To Determine Influence of Slow Moving Vehicle Composition on Travel Time: A Case Study of Ahmedabad City

Ronit Doshi
PG Student
Government Engineering College, Modasa 383315

H. K. Dave
Associate Professor
Department of Civil Engineering
Government Engineering College, Modasa 383315

Abstract

Ahmedabad an urban center is characterised with heterogeneous traffic flowing through its streets. It includes vehicles like three wheelers, bus/truck, non motorised which has comparatively lesser accelerating ability, causing impedance to the flow of other motorised vehicles with high acceleration like two wheeler, car etc. hence a study is conducted on selected three stretches to study the influence of such slow moving vehicles on increment in travel time. Study reveals the increase in travel time ranging from 35% to 133% for different SMV Composition on selected stretches.
Keywords: SMVC: Slow Moving Vehicle Composition, Travel Time

I. INTRODUCTION

The traffic stream in developed countries mainly consists of cars and heavy vehicles (buses and trucks). On the other hand, in developing countries like India, road traffic in general and urban roads traffic in particular, is highly heterogeneous comprising vehicles of widely varying static and dynamic characteristics and the vehicles share the same road space without any segregation.

II. NEED OF STUDY

It has been observed that there is wide variation in travel time with different vehicular composition and same density expressed as PCU. Hence it is needed to study the effect of composition on traffic stream characteristics, which is done by segregating vehicles into slow moving and fast moving with their different compositions.

III. OBJECTIVE

To quantify the increment in travel time due to effect of slow moving vehicle.

A. Scope of Work:

In order to perform this study, traffic volume count survey, spot speed study, with an aim to quantify the increment in travel time are done.

B. Survey Methodology:

Five video cameras are mounted on the roadside, which covered the length about 20m to 30m chalk line. Cameras were mounted on the tripod on side of the road for capturing the moving vehicle in one direction with proper time synchronization.

C. Methodology Chart:

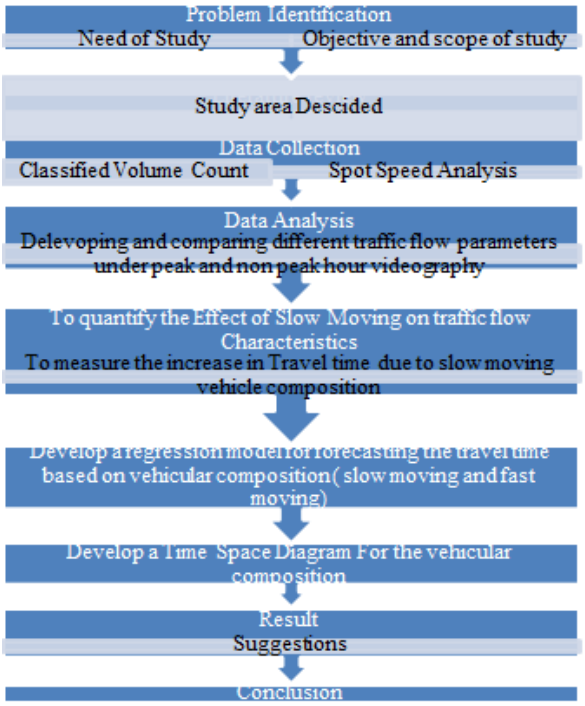

Fig. 1: Methodology Chart

Data collected from the videography their frequency in number of vehicle, their average velocity, percentage composition of different six categories of vehicles as Motorised Two-Wheelers (M2W), which includes Motorcycles, Scooters and Mopeds, Motorised Three-Wheelers (M3W.), which includes Auto-Rickshaws and three wheeled goods vehicles, Motorised four wheelers (M4W), Buses, Trucks, Tempo (B/T), Bicycles and Tricycles, and Hand Cart in non motorised vehicles (NMV).
Data collection for the following stretches during Nonpeak and Peak hour are done;

1) For the stretch Kalupur to Sarangpur having length 550m.
2) For the stretch Sarangpur to Raipur gate having length 450m.
3) For the stretch Relief cinema to J C Prakash Highschool having length 750m.

D. Data Analysis:

Considering the accelerating characteristics of vehicles, M2W and M4W are taken as Fast moving vehicle and rest four category is taken as SMV. Data collected through videography with composition of slow moving vehicle in the range 0-25%, 25-50%, 50-75%, 75-100% are segregated out to develop relation between travel time and stretch length for different range of (composition of) slow moving vehicles.

For observed different composition of SMV Figure shows travel time vs. distance of stretch for different SMV composition in Nonpeak hour and peak hour. Regression model for predicting travel time for different SMV Composition are developed.

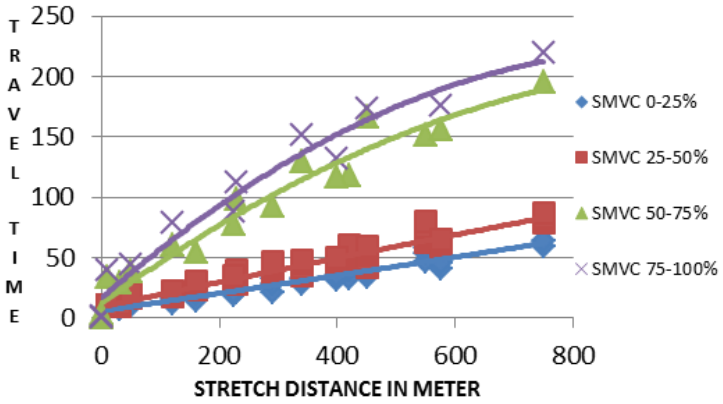

Fig. 2: Travel Time for SMVC in Nonpeak Hour

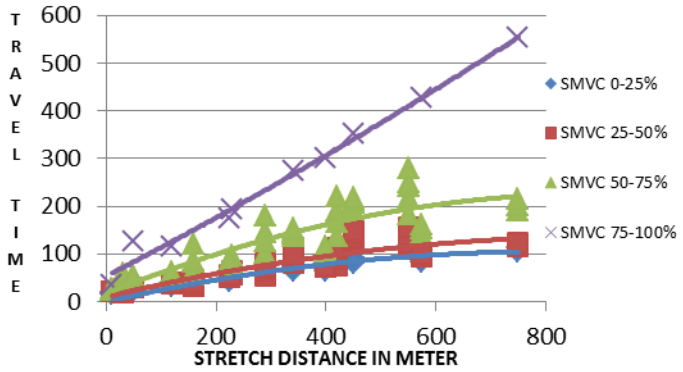

Fig. 3: Travel Time for SMVC in Peak Hour

Table – 1
Travel Time Calculated According To Obtained Equation for Different SMV Composition in Nonpeak Hour

travel time calculated according to obtained equation for different smv composition for nonpeak hour				
SMVC	*0-25%*	*25-50%*	*50-75%*	*75-100%*
DISTANCE	$y = 4E\text{-}06x^2 + 0.072x + 6.0791$	$y = -8E\text{-}06x^2 + 0.1045x + 9.3024$	$y = -0.0002x^2 + 0.4217x$	$y = -0.0003x^2 + 0.5159x$
400	*34.88*	*51.1*	*136.68*	*158.36*
500	*42.08*	*61.55*	*160*	*182*
600	*49.28*	*72*	*183.32*	*205.64*
700	*56.48*	*82.45*	*206.64*	*229.28*
800	*56.68*	*92.9*	*229.96*	*252.92*
900	*70.88*	*103.35*	*253.28*	*276.56*
1000	*78.08*	*113.8*	*276.6*	*300.2*

Table – 2
Travel Time Calculated According To Obtained Equation for Different SMV Composition in Peak Hour

Travel time calculated according to obtained equation for different SMV composition in peak hour				
SMVC	*0-25%*	*25-50%*	*50-75%*	*75-100%*
DISTANCE	$y = -0.0002x^2 + 0.2599x$	$y = -0.0002x^2 + 0.3266x$	$y = -0.0004x^2 + 0.5562x$	$y = -0.0002x^2 + 0.8726x$
400	*71.96*	*98.64*	*158.48*	*317.04*
500	*79.95*	*113.3*	*178.1*	*386.3*
600	*87.94*	*127.96*	*197.72*	*455.56*
700	*95.93*	*142.62*	*217.34*	*524.82*
800	*103.92*	*157.28*	*236.96*	*594.08*
900	*111.91*	*171.94*	*256.58*	*663.34*
1000	*119.9*	*186.6*	*276.2*	*732.6*

Table – 3
Increase in Travel Time in % during Non-Peak Hour

Increase in travel time in % during non peak hour			
Distance	*Smvc 25-50%*	*Smvc 50-75%*	*Smvc 75-100%*
400	*31.74*	*62.61*	*13.69*
500	*31.63*	*61.53*	*12.09*
600	*31.56*	*60.72*	*10.85*
700	*31.50*	*60.10*	*9.87*
800	*38.99*	*59.60*	*9.08*
900	*31.42*	*59.20*	*8.42*
1000	*31.39*	*58.86*	*7.86*

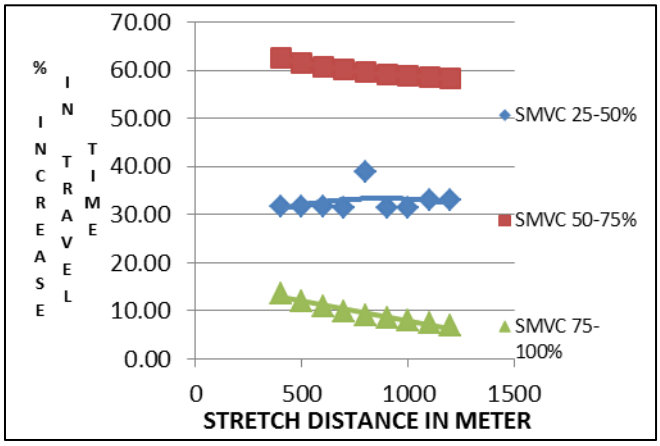

Fig. 4: Increment In Travel Time For Different SMVC For Different Stretch Length For Nonpeak Hour

Table – 4
Increase In Travel Time In % During Peak Hour

Increase in travel time in % during peak hour			
Distance	*Smvc 25-50%*	*Smvc 50-75%*	*Smvc 75-100%*
400	*27.05*	*37.76*	*50.01*
500	*29.44*	*36.38*	*53.90*
600	*31.28*	*35.28*	*56.60*
700	*32.74*	*34.38*	*58.59*
800	*33.93*	*33.63*	*60.11*
900	*34.91*	*32.99*	*61.32*
1000	*35.74*	*32.44*	*62.30*

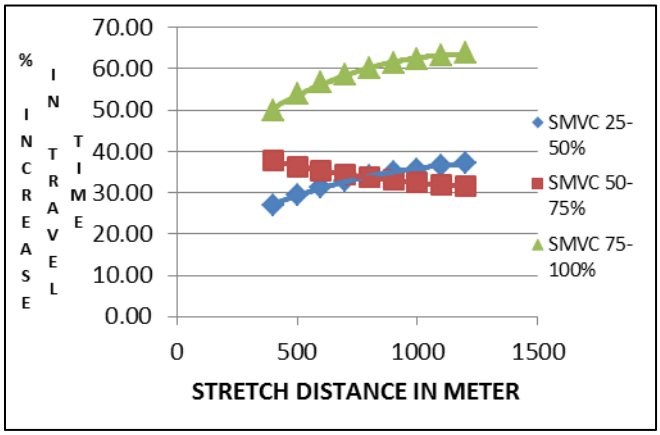

Fig. 5: Increment In Travel Time For Different SMVC For Different Stretch Length For Peak Hour

IV. CONCLUSION

Study indicates that increment in travel time for SMV composition 25-50% is by 30% ,while for SMV composition 50-75% is by 90%, while for SMV composition greater than 75% is by 98% during peak hours when compared with 0-25% SMV composition. Study indicates that increment in travel time for SMV composition 25-50% is by 35% ,while for SMV composition 50-75% is by 68%, while for SMV composition greater than 75% is by 133% during peak hours when compared with 0-25% SMV composition.

REFERENCES

[1] TRAFFIC CHARACTERISTICS OF INDIA by Dr. Santosh A. JALIHAL, KAYITHA Ravinder, Dr.T.S. Reddy, Proceedings of the Eastern Asia Society for Transportation Studies, Vol. 5, pp. 1009 - 1024, 2005.
[2] Speed and Acceleration Characteristics of Different Types of Vehicles on Multi-Lane Highways by Arpan Mehar, Satish Chandra, and Senathipathi Velmurugan, European Transport \ Trasporti Europei (2013) Issue 55, Paper n° 1, ISSN 1825-3997
[3] Influence of Traffic mix on PCU value of Vehicles under Heterogeneous traffic conditions by Prema Somanathan Praveen, Venkatachalam Thamizh Arasan, International Journal for Traffic and Transport Engineering, 2013, 3(3): 302 – 330.

[4] Traffic Stream Characteristics by Fred L. Hall.
[5] "Capacity Estimation Procedure for Two-lane Roads under Mixed Traffic Conditions" by Dr. Satish Chandra.
[6] A COMPARATIVE STUDY OF EFFECT OF MOTORCYCLE VOLUME ON CAPACITY OF FOUR LANE URBAN ROADS IN INDIA AND THAILAND Sanjeev SINHA, Satish CHANDRA, Pichai TANEERANANON
– WEB SITES:
[7] www.google.com
[8] www.wikipedia.com