

Critical Analysis and Feasibility of PRT for Gurgaon City

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ABSTRACT

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Without compromising the present traffic needs, a kind of transport system is required which helps in sustainable development in the present world scenario where fuel and environment have become areas of major concern for transportation. The modern transportation system must be sustainable, congestion free, accident free, fuel efficient and economical. PRT (Personal Rapid Transit) is the most recent development in public transportation and is best possible option which compiles to the above needs. PRT is a new innovative and on demand system for developed or urban transportation environments by using small, driverless, electric vehicles which run on guide ways. Its lightweight and flexible nature enables it to be retrofitted into a broad range of transportation environments. It is designed to be reliable and safety built in to ensure comfort and security of its passengers. This paper discusses how PRT is efficient in managing urban traffic and solving most of the modern traffic problems.

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I. INTRODUCTION

Personal rapid transit (PRT) is a new and innovative on-demand system for developed or urban environments. It is designed to meet the need for congestion free, multi-origin, multi-destination public transport. [1] Personal Rapid Transit is a driverless automated transit technology that has a unique movement pattern for the transit rider.

PRT is the most energy efficient mass urban transport system that has been devised so far. It consists of small light weight 2-6 passenger's vehicle built on an elevated guide way under computer control. The vehicles are electric but have no batteries as they take

power from electric contacts in the guideways' vehicles are sized for individual or small group travel. Guide ways are arranged in a network topology, with all stations located on sidings, and with frequent merge/diverge points. This allows for nonstop, point-to-point travel, bypassing all intermediate stations. The point-to-point service has been compared to a taxi or a horizontal lift (elevator).

II. HISTORY

[2] PRT was originally an engineering research project to devise the optimum urban transport solution for the 21st century; Ultra began development in 1995 in association with the

University of Bristol. Ultra was the company who first undertook the PRT initiative. The company was founded by Martin Lowson a rocket scientist. He was accompanied by 50 staff of Apollo space programme's Saturn rocket, chief scientist of Westland helicopters. Royal Academy of Engineering, Royal Aeronautical Society, and American Institute of Aeronautics and Astronautics were also the fellow members. They started this project in the year 1995 and finally won a contract to build a pod system at London's Heathrow airport in the year 2005.

III. WORKING

3.1. Guideway

The pods run on light, flexible and aesthetic guideways. Guideways are constructed at a height from the ground, so as to ensure safety, stability and congestion free operation of PRT as well as the road traffic. The piers of the guideway are not built very heavily as the guideway has to carry light pods with only few passengers inside them. The pavement surface is made in an intelligent way. Portion where wheels of pod car are to run are provided with a smooth surface. And rest of the area is made of either steel mesh with round wholes or parallel running horizontal steel bars. The width of pavement is decided according to the width of pod car. A channel of power cable has to be laid in the pavement which will provide energy (electric current) to the pod cars. As the pavements are light weight and flexible, they can be easily routed as per the requirement. Also, at turning points, a slight superelevation will do the work. The problems of snow and ice are also kept into consideration (for areas where required). The snow passes out from the gaps of pavement. For icing action, application of "benign", a de-icing fluid is done. The fluid works till a temperature of -15 degrees Celsius.

3.2. Pods

These are light weight cabs made to carry 3-6 people at a time. It is sufficiently large to carry its passenger

capacity along with space for extra materials like wheelchair, bicycle, shopping carts, push carts etc. These do not have a heavy engine to drive or any other heavy mechanical parts. These are run by electric driven motors installed in each individual pod. The motors receive power from the cables laid in the guideway. The pods provide a comfortable sitting to passengers. It also ensures their safety and comfort. Pods can be made air-conditioned according to the climatic conditions. The wheels are made of solid rubber to ensure least maintenance. They are small in size and run on particular exact path.

3.3. Monitoring system

The monitoring system that operates PRT is one of best available monitoring system in today's world. This centralized system is responsible for smooth, fast, proper, safe and efficient functioning of PRT. The system is uncomplicated and intuitive; a touch screen panel enables them to choose their destination while an automated voice-over tells them though the process. Once on board they can relax as the vehicle takes them straight to their destination. The use of off-the-shelf technology, mostly from the automotive industry, provides a mature, well proven and reliable system. The system monitors movement of pod cars. It keeps on analysing the locations of every pod and also the demand of pods at every different station. When there is an increased demand at a particular station, the system diverts pods from low demanding areas. The stations are made off the track to ensure continuous movement of pods. An important part of work of the system is to check running status of every pod and prevent their collisions at junctions of cross-ways and of stations. [3] PRT is a demand responsive service with its operation optimised through a control algorithm

3.4. Advantages

[4] It has all of the advantages and features of both car ownership and public transport, with added attractions of its own.

- i. Congestion Free-Due to the advanced monitoring system and proper guided route, there are negligible chances of congestions like traffic jams, slow movement or any other obstruction in the movement. Negligible chances of accidents-All the reasons of accidents in conventional transport system e.g. haphazard movement of traffic, human errors, vehicular defects etc. have been eliminated here due to the use of modern technology.
- ii. Space restrictions-PRT is supported on piers which need very less cross-sectional area for their erection. It is so due to the lightweight of super structure.
- iii. Flexible routing-The guideways can be routed according to the demand. This enables smooth functioning of PRT as well as normal traffic of the surrounding. Extensions of guideways are possible for future demand.
- iv. 24x7 availability - It ensure smooth and efficient functioning in all weathers. It requires very less man power and can be operated around the clock.
- v. On demand Service-This ultra-advanced system gives the provision of selecting routes according to the need. And not adjusting with a pre-defined route.
- vi. Greater Privacy-It avails the facility of privacy. As if wished a person or a group of persons can travel in a pod car without sharing it with others.
- vii. Zero on-site Emission-Pod cars are driven by electric motors and hence there is no on-site emission of any type of pollutant.

Extremely low overall energy Use-Pod cars are very lightly built and utilise very little of electric energy. The monitoring system also doesn't consume large quantity of energy. So overall there is very less energy consumption.

IV.COMPARISION WITH CONVENTIONAL TRANSPORT SYSTEM

[5] Personal Rapid Transit (PRT) is a novel form of fully automated rail- based public transportation which will become commercially available in the near future. The biggest benefit of PRT over other conventional transport systems like bus, train, taxi etc. is that it is eco-friendly. PRT requires very less space for its installation and operation. The risks of accidents and mishapenness are negligible. Public transports are more vulnerable to accidents. PRT is more comfortable and provides greater privacy to passengers. It is a quick and time saving system which makes it even more preferable over other transport systems. According to an average calculation, with a four-person vehicle, the maximum demand that can be served is then 2400 passengers per hour, which corresponds to one passenger, launched every 1.5 seconds, or clearance of a 50-person group in 1 minute 15 seconds. When compared to bus or rail system, PRT results are comparatively outstanding. The success of PRT can be seen at Heathrow airport. For the year May 2011-12, PRT carried over 370,000 passengers, ensured 99.00% availability of pod cars, resulted in removal of 50,000 buses and corresponding savings in CO2 emission.

V. GURGAON CITY AS URBAN PRT



Fig.1. Gurgaon Map

The holy city is soon set to become the first place having an urban PRT. At peak capacity, the Amritsar system is expected to carry up to 100,000 passengers a day on an 8km / 4.8-mile elevated guideway in over 200 pods between seven stations, making it the

world's largest PRT system to date. Financed entirely by private funding on a build, own, operate transfer (BOOT) basis, passenger services will go live in 2014. Although the cost of the scheme is subject to commercial confidentiality, it demonstrates that a large scale urban PRT system can be delivered on a financially viable, fare-based model and offer very real returns for financial backers. The route will focus on taking passengers from the railway and bus stations to the Golden Temple and will: Take 35% of daily visitors to the Golden Temple Save up to 30 minutes on the current journey times Attract passengers from a wide geographic and demographic profile, from regular commuters to "one off day trip" users.

Run from 04.00 – 24.00 seven days a week Charge fares competitive with alternative modes such as taxis and auto-rickshaws.

VI. LIMITATIONS OF PRT

Less space in vehicle: PRT is a very compact system so the space is cooperatively less as compared to other system. Transportation systems with guide ways (rail, monorail, or other technology), stations and sophisticated automation require substantial investment costs. Therefore, guided systems are economically justified only when they have spacious vehicles, such as light rail or rapid transit trains. The high capacity of these vehicles allows transportation of large passenger volumes. Small vehicles, on the other hand, are efficient for low-density travel, but very inefficient in serving large passenger volumes.

No door-to-door connectivity: PRT does not provide door to door connectivity because it works on elevated rail which cannot provide door to door connectivity and can only facilitate station to station travel. It is one of the shortcomings as compared to taxi and auto rickshaw.

VII. CONCLUSION

From the above discussion, it can be concluded that PRT can be used as a feeder for long distance

transport system such as buses, railways, airways etc. Also, being pollution free it can act as a good transportation system for local movement of people locally. It is also cheap and hence will contribute in sustainable development of big cities with alarming pollution level.

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