:-

- Noise generated due to four wheeler vehicle is dependent on the speed of the vehicle and type of the pavement also.
- Rigid pavement are generated more noise level with respect to flexible pavement.
- Difference of noise level at particular speed on both the pavement are increasing with increasing speed.

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