

Introduction to Electronic toll collection system on highways of India

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Abstract — Transportation is the backbone of our economy. Advancement in transportation will lead to lifestyle characterized by extraordinary moments of people, immense trade in manufactured of good. Manual or automatic toll collection system as many drawbacks compared to electronic toll collection system like it needs collector to collect the amount at a toll booth, delay in time, traffic congestion, more fuel consumption, longer queue of traffic. All these points are eliminated in electronic toll collection system. Electronic toll collection is cost effective, it provides better audit control, less delay of time, shorter queue of traffic, less fuel consumption, use of sms service instead of receipts. The development of electronic toll collection holds the promise of providing revolutionary improvements in speed, efficiency, time, fuel consumption, operating cost, long queue lengths. This system determines whether passing vehicle is registered or not. ETC system can improve the traffic flow to the toll area. ETC system based on RFID technology is mainly used in India.

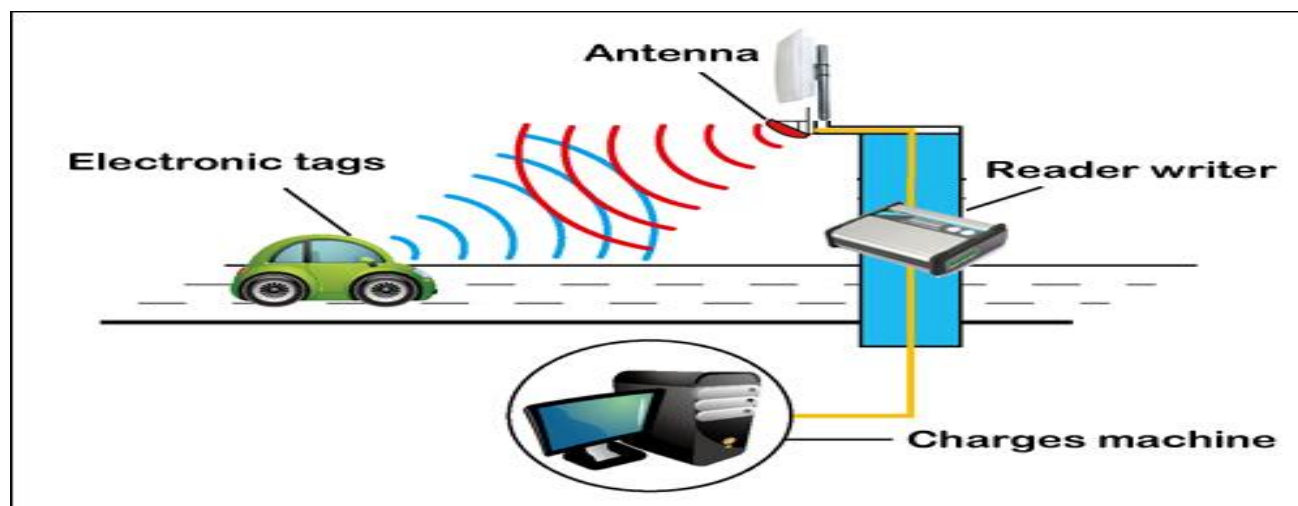
Keywords-Electronic toll collection, RFID, Fuel consumption, Traffic congestion

I. INTRODUCTION

India, the second most populous country in the world, and a fast-growing economy, is seeing terrible road congestion problems in its cities. The problem is often felt in almost all major cities. This is primarily because infrastructure growth is slow compared to growth in number of vehicles, due to space and cost constraints. Transportation is the moment of men and goods is as old as civilization. Roads or highway are one form of the means of transporting men and material from one place to another.

At present, revenue collection procedures at most toll facilities require a driver to stop his/her car, open the window or door, and find correct coins or a valid card before continuing his/her journey. As the use of tolls becomes more widely accepted, the drawbacks of this conventional toll collection method will be emphasized. Tollbooths suffer from being land intensive, labor-intensive (owing to the hiring of toll operators), and time-intensive. Electronic toll collection (ETC) systems are superior to manual methods from the perspective of both the toll agency and the user.

ETC toll collection is a technology enabling the electronic collection of toll payment. It has been studied by researchers and applied in various highways, bridges, and tunnel requiring such a process. This system can determine if the car is registered or not, and then informing the authorities of toll payment violation, debits and participating accounts. The most advantage of this technology is the opportunity to eliminate congestion in toll booths, especially during festive seasons when traffic trends to be heavier than normal. Other general advantages for the motorists include fuel savings and reduced mobile emissions by reducing or eliminating deceleration, waiting time, and acceleration.



Electronic toll collection system based on Radio Frequency Identification (RFID) technology is mainly used in India. As time and efficiency are a matter of priority nowadays, the traditional method as to be reformed. In order to overcome the major issues of traffic congestion and time consumption RFID technology is used. RFID reader fixed at tollgate frame reads the tag attached to windshield of vehicle. The object detection sensor in the reader detects the approach of the incoming vehicle's tag and toll deduction takes place through a prepaid card assigned to the concerned RFID tag that belongs to the owners' account. Electronic toll collection system (ETC) has various advantages compared to traditional method.

II. NEED OF STUDY

Nowadays in urban areas population is increasing drastically within few years, same time light and medium traffic is increasing day by day in the city. So, in urban development the major problem is space. So it is very difficult for us to provide extra space for the solution of traffic problem.

Due to increase in population, the no of cars has been increased which leads to more traffic congestion. More vehicles for low capacity roads. For newly constructed highway revenue is very important, for that toll need to be collected from users.

Generally, toll is collected manually which leads to long queue length, more fuel consumption, wastage of time, more operating cost on express highways. To solve this problem, it is necessary to develop electronic toll collection system. Electronic toll collection system will eliminate all the problems which manual system is facing. It will provide better efficiency than manual

III. LITERATURE REVIEW

H. M. AI-Deek, Member, ASCE, A. A. Mohamed, and A. E. Radwan "OPERATIONAL BENEFITS OF ELECTRONIC TOLL COLLECTION (1997)"

H. M. AI-Deek, Member, ASCE, A. A. Mohamed, and A. E. Radwan, This paper reports the improvements in traffic operations at the electronic toll collection plazas of the Orlando-Orange County Expressway Authority. Service time, vehicle arrival times, and departure times, as well as vehicle counts were collected "before" and "after" the installation of automatic vehicle identification technology known as E-PASS. The findings indicate that, for the dedicated E-PASS lane, the measured capacity has tripled, the service time has decreased by five seconds per vehicle, the average queuing delay has decreased by one minute per vehicle, the maximum queuing delay has decreased by 2.5-3 minutes per vehicle, and the total queuing delay has decreased by 8.5-9.5 vehicle-hours per morning peak hour for that lane. Also, variability in the headway has been reduced significantly in the dedicated E-PASS lane. Capacity, headway, and service times of the mixed lanes did not change significantly. However, arrivals have shifted to the dedicated E-PASS lanes, thus reducing delays at the mixed lanes and improving traffic operations for the entire toll plaza.

Mahmoud Saffarzadeh ,Abdolreza Rezaee-Arjroody "COST-BENEFIT ANALYSIS OF ELECTRONIC TOLL COLLECTION IN IRANIAN FREEWAYS (CASE STUDY: TEHRAN-QOM FREEWAY)"

Mahmoud Saffarzadeh ,Abdolreza Rezaee-Arjroody, This paper focuses on the pay toll system in road that is based on the traditional method which is collecting the toll by road barriers installed at the beginning of Freeways. The drivers will be permitted to enter the freeway after paying the toll by cash or ticket. Although in this system the toll is collected directly from the drivers, the existence of barriers causes increased travel time, increased fuel consumption and consequently increased pollution in the road environment. Another method widely used in industrial countries is Electronic Toll Collection (ETC) system. This method has quite a considerable number of advantages amongst which the reduced fuel consumption through reduced vehicle stop times, increased vehicle speeds, reduced number of personnel required for running the system, reduced environmental pollution, more passenger comfort, reduced cash circulation and consequently integration of the financial system, may be mentioned. This paper focuses on the economic and technical analysis of ETC after investigating the ETC systems in Tehran-Qom and Tehran-Karan freeways. It should be noted that this paper is based on a study carried out two years ago, and according to a more recent research Tehran-Karaj is not a toll road anymore. The most important aspects considered in this paper are reduced fuel consumption, reduced personnel costs, and reduced waste time of passengers. Finally, the economic savings obtained by utilization of such a system in the mentioned freeway is calculate

Sanchit Agarwal, Shachi Gupta, Nidheesh Sharma “ELECTRONIC TOLL COLLECTION SYSTEM USING BARCODE LASER TECHNOLOGY (2014)”

Sanchit Agarwal, Shachi Gupta, Nidheesh Sharma, This paper focuses on an electronic toll collection (ETC) system using barcode laser technology. The proposed barcode laser system uses tags (barcode) that are mounted on the number plate of vehicles, through which information embedded on the barcode are read by barcode readers, the proposed system eliminates toll authorities to perform ticket payments and toll fee collections, respectively. Data information are also easily exchanged between the motorists and toll authorities, thereby enabling a more efficient toll collection by reducing traffic and eliminating possible human errors.

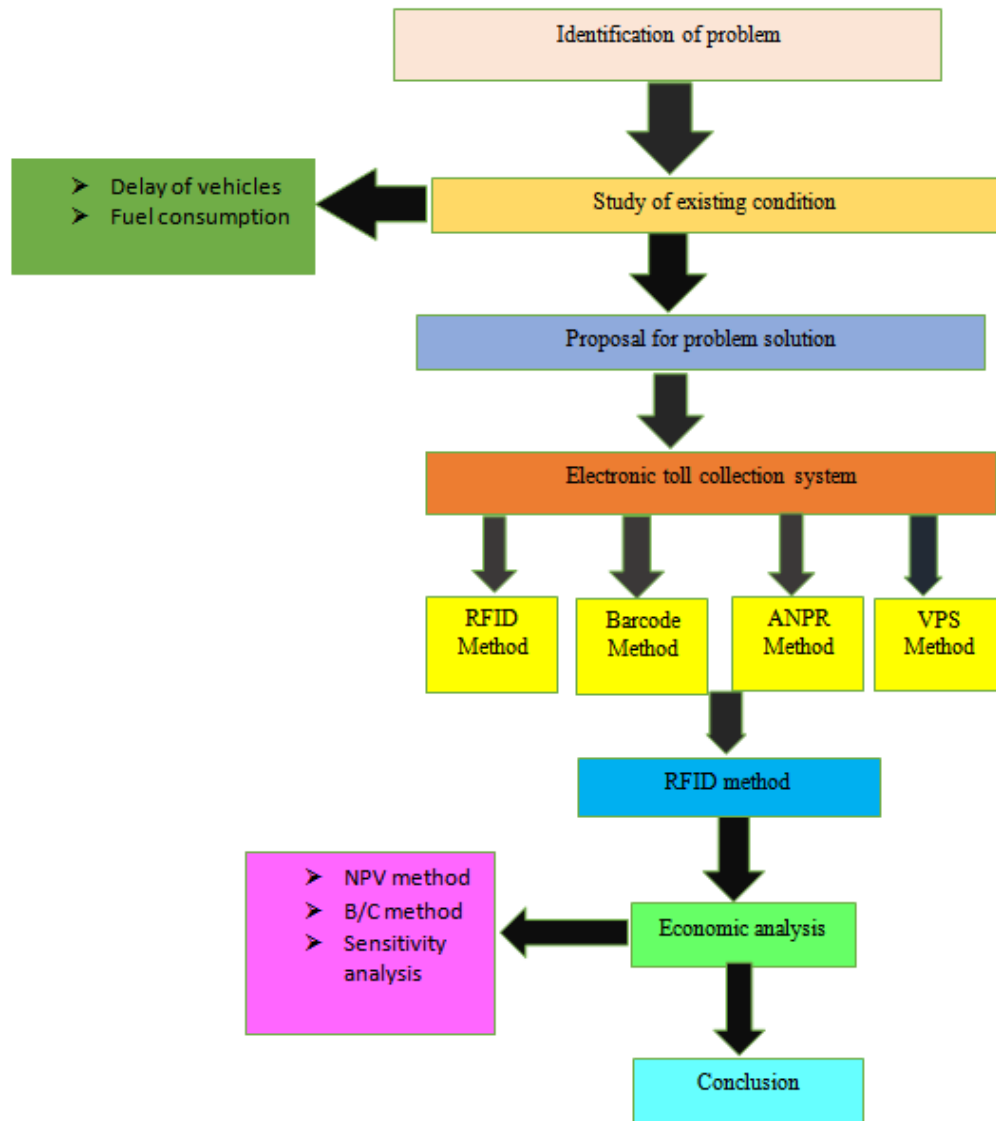
IV. STUDY AREA

The Ahmedabad Vadodara expressway is an expressway connecting the cities of Ahmedabad and Vadodara in the state of Gujarat, India. The 93.1 km long expressway reduces the travel time between the two cities from two and a half hours to an hour. There are lots of problem being faced at the toll system due to increase no of vehicles at the expressway. Larger number of queue line, delay in travel time, loss of fuel consumption, air pollution, noise pollution are the problems being faced at toll system. In order to solve all these problems we need to implement ETC system.



V. METHODOLOGY

To achieve the objectives a methodology is framed. Complete flowchart of each activity showing various stages involved as shown above. For this work study area is to identified for collecting data. Main stretches of the study area identify problems, such as delay in travel time, loss of fuel consumption, air pollution, noise pollution. Traffic data are collected from location and is used for analysis propose. Economic evaluation is carried out for the traffic data to find travel timesaving and fuel saving.



VI. CONCLUSION

ETC systems have some indirect benefits such as air pollution reduction and environmental effects that result in a healthier environment and reduction of hygienic costs. One of the important advantages is longer vehicle life, reduction of transportation costs due to less travel time, increased monitoring capability and highway traffic control, increased precision of surveying activities in highways, less fuel consumption, better audit control, use of sms service instead of receipts.

VII. ACKNOWLEDGEMENT

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