Traffic Reducing System

Dr. Anil V. Shirgire[1], Shubham V. Badar[2], Saurabh S. Hire[3], Shivprasad D. Rakh[4], Shubham R. Taware[5]
[1]Assistant Professor
[1, 2, 3, 4, 5]Dr. D. Y. Patil Institute of Technology, Pimpri, Pune

Abstract- *Vehicular traffic is the major problem in metropolitan cities because traffic congestion is increasing rapidly at signalized intersections; it results in chronic situation in dense downtown areas. Traffic congestion is also major problem for smooth transportation. So, here we adopted a mechanism which minimizes traffic problems, and that mechanism is called hydraulic machine. Hydraulic machine is the mechanisms which lift the things up and down at a particular height. Our purpose is to create a mechanism which lifts the footpath at signalized intersection up and down when there is more traffic at signalized intersection*

We studied about the various congested signalized intersection areas and then Sancheti hospital pune for our study. We collected the peak hour traffic data using video graphic survey method and categorized the vehicles into different classes. Calculate the queue length at Sancheti hospital pune square using normal footpath and again calculate the queue length for same traffic data by using hydraulic footpath. On comparing the reduction of queue length percentage, we observed that hydraulic footpath is preferable than the normal footpath for congested traffic at signalized because it reduce approximate 60% queue length. Also, hydraulic footpath gives extra space at signalized intersection, and it helps to increase service volume

I. INTRODUCTION

As the number of vehicles and the need for transportation grow, cities around the world face serious traffic congestion problems: almost every weekday morning and evening during rush hours the sat-u ration point of the main roads is attained. Traffic jams do not only cause considerable costs due toun productive time losses1; they also augment the possibility of accidents and have a negative imp Acton the environment (air pollution, lost fuel) and on the quality of life (health problems, noise, stress).In general there exist different methods to tackle the traffic congestion problem construction of new roads to eliminate the most important bottle-necks or to realize missing links, stimulating alternatives by promoting public transportation and larger vehicle occupancy, or by appropriate pricing and taxing, reducing demand by raising tolls or other taxes, or by developing a high-speed communication network, which for many purposes could replace the need for travel, better use of the available capacity of the existing infrastructure by pricing (time-of-the-day de-pendent tolls), influencing behaviour (promoting car-pooling and stimulating employee trans-portation plans for companies) and by better control of traffic

Every common people faced traffic congestion problem every day in their daily life and because of this problem everybody regularly fails to reach at their destination like offices, schools and colleges etc. but still physically fit and mentally stable people can wait for few minutes or may be for the couple of hours but emergency vehicles would not be able to wait until and unless traffic gets cleared, because they have the responsibility to save lives of those people who are physically ill and may be stuck in trouble. For minimizing the traffic in case of unstable circumstances and giving a proper way or path to emergency vehicles I have introduced new concept of hydraulic jack system installed in footpath to control upward and downward movement of footpath surface.

In case of any emergency, area of footpath can be used as same as road surface for just temporary time and when the emergency vehicle passed out easily from footpath then with the help of hydraulic jack, footpath will get at its original position For minimizing the traffic in case of unstable circumstances and giving a proper way or path to emergency vehicles I have introduced new concept of hydraulic jack system installed in footpath to control upward and downward movement of footpath surface. In case of any emergency, area of footpath can be used as same as road surface for just temporary time and when the emergency vehicle passed out easily from footpath then with the help of hydraulic jack, footpath will get at its original position

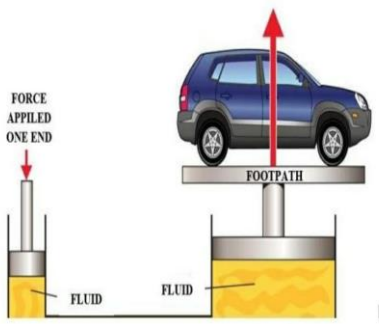

Image 1.1 Floodgate Mechanism

II. OJECTIVES

1. To reduce traffic during inclement weather
2. To improve traffic flow.
3. In the event of an emergency, use the walkway as an extra lane.
4. To ease traffic flow and alleviate traffic congestion.

III. METHODOLOGY

HYDRAULIC JACK SYSTEM

For the vertical movement of the footpath, we are going to install the hydraulic jack/mechanism underneath the footpath.

Hydraulic Jack: A hydraulic jack is a device that is used to lift the heavy loads by applying a force via a hydraulic cylinder. Hydraulic jack lifts the loads using the force created by the pressure in the cylinder chamber.

- Hydraulic footpath can be used in places which are subjected to high and dense traffic, metro cities, medically important places and near fire brigade stations
- The hydraulic footpath is mainly used to serve in emergency situations, e.g., a ambulance/fire brigade is stuck in heavy traffic at such instances those vehicles shall use the footpath as a route to travel to desired place.
- A well-connected network of such footpaths can be spread through an entire city
- At intersections, a watch house can be established where in a system appointed person would be able to operate the hydraulic systems
- IT uses the basic of hydraulics and its principles.

Principle of Hydraulics: Hydraulics is based on the Pascal's Law.

Pascal's Law: A change in pressure at any point in an enclosed fluid at rest is transmitted undiminished to all points in the fluid.

We use the fundamentals of hydraulics and its concepts because our concept is built on the hydraulic jack mechanism.

Principle of Hydraulics: The Pascal's Law governs hydraulics.

Pascal's Law states that any change in pressure at any point in an enclosed fluid at rest is communicated unequally to all other places in the fluid.

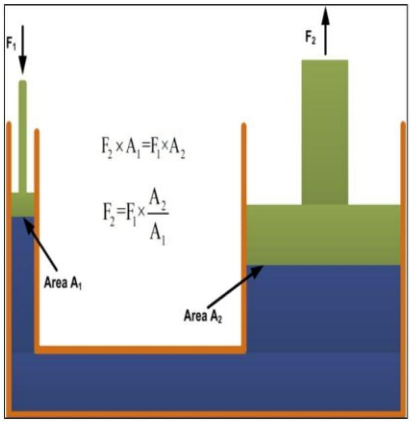

Fig no 3.1Pascal's Law

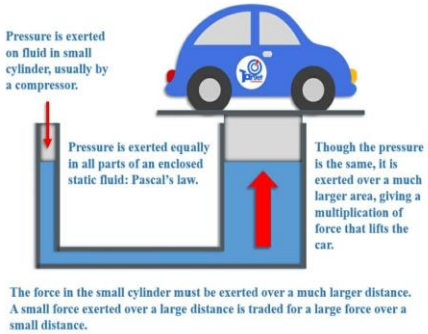

Fig no 3.2 Principal of Hydraulic jack

Working of Hydraulic Jack

Consider figure-

λ There are two platforms inside a hydraulic jack, one with a smaller size and the other with a bigger area; it is a tube-like construction that is filled with uniform fluid. λ

At both ends of the tube, there are two pistons (P1 and P2)

λ The cross-sectional area of piston P1 is A1, whereas the cross-sectional area of piston P2 is A2. λ When force F1 is applied to P1, pressure is created, and according to Pascal's law, pressure is transmitted in both directions, with the identical pressure being exerted on the opposite end. λ As a result, the Piston P2 ascends. λ Advantage of using hydraulic lift is that by applying small force on the small area we are able to generate a larger force. Mathematically:- F2=PA2 where F2 = Resultant Force,A2 = area of cross-

section F2= (F1/A1)A2 where P=F1/A1 (Pressure P is due to force F1 on the area A1) F2 =(A2/A1)F1. This shows that the applied force has increased by A2/A1. λ Because of Pascal's law the input gets magnified. λ At a very basic level, hydraulics is the liquid counterpart of pneumatics, which concerns gases. Fluid mechanics provides the theoretical foundation for hydraulics, which focuses on the applied engineering using the properties of fluids

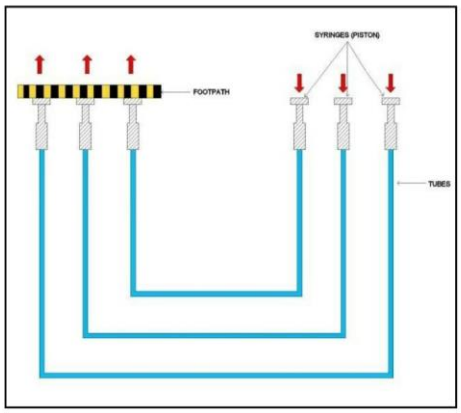

Fig no 3.3 Conceptual design for actual hydraulic TRS

DUE TO APPLICATION OF FORCE ON THE ONE END ,THIS END LEFTS UP i.e. FOOTHPATH IS RISEN & VICE VERSA

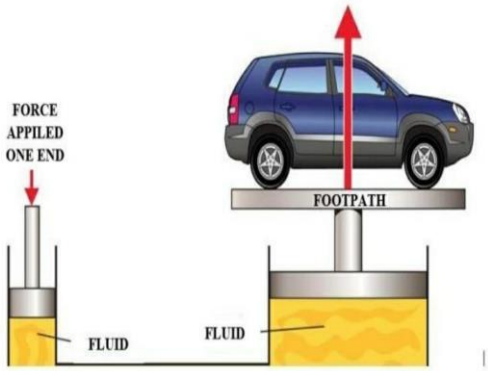

Fig no 3.4 Demonstration of hydraulic jack actual in footpath

Inside a hydraulic jack there are 2 platforms, one has a smaller area and the other one has a larger area.

- It is a tube-like structure which is filled with uniform fluid.
- There are 2 pistons (P1 and P2) which are attached at both the ends of the tube.
- Cross-sectional area of piston P1 is A1 and of piston P2 is A2.
- If we apply force F1 on P1, pressure gets exerted and according to Pascal's law the pressure gets transmitted in all the directions and same pressure gets exerted on the other end. As a result, the Piston P2 moves upwards.
- Advantage of using hydraulic lift is that by applying small force on the small area we are able to generate a larger force
- Mathematically: -F2=PA2
- where F2 = Resultant Force, A2 = area of cross- section
- F2= (F1/A1) A2 where P=F1/A1 (Pressure P is due to force F1 on the area A1) F2 =(A2/A1) F1. This shows that the applied force has increased by A2/A1. Because of Pascal's law the input gets magnified. At a very basic level, hydraulics is the liquid counterpart of pneumatics,

which concerns gases. Fluid mechanics provides the theoretical foundation for hydraulics, which focuses on the applied engineering using the properties of fluids.

Study Area and Data Collection:

Fig no 3.5 Traffic at "Sancheti hospital pune" Square

To provide hydraulic footpath we have selected sucha site where there is a junction of 4 roads whereconsist of footpath by all sides of road. There are many such intersections in our city from which we have selected **"Sancheti hospital pune**"

3.2 Study Area

Place: **pune**
Area: **Sanchiti hospital Shivaji Nagar**
longitude: NL = 2110'59''EL = 7905'36

3.3 Calculation **for service volume at signalized intersection:**

-Service volume at 6.2m width of road: -
-Width of road = 6.2m
- Load factor = 0.3 ... (ref. from HCM 2000)

- Population for city = 60 lakh

- Peak hour factor PHF= × V15 = × 1140 = 0.96
- Hourly Volume = 4400 v/hr.… (from nomograph chart)
- Peak hour factor = 1.21

PHF=v/4*v15=4400/4*1140=0.96
Hourly volume 4400v/hr
- G/C ratio = = 0.26

Therefore, service volume = Vehicle volume per hour *Adjustment factor ×Peak hour factor × g/c ratio
= 4400 × 1.25 × 1.21 × 0.26
= 1730 VPH

3.3.2 Calculation for Queue length: - Formulas for Queue Length

Q=tq*Qm/2c
Qm=v*r/3600
Tq=(c-cr) *t/c-v
Were,
V = Mean arrival rate (veh/hr)
r = Effective red time (s)

Q = Average Queue length (veh)
Qm= Maximum queue length (veh)
Cr = Mean service rate (veh/hr)

C = Mean service volume

(veh/hrc = Cycle length (sec)
Tq = Time duration of queue (sec)
t = Effective red time (sec)
1) Nara Road:
•Service Volume = 1466 VPH
•Service Rate = 1026 VPH
•Arrival Rate = 1320 VPH
Tt/q =(c-cr) *t/{c-v}
(1466-1026) *0.0234/1466
=0.0705hr
=254sec
Qm =v*r/3600

-Service volume at 7.5m width of road: - Width of road = 7.5m
- Load factor = 0.3... (ref. from HCM 2000)
- Population for city = 24 lakh- Peak hour factor: PHF = × V15 = × 1420 = 0.96
- Hourly Volume = 5500 v/hr.
… (from nomograph chart)
- Peak hour factor = 1.21
... (Depend on population)
G/c ratio = 3.1/119=0.26

CALCULATION OF FOOTPATH ANDPEDES

Data analysis for pedestrian traffic:

•Width of footpath = 1.2m

•Standard width of footpath for
urban street = 1.5m
… (recommended by IRC)
•Capacity of footpath in 1.5m width of footpath = 800 P/hr.…
(Given in IRC table. ref. 47)
Capacity of footpath in 1.2m width of footpath is
= 800/1.5=1.2
=800*1.2/1.5
=640 p/hr
Therefore, Data analysis for survey is 220 persons are traveled on each footpath.
…. (data analysis after surveying)
Loading calculation for footpath:
A) For pedestrian:
•Width of footpath = 1.2 m
•Length of footpath = 10 m
•Area of footpath = 12m^2
•Minimum Average surface required in pedestrian= 0.085 m
•No. of pedestrian in footpath surface= 12/0.085= 142 No.
•Average weight of presence per head = 60 kg/head
…. (ref. for WHO data analysis)

•Total weight of pedestrian in footpath surface
= No. of person's ×
wt. of person= 142 × 60= 8520 kg
8520 per 12m^2 area of footpath surface
=8520/12
=710 kg/m^2

B) For vehicles:

•Average of all vehicles= 4-wheeler/Passenger/Ambulance
•Dimension of vehicle (Area) = 2.40m^2(ref. from textbook)
•Weight of vehicle (kg) = 1200 kg (ref. from textbook)
•No. of vehicle = Area of footpath surface / Area of vehicle required

12/2.40
= 5 No. of vehicles
•Average weight of vehicleincludes in passenger
= weight of vehicle + passenger weight ×
No. of person's
= 1200 + 60 × 9
= 1740 kg
Therefore, weight of vehicle on footpath surface
= weight of vehicle × No. of vehicle= 1740 × 5
= 8700 kg/12m^2= 725 kg/m^2
3.5.3 Loading capacity of footpath surface:
•Total weight of vehicle
on footpath surface = 725 kg/m^2
= 0.0725 kg/cm^2

•Total weight of pedestrian on footpath surface = 710 kg/
= 0.072 kg/cm^2
•Provided the metal sheet on footpath surface1)
Type - Steel metal sheet
2)Tolerance - 6327 kg/ (Tensile Strength)- 2812 kg/(Yield Strength)
•Provided the hydraulic machine below the footpath which lift footpath up and down: a)
Type: Fixed Displacement Pump)
Model: F-12c)
Pressure: 6000 PSI = 422 kg/d)
Speed: 2290 RP Me)
Flow rate: 240 LP Mf)
Compacted and Light weight)

IV. CONCLUSION

Traffic congestion has been a worldwide issue which results into wastage of time, energy and causes environmental pollution. Identification of congestion is the initial step for selecting appropriate method to avoid this situation. To understand congestion in simple way it is classified into different categories. There are number of reasons for the congestion problem. There are numerous potential congestion administration procedures. The suggested two related measures are for traffic management are Regularity measures and Economic measures. Regularity measures are access management and parking management, and pricing policies are economic measures. Overall, we can use this mechanism to solve the problems. I am confident that it can reduce traffic congestion in the high-density traffic areas.

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