

Case study of Travel Time, Delay Study and Speed Delay by Floating Car Method and Test Vehicle Method in Surat, India

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Abstract: *There are various modes of study of speed delay, time delay and travel time which makes one understand about design of intersections, rotaries, lanes and traffic signals in study area in much proper, technical and economical manner. Here, there are two study regions which are Pal RTO to Gujarat Gas circle and Majura gate to Athwa gate of Surat city of India by Floating car method and Test vehicle method respectively whose records can be used for design purpose.*

Keywords: Travel Time, Delay Study, Speed Delay, Surat, Surveying, Traffic Engineering, Floating car, Test vehicle method

1. Introduction

1.1 Definitions

1.1.1 Travel time

A travel time and delay study measures average travel time and running time along sections of a route, while at the same time information regarding location, cause and duration of delay is collected.

1.1.2 Speed delay

Speed delay is the interruption in the speed of the vehicles at the particular length in particular time due to various reasons

1.2 Purposes

Time Travel and Delay Study

- Travel time being a good indication of efficiency of roadway.
- To determine the need for traffic controlling devices.
- Info about amount, cause and location of delays.
- Economic studies such as cost-benefit analysis utilize delay studies.
- Trip assignment is based on speed delay characteristics.
- Sufficiency ratings or quality indices methods based on travel time.

Speed Delay:

- To evaluate the quality of traffic movement along a route and determine the locations, types, and extent of traffic delays.
- To compare operational conditions before and after roadway or intersection improvements have been made.
- It can be used as a tool to assist in prioritizing projects by comparing the magnitude of the operational deficiencies (such as delays and stops) for each project under consideration.
- It can also be used by planners to monitor level of service for local government comprehensive plans.
- The engineer can provide recommendations for improvements such as traffic signal re-timing, safety

improvements, turn lane additions, and channelization enhancements

- Travel time and delay studies are used to evaluate traffic conditions such as the onset of congestion along major corridors.
- The impacts of developments such as transportation infrastructure, commercial, residential and industrial projects. Results are used to determine levels of service and to plan for improvements of such projects.

1.3 General Definitions

- Control Point (CP) - A node at the beginning or end of a link, usually the stop line at a signalized intersection, but can be any physical feature, i.e., power pole.
- Delay (D) - The elapsed time (in seconds) spent driving at a speed less than 5 mph.
- Operational delay - That part of the delay caused by the impedance of other traffic Stopped-time delay That part of the delay during which the vehicle is at rest.
- Travel Speed (TS) or Average Speed (AS) or Journey Speed - The test vehicle's average speed (in miles per hour) over a distance.
- Travel Time (TT) - The total elapsed time (in seconds) spent driving a specified distance
- Running Speed (RS) - The test vehicle's average speed while the vehicle is in motion (does not include delay time)
- Running Time (RT) - The elapsed time (in seconds) excluding delay spent driving a distance. Fixed delay That part of the delay caused by control devices such as traffic signal

1.4 Methods of Travel Time and delay and Speed Delay studies

1.4.1 Floating car method:

Floating car data are positions of vehicles traversing city streets throughout the day. In this method the driver tries to float in the traffic stream passing as many vehicles as pass

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the test car. If the test vehicle overtakes as many vehicles as the test vehicle is passed by, the test vehicles should, with sufficient number of runs, approach the median speed of the traffic movement on the route. In such a test vehicle, one passenger acts as observer while another records duration of delays and the actual elapsed time of passing control points along the route from start to finish of the run

1.4.2 License Plate Method:

When the amount of turning off and on the route is not great and only over all speed value are to be secured, the license-plate method of speed study may be satisfactorily employed. Investigator stationed at control point along the route enters, on a time control basis, the license plate numbers of passing vehicles. These are compared from point to point along the route, and the difference in time values, through use of synchronized watches, is computed.

This method requires careful and time-consuming office work and does not show locations, causes, frequency, or duration of delay. Four basic methods are:

- Manual: collecting license plates via pen and paper or audio tape recorders and manually entering license plates and arrival times into a computer.
- Portable Computer: collecting license plates in the field using portable computers that automatically provide an arrival time stamp.
- Video with Manual Transcription: collecting license plates in the field using video cameras or camcorders and manually transcribing license plates using human observers.
- Video with Character Recognition: collecting license plates in the field using video, and then automatically transcribing license plates and arrival times into a computer using computerized license plate character recognition.

1.4.3 Photographic Method

These methods are suitable for short sections, such as intersections, etc. Method provides a means of obtaining a large sample of vehicles and a permanent record. But it is very costly and limited to day light and good weather conditions.

1.4.4 Elevated Observer method:

Station observers in high buildings or other elevated points from which a considerable length of route may be observed. These investigators select vehicle at random and record time, location and causes-of-delay. The drawback is that it is sometime difficult to secure suitable points for observation throughout the length of the route to be studied.

1.4.5 Maximum Car method:

In this procedure, the driver is asked to drive as fast as is safely practical in the traffic stream without ever exceeding the design speed of the facility.

1.4.6 Test Car method

In this method a test car is driven along the study route using one of the following operations:

The test car is driven according to the driver's judgement of the average speed of the traffic on the route. The test car is driven at the legal speed limit unless impeded by actual traffic conditions. On an average 8-12 readings are taken for accurate results.

1.4.7 Moving Observer method:

This method is also known as Wardrop Charlesworth Method. It was developed in England. In this method, the speed and flow can be obtained by travelling in a car against and with the flow. Noting down the journey time and the number of vehicles met with from opposite directions and number of vehicles overtaking the test vehicle. Advantages

- It gives an unbiased estimate of the flow.
- It gives information of stops at intersections, delays, parked vehicle.
- It enables data on speed and flow to be collected at the same time.
- This method is economical in man power aspect.
- It gives mean values of flow and speed over a section rather than at a point.

1.4.8 Interview method:

In this method selected individuals are interviewed for their travel time and delays experienced on the trips. Sometimes they are asked in advance to record their experience. With good cooperation the results may be satisfactory and requires minimum time. But this type of survey is a bit volatile in nature with less accuracy.

2. Case Study by Travel time and Delay Via Test Vehicle Method

In this study, there are two locations which are studied under different methods of study. Here, in this below case we calculated by test car method and other details related to study are mentioned below

2.1 Details about Location

- Majuragate to Athwagate
- Distance: 1.031 Km



Figure 1: Location of Case study and its position in Map
Source: google maps

- Single direction turn
- Athwagate: 18m carriage way
- Majuragate: 45m carriage way

2.2 Details of Survey

- Test Car method utilized
- Ideal speed considered: 40 Km/hr.
- Mode considered: 2W- Two-wheeler 4W-Four-wheeler
- Stopwatch: Android Smartphone
- Vehicles used:
- GJ 05 LD 8892
- GJ 05 JP 2870
- GJ 05 NB 5312

2.3 Observation of the Case Study

The following table represents about the survey taken during case study by Test Car Method.

Table 1: Observation Table by Test Car Method

| Mode | Date of survey | Time of survey | Total Time (Secs) | Avg Moving speed (Km/hr.) | Ideal Time (Secs) | Delay Time (Secs) | Avg Delay (Secs) |
|------|----------------|----------------|-------------------|---------------------------|-------------------|-------------------|------------------|
| 2W | 19-08-2018 | 11:43 | 122 | 31 | 93 | 29 | |
| 2W | 19-08-2018 | 11:50 | 119 | 31.6 | 93 | 26 | |
| 2W | 19-08-2018 | 12:04 | 125 | 29.69 | 93 | 32 | 29 |
| 2W | 02-09-2018 | 14:06 | 105 | 35.34 | 93 | 12 | |
| 2W | 02-09-2018 | 14:18 | 106 | 35.38 | 93 | 13 | 12.5 |
| 2W | 04-09-2018 | 00:34 | 98 | 37.9 | 93 | 5 | |
| 2W | 04-09-2018 | 00:45 | 96 | 38.8 | 93 | 3 | |
| 2W | 04-09-2018 | 00:56 | 99 | 37.59 | 93 | 6 | 4.67 |

| | | | | | | | |
|----|------------|-------|-----|-------|----|----|-------|
| 4W | 19-08-2018 | 11:44 | 126 | 29.45 | 93 | 33 | |
| 4W | 19-08-2018 | 11:52 | 121 | 30.67 | 93 | 28 | |
| 4W | 19-08-2018 | 12:02 | 126 | 29.45 | 93 | 33 | 31.33 |
| 4W | 02-09-2018 | 14:08 | 108 | 34.36 | 93 | 15 | |
| 4W | 02-09-2018 | 14:19 | 110 | 33.74 | 93 | 17 | 16 |
| 4W | 04-09-2018 | 00:34 | 100 | 37.11 | 93 | 7 | |
| 4W | 04-09-2018 | 00:45 | 98 | 37.87 | 93 | 5 | |
| 4W | 04-09-2018 | 00:56 | 101 | 36.74 | 93 | 8 | 6.67 |

3. Case Study by Floating Car Method from Pal RTO to Gujarat Gas Circle

Here, all the details related to this study are mentioned below

3.1 Route basic information

- Type of pavement surface: Bituminous and R.C.C
- Number of lanes: 8(including BRTS lanes)
- Peak traffic: 8:00PM-11:00PM
- Number of speed breakers: 4
- Number of intersections: 5
- Street Lighting: Yes
- Rotary Intersection: Yes
- Distance:2700m

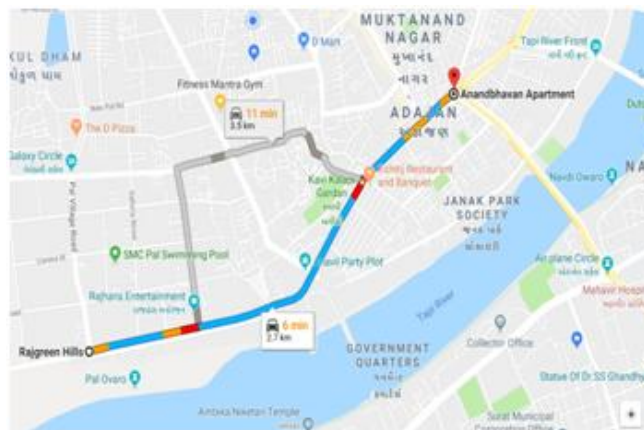


Figure 2: Location of Pal RTO to Gujarat Gas Circle in Map

Source: google maps

3.2 Observation of the Case Study

Various observations were taken in the format as shown in figure in different timings.

| | A | B | C | D | E | F | G |
|---|---------|----------|------------|------------|------------------|----------------------|---|
| 1 | Time | Distance | Total Time | Total Dela | Journey Speed(km | Running Speed(km/hr) | |
| 2 | 7:00 PM | 2700 | 308 | 53 | 31.55844156 | 38.11764706 | |
| 3 | 7:30 PM | 2700 | 300 | 35 | 32.4 | 36.67924528 | |
| 4 | 8:00 PM | 2700 | 350 | 100 | 27.77142857 | 38.88 | |

Figure 3: Observation filling format of floating car method



Figure 4: Floating car

3.2.1 Calculations

Calculation of the data collected during observation is done by below equations:

- Journey Speed(km/hr.) =Distance(m)/Total Time including delay(sec)*3.6
- Running Speed(km/hr.) =Distance(m)/Total Time excluding delay(sec)*3.6

3.2.2 Analysis Result

As shown in the figure one can see the difference between journey speed and running speed and numerical values of the case study is shown in below figure. Where fig;4 shows speed delay and fig.5 shows total time delay

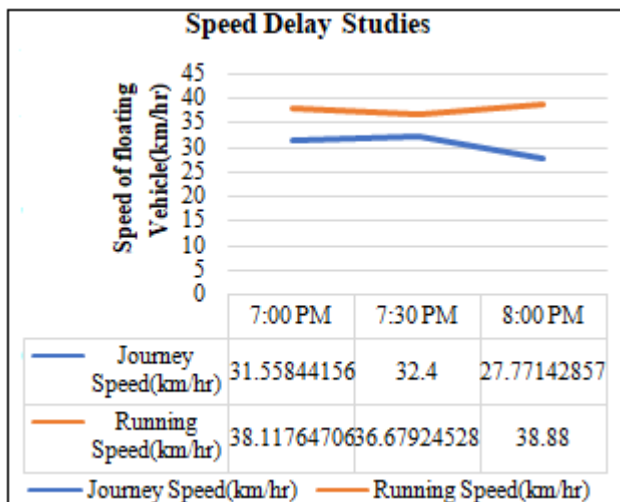


Figure 4: Speed Delay Analysis

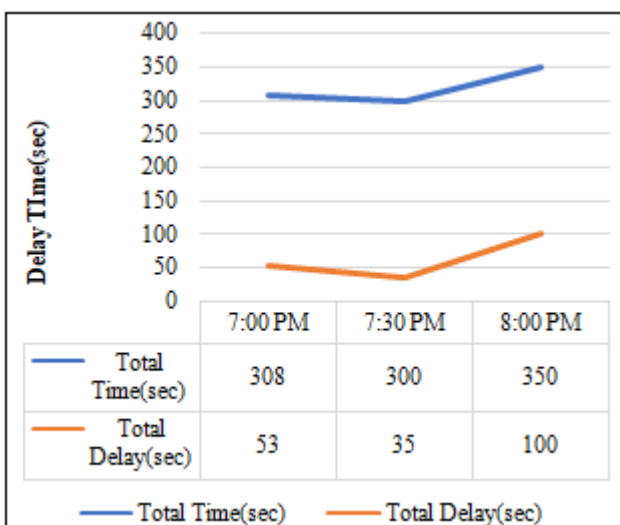


Figure 5 Total Time Delay Analysis

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Author Profile

Maitray Parikh completed the D. E (Diploma Engineering) and B.E. course in Civil Engineering from Dr. S&S. S Ghandhy College of Engineering and Technology, Surat and Sarvajanic College of Engineering and Technology, Surat in 2016 and 2019 respectively.

4. Conclusion

- The cost of journey depends upon the speed at which it is made. In all highway economic studies, travel time and delays are highly important.
- Delay studies help in trip assignment.
- It helps in identifying the effectiveness of intersections.
- It helps in evaluating the causes of congestion, level of service, scope of improvements and helps in implying them.
- Floating car method and Test vehicle methods are quicker, less cumbersome and less time-consuming compare to License plate method

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