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Analysis of traffic and management at Kovilambakkam intersection

R. Chitra*
Department of Civil Engineering, Bharath University, Selaiyur, Chennai.
***Corresponding author:E-Mail: chitra_r@gmail.com**

ABSTRACT

To study the traffic volume at a four legged intersection and analyse the traffic characteristics of the intersection suggest alternatives for intersection improvement to provide better management solution for traffic congestion and to suggest solutions focus on sustainability in the long run.

KEYWORDS: Traffic, Management, Kovilambakkam.

1. INTRODUCTION

Selection of study area: The Chennai Metropolitan Authority (CMA) consists of the Municipal Corporation of Chennai and its adjoining areas and 8 Municipalities. There are 244 settlements located within the CMA boundary of Chennai. Majority of these developments occur within 5-6 km distance from major road networks or rail networks. The city has three major corridors along the North, South and West directions apart from which there are few more arterial roads. Also there are 3 rail networks running in the above said three directions. The above factors have led to the development of numerous peri-urban settlements, distributed around these major corridors. Kovilambakkam junction was chosen as a study area due to its high growth rate and traffic congestion. Apart from which, it is located in one of the important corridors in the south of Chennai.

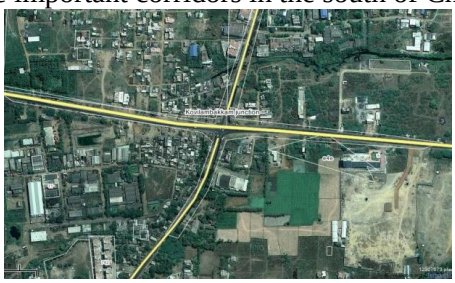

Figure.1. Shows the Aerial photograph of Kovilambakkam Intersection

Table.1. Characteristics of Kovilambakkam (as per 2001 census)

Description of Characteristics	Units
Population	9277
Number of households	2145

Four armed intersections are the most common, because they usually involve a crossing over of two streets or roads. In areas where there are blocks and in some other cases, the crossing streets or roads are perpendicular to each other. However, two roads may cross at a different angle. In a few cases, the junction of two road segments may be offset from each when reaching an intersection, even though both ends may be considered the same street

Problems at intersection: As long as each vehicle moves in its own lane without getting in the way of another vehicle, travelling is smooth. But travel is not all in the same direction. Our chosen line of traffic often must cross the paths of other vehicles, and that's when trouble comes—the intersection problem.

- The intersection faces traffic congestions during peak hours.
- Accidents take place due to no safety improvements at the intersection.
- Due to traffic congestions the intersection gets polluted and leads to irritation, waste of time, mental stress etc.

Users should approach each intersection with an attitude of courtesy and the knowledge and skill to take the crossing in proper turns without incident.

2. METHODOLOGY

After establishing the need for the study, the objectives were formulated for carrying out the study. Kovilambakkam intersection was chosen because of its high growth rate of population, flow of traffic and development of area.

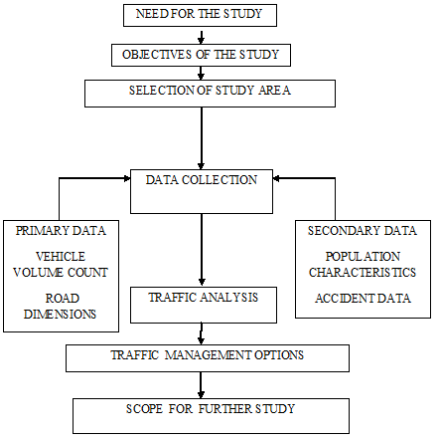

Figure.1. Flow chart Methodology

Data collection and traffic analysis:

Definition: One of the important functions of a traffic engineer is to organise and implement various services and studies aimed at collection of data pertaining to traffic characteristics. Such study include origin and destination survey, volume count, speed , travel time and delay measurements, accident statistics, parking characteristics, pedestrian behavior and use of streets, capacity studies , economic loss caused by inferior traffic facilities etc.

Primary data:

Table.1. Primary data

Hour	Car	Auto	bus	truck	Two wheeler	cycle
5.30-5.45	83	18	15	45	152	53
5.45-6	78	26	21	46	176	51
6-6.15	89	37	16	52	242	57
6.15-6.30	102	48	18	51	265	59
6.30-6.45	120	48	13	56	274	44
6.45-7	114	47	21	47	295	44
TOTAL	15773	4984	1480	4497	47392	4947

Passenger car unit (PCU): In British practice it is usual to express capacity in terms of "passenger car units". This system is also being followed in India. The basic consideration behind this practice is that different types of vehicles offer different degrees of interference to other traffic and is necessary to bring all types to a common units. The common unit adopted is the passenger car unit (PCU).

Table.2. PCU Value for Indian Practices

Vehicle type	PCU Equivalency factor
Motor cycle and scooter	0.33
Car ,van, and auto	1.00
Truck and bus	2.25
Cycle	0.20
Bullock cart	6.00

Table.3.PCU calculation for Friday

Direction	Mode		Car	Auto	Bus	Truck	Two Wheeler	Cycle
E-W	PCU Factors		1	1	2.25	2.25	0.33	0.2
	Volume	In number	3665	803	281	771	10439	635
		PCUs	3665	803	633	1735	3445	127
N-S	Volume	In number	3616	2009	497	1090	15433	1585
		PCUs	3616	2009	1118.25	2452.5	5092.89	317
W-E	Volume	In number	2996	492	38	413	7417	661
		PCUs	2996	492	85.5	929.25	2447.61	132.2
S-N	Volume	In number	4425	1352	866	1333	12802	1044
		PCUs	4425	1352	1948.5	2999.25	4224.66	208.8

Table.4.PCU calculation for Thursday

Direction	Mode		Car	Auto	Bus	Truck	Two Wheeler	Cycle
E-W	PCU Factors		1	1	2.25	2.25	0.33	0.2
	Volume	In number	4414	1138	113	804	7392	1241
		PCUs	4414	1138	254.25	1809	2439.36	248.2
N-S	Volume	In number	4064	1648	621	1144	14925	2142
		PCUs	4064	1648	1397.25	2574	4925.25	428.4
W-E	Volume	In number	3112	780	59	1254	13327	742
		PCUs	3112	780	132.75	2821.5	4397.91	148.4
S-N	Volume	In number	4112	1314	676	1273	7560	747
		PCUs	4112	1314	1521	2864.25	2494.8	149.4

Table.5.PCU calculation for Sunday

Direction	Mode		Car	Auto	Bus	Truck	Two Wheeler	Cycle
E-W	PCU Factors		1	1	2.25	2.25	0.33	0.2
	Volume	In number	2830	835	44	1131	6415	808
		PCUs	2830	835	99	2544.75	2116.95	161.6
N-S	Volume	In number	2148	1247	274	576	9537	889
		PCUs	2148	1247	616.5	1296	3147.21	177.8
W-E	Volume	In number	2791	439	1	339	5546	320
		PCUs	2791	439	2.25	762.75	1830.18	64
S-N	Volume	In number	2673	958	409	466	9067	1318
		PCUs	2673	958	920.25	1048.5	2992.11	263.6

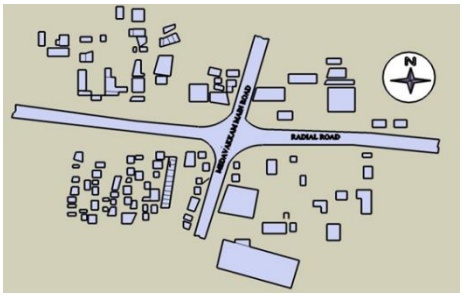

Figure.2.Layout area of Kovilambakkam junction

Secondary data:

Table.6. Accident Data at Kovilambakkam Junction for the Year 2009

S.NO	Date	Details	Type of accident
1	02.01.09	M\C(TN09 AC- 6297) Vs CAR(TN07 AL- 58888)	Major
2	17.03.09	TATA INDICA (TN07- AA2422) Vs BAJAJ CT100 (TN04- S3018)	Major
3	16.06.09	LORRY(TN28- A 6900) Vs M|C(TN32 P-6816)	Major
4	17.06.09	Tata Indigo(Tn42-7377) Vs Bolero (Tn05 D 5175)	Major
5	17.06.09	AUTO (TN09 AA -2238) Vs Pedestrian	Minor
6	28.06.09	M\C(TN22 AS-8613) Vs TATA ACE(TN22 BC-2877)	Major
7	13.07.09	CAR(TNO7 DN- 6888) Vs AUTO(TN22 S- 6019)	Major
8	26.12.09	VAN(TN21- 403705) Vs SPLENDER(TN22- AW1992)	Minor

Traffic analysis: The various survey and studies aimed to collection of data pertaining to traffic characteristics. Such studies include. Origin destination survey, volume count, accident statistics,

- Peak hour
- Peak hour factor
- V/C ratio
- Level of service
- Mode of share

Peak Hour: The max PCU value in the hour per day.

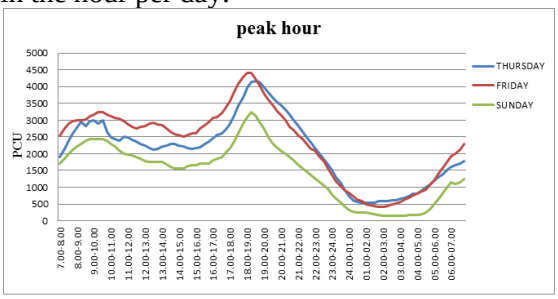

Figure.3.Combination of peak hour for Thursday, Friday and Sunday

Peak Hour Factor: It is a measure of the variation in demand during the peak hour and defined as the ratio between the number of vehicles counted during the peak hour and four times the number counted during the highest 15 consecutive mins. It can range from 0.25 to 1.00.

Calculation of peak hour factor

Thursday peak hour factor = 4163/ (1103x4) = 0.94
Friday peak hour factor = 4417/ (990*4) = 1.11
Sunday peak hour factor = 3235/ (766*4) =1

V/c ratio: The ratio of the service volume to capacity

Table.7.Calculation of v/c ratio and level of service

Year	Road	V/C Ratio	Level Of Service
(08/01/2010) 2010	Radial road	2165/3780 =0.57	A
	Medavakkam main road	2253/3240 =0.67	B
2015	Radial road	3487/3780=0.92	E
	Medavakkam main road	3629/3240=1.12	F
2020	Radial road	5616/3780 = 1.4	F
	Medavakkam main road	5844/3240 =1.8	F

Level of Service: It is defined as a qualitative measure describing the operational conditions within a traffic stream, and their perception by motorists and passengers

When a road is carrying a traffic equal in volume to its capacity under ideal roadway and traffic condition, the operating conditions become poor. Speed drops down and the delay and frequency of stops mount up. The service which road way offers to the road users vary under different volumes of traffic. The highway capacity manual has introduced "level of service" to denote the level of facility one can derive from a road under different operating characteristics and traffic volumes. The concept of level of service is defined as a qualitative measure describing the operational conditions within a traffic streams, and the perception by motorists and / or passengers.

Mode share: Process of separating the person-travel by the mode of travel.

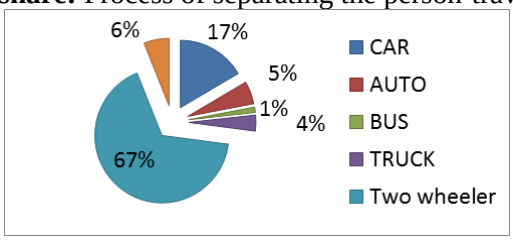

Figure.4.Mode share diagram for Friday (08/01/2010)

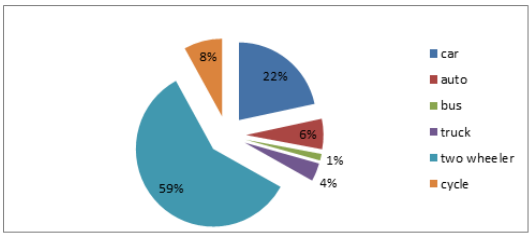

Figure.5.Mode share diagram for Sunday (10/01/2010)

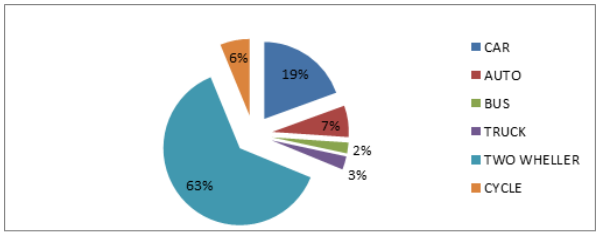

Figure.6.Mode share diagram for Thursday (04/02/2010)

Table.8.Calculation of maximum ratio of saturation flow

From	North			East			South			West		
To	**E**	**S**	**W**	**S**	**W**	**N**	**W**	**N**	**E**	**N**	**E**	**S**
Flow (Pcu/Hr)	244	711	213	250	1023	263	164	656	267	112	373	145
Correction For Left Turn (+25%)	61			62.5			41			28		
Correction For Right Turn(+75%)			160						200			
Total Flow Phase 1	244+711 +61=1016						164+656 +41=861					
Saturation Flow Phase 1	525*3.5*2=3675						525*3.5*2=3675					
Y1	=1016/3675 =0.27						=861/3675 =0.23					
Total Flow Phase 2				250+1023+62.5 =1336						112+373+28 =513		
Saturation Flow Phase 2				525*3.5*2=3675						525*3.5*2=3675		
Y2				=1336/3675 =0.36						=513/3675 =0.13		
Total Flow Phase 3				263						145		
Saturation Flow Phase 3				1800/(1+1.52/15) =1620						1800/(1+1.52/15) =1620		
Y3				=263/1620 =0.16						=145/1620 =0.08		
Total Flow Phase 4	213						267					
Saturation Flow Phase 4	525*3.5=1838						1838					
Y4	213/1838=0.11						267/1838=0.14					

Max value of y

y1=0.27, y2=0.36, y3=0.16, y4=0.14

Y=y1+y2+y3+y4 = 0.87

Lost time (L)= $\sum$(I−a)+$\sum$ l =3*(4−2)+(3*2) =12 seconds

Optimum cycle time:

C_o = 1.5L+5/1+Y =(1.5*12)+5/(1−0.87) =23/0.13

=176 seconds~180 seconds.

Effective green time = 176−L =176−12 = 164 seconds

This will be distributed as follows

G1 = (y1/Y)*164 = (0.27/0.87)*164 = 51 seconds

G2 = (y2/Y)*164 = (0.36/0.87)*164 = 57 seconds

G3 = (y3/Y)*164 = (0.16/0.87)*164 = 30 seconds

G4 = (y4/Y)*164 = (0.14/0.87)*164 = 26 seconds

Total = 164 seconds

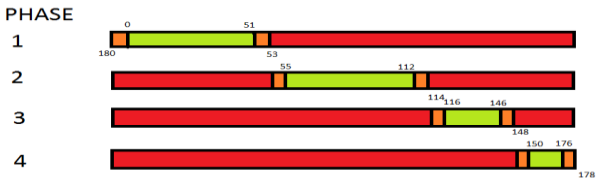

Figure.7.

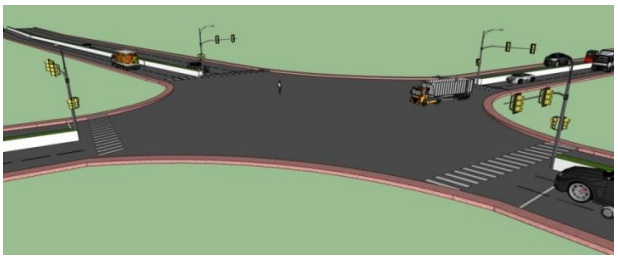

Figure.8.Junction with signal right side view

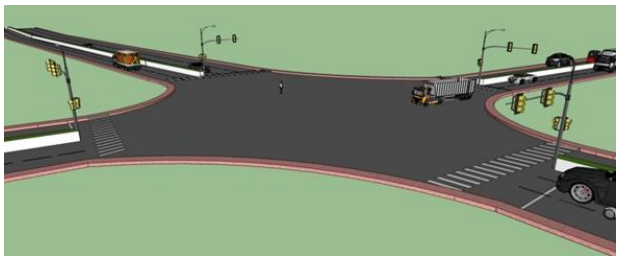

Figure.9.Junction with signal left side view

Figure.10.Junction with flyover at top view

Figure.11.Three level grade separator at junction

3. RECOMMENDATIONS AND CONCLUSION

Kovilambakkam intersection is situated in the southern part of Chennai and is highly congested with vehicular traffic posing danger to the safety of the road users. From the study suggest install action of signal at the intersection to avoid vehicular conflict and improve traffic flow. The intersection of Radial road and Medavakkam main road requires splay(radius 15 m) and footpath(2m wide) on either sides of the road. However this signalisation of the intersection will work efficiently only upto the year 2015, after which the traffic volume at intersection will reach 76108 PCU. The above statement necessitates the need for next level of intersection traffic management, which is grade separation. Initially a flyover shall be constructed to grade separate the east-west straight traffic movement from the other traffic movements at the intersection. Even this traffic improvement will sustain only till the year 2020 when the traffic at the intersection is expected to reach 122573 PCU. This in turn necessitates for further grade separation i.e multilevel grade separator. From a sustainable growth perspective all the above intersection improvements will efficiently work only for short periods and this particular intersection in the study. Providing sufficient public transport infrastructure in terms of buses, light rail transit or metro rail will reduce private vehicle usage and this will in turn reduce the traffic volume at the intersection. Mixed use development in the neighbouring area will reduce internal to external trips, thereby reducing traffic.

REFERENCES

Anbazhagan R, Satheesh B, Gopalakrishnan K, Mathematical modeling and simulation of modern cars in the role of stability analysis, Indian Journal of Science and Technology, 6 (5), 2013, 4633-4641.

Brindha G, Krishnakumar T, Vijayalatha S, Emerging trends in tele-medicine in rural healthcare, International Journal of Pharmacy and Technology, 7 (2), 2015, 8986-8991.

Brintha Rajakumari S, Nalini C, An efficient cost model for data storage with horizontal layout in the cloud, Indian Journal of Science and Technology, 7, 2014, 45-46.

Gopalakrishnan K, Prem Jeya Kumar M, Sundeep Aanand J, Udayakumar R, Analysis of static and dynamic load on hydrostatic bearing with variable viscosity and pressure, Indian Journal of Science and Technology, 6 (6), 2013, 4783-4788.

Guide Line On Design and Installation of Road Traffic Signal, IRC, 93-1985,Indian Road Congress, Nwe Delhi,1985

Jeyanthi Rebecca L, Susithra G, Sharmila S, Das M.P, Isolation and screening of chitinase producing Serratia marcescens from soil, Journal of Chemical and Pharmaceutical Research, 5 (2), 2013, 192-195.

Kadiyali LR, Road Transport Demand Forecast for 2000 A.D, journal of the Indian Roads Congress, New Delhi, 48 (3), 1987

Kerana Hanirex D, Kaliyamurthie K.P, An adaptive transaction reduction approach for mining frequent itemsets, A comparative study on dengue virus type1, International Journal of Pharma and Bio Sciences, 6 (2), 2015, B336-B340.

Khanaa V, Mohanta K, Saravanan T, Comparative study of uwb communications over fiber using direct and external modulations, Indian Journal of Science and Technology, 6 (6), 2013, 4845-4847.

Khanaa V, Thooyamani KP, Udayakumar R, Cognitive radio based network for ISM band real time embedded system, Middle - East Journal of Scientific Research, 16 (12), 2013, 1798-1800.

Kumarave A, Rangarajan K, Algorithm for automaton specification for exploring dynamic labyrinths, Indian Journal of Science and Technology, 6 (5), 2013, 4554-4559.

Kumaravel, A, Pradeepa, R, Efficient molecule reduction for drug design by intelligent search methods, International Journal of Pharma and Bio Sciences, 4 (2), 2013, B1023-B1029.

Sachithanantham P, Sa Nkaran S, Elavenil S, Experimental study on the effect of rise on shallow funicular concrete shells over square ground plan, International Journal of Applied Engineering Research, 10 (20), 2015, 41340-41345.

Sharmila S, Jeyanthi Rebecca L, Das M.P, Production of Biodiesel from Chaetomorpha antennina and Gracilaria corticata, Journal of Chemical and Pharmaceutical Research, 4 (11), 2012, 4870-4874.

Sharmila S, Jeyanthi Rebecca L, Naveen Chandran P, Kowsalya E, Dutta H, Ray S, Kripanand N.R, Extraction of biofuel from seaweed and analyse its engine performance, International Journal of Pharmacy and Technology, 7 (2), 2015, 8870-8875.

Udayakumar R, Khanaa V, Saravanan T, Saritha G, Cross layer optimization for wireless network (WIMAX), Middle - East Journal of Scientific Research, 16 (12), 2013, 1786-1789.

Vanangamudi S, Prabhakar S, Thamotharan C, Anbazhagan R, Dual fuel hybrid bike, Middle - East Journal of Scientific Research, 20 (12), 2014, 1819-1822.