

## **Emerging Automotive Technologies: Personal Rapid Transit System (PRTS)**

**Mohit Ojha**

*Department of Automobile Engineering, Dr. Sudhir Chandra Sur Degree Engineering  
College, West Bengal University of Technology, Kolkata.*

### **Abstract**

The Automobile Industry Is rapidly evolving with time. New technologies have been successfully implemented, however growing consumer demands have posed new challenges in front of the automobile industry. The main theme of my research is the PRTS (Personal Rapid Transit System), a mode of transport which has the potential to solve a lot of problems faced by vehicle manufacturers. We shall have a look at the barriers in implementation, and my proposed solutions.

**Keywords:** PRTS, Transport, Consumer, Challenges, Vehicles.

### **1. Introduction**

First of all let us understand what exactly a PRTS is. A PRTS is a transportation system which can be described as a hybrid of a car and a train. A PRTS basically features small automated vehicles which run on a guideway network arranged in a topology. All stations are located on sidings and the service has frequent merging points. This feature allows for non-stop point to point travel which greatly reduces travel time and crowds. PRT research was first started in the 1950s when search for better and more efficient modes of public transport was started. So we can say that the PRT system research was started with the aim of developing an alternative to the MRTS (Mass Rapid Transit Systems). There are currently two quasi PRT systems which are operational, one in Morgantown, USA and the other is in the UAE. However, as depicted in the later sections, a city wide implementation has not yet been achieved because of various issues both technical and safety related.

## **2. Technical Features**

### **2.1 Propulsion**

The PRT systems run on electricity. The power is generally transmitted via conductors instead of using batteries, so that the weight of the vehicle is reduced. The steering of the vehicle is controlled by an onboard computer interface .

### **2.2 Overall Designing**

It's an established theory that the larger the size of the vehicle, the more expensive will be the construction cost and the feasibility will automatically decrease, moreover the guideways will also be more expensive to construct. Hence smaller pods are preferred so that there are less cost over runs and more surface area per person is achieved. The Morgantown PRT uses medium sized pod cars which tackle the surface area issue effectively but the downside is the fact that smaller systems are overall less efficient than larger systems.

### **2.3 Track Switching**

Conventional track switching has a lot of problems like slow speed of switching, a bigger impact of malfunctions as one failed switch will affect the entire guideway and thus making other pods on the route suffer. Mechanical switches have sometimes been used by designers, these switches minimize the headway distance but have the same problem as conventional switches, it cannot automatically adjust switch settings and hence one failure will affect all the other pods following the same route.

### **2.4 Guideways**

In a pod system, guideways will have a major role to perform and hence the construction material used should be such that the cost of installation will be less and visual intrusion will be minimal. Guideways are also needed for transmission of power to the pods. The Morgantown PRT uses a concrete guideway which is steam heated. However, this has proved to be a bane as it is not resistant to extreme weather conditions.

### **2.5 Station Locations**

Since the service is a point to point travelling system, stations are supposed to be very minimal and offer less of facilities offered by MRTS stations.

### **2.6 Energy Efficiency**

The energy efficiency of a PRT system will always be higher than that of an MRTS system because it eliminates the intermediate starting and stopping of stations. As a result of this, the average load factor will come down resulting in a more energy efficient means of transportation.

**Comparison to MRTS**

PRTS systems are often touted as replacements for MRTS .Below is table which offers a detailed look at the various similarities and differences between a MRTS system and a PRTS system.

<u>Similarities</u>	<u>Differences</u>
1)Like MRTS, it is also a public amenity 2)Since both are electric powered, both help in the reduction of pollution 3)Both have discrete stations at which passengers embark and disembark	1)More energy efficient 2)Offers the passengers point to point service like automobiles 3)Service has round the clock, on demand availability 4)Scope for co ordination of vehicle movements 5)Smaller vehicle size than MRTS systems, which translates to less infrastructure requirement on stations 6)Offers a degree of privacy

**3. Barriers In Implementation**

Even though a highly ambitious project,there are still a lot of barriers in the Implementation of a PRT system over a large geographical area such as a city or a county.The major barriers which have been found are:-

- 1) Safety in emergency situations:One of the major problems in a PRT system is the lack of adequate measures which can be taken in case of emergencies like the pod’s ventilation failing,switch mechanism difference between one station and another.
- 2) Accessibility for the disabled:Even though most facilities today offer access to the disabled,the PRT systems have been constantly known to lack this fundamental feature.
- 3) Guideway costs:It has been constantly found that with the existing designs and the systems,the main cause of cost overruns is the high cost of guideway construction.Since guideways have to be layed extensively for a route to be feasible,cost overruns are often huge and the current systems have all been proposed for stations at a very small intervals which in turn resultsin more guideways.
- 4) Lack of a sustainable power source:Electrification of guideways will result in a large expenditure and batteries are not powerful enough to sustain longer travels,hence there is no proper pollution free source to power the pods in the designs developed so far.
- 5) Congestion:It has been found that due to the extensive guideways and the large number of pods required to transport people,the guideways might get congested.

#### 4. Suggested Solutions

Through some research on the topic, I have proposed some ways in which the above mentioned problems can be solved or mitigated to an extent. The ways are:-

- 1) In case of emergency problems such as Air conditioning failing, The pods can be equipped with an alternative auxiliary power unit that will provide uninterrupted power in case of a power failure. Another feasible option might be to provide a secondary battery system which will power the pod just enough to reach the next station where the maintenance can be carried out
- 2) The service can be made more easily accessible to the disabled by two ways. Either separate pods with ramps and voice aids can be built which will aid the passengers or the stations which have already been built can have separate elevator linked platforms or bays marked specifically for use by handicapped people.
- 3) The guideway system works like a system of streets with pods. Hence Instead of constructing stations at small distances, stations should only be constructed at pivotal points within an area and the overall guideway network can be shortened by linking small guideways to form a one big grid which pods travelling to a common destination can follow. Guideway costs can also be reduced by constructing smaller pods which will result in smaller guideways. The stations can be co-ordinated by a central co-ordination station built in specific areas.
- 4) Pods can use solar energy on a large basis as a sustainable power source. It was earlier experimented upon and the experiment was successful for a short distance. To use it for large distance travels, Solar panels can be set at stations which will recharge the pod and enable it to move larger distances.
- 5) Congestion problems can be solved by arranging the pods into a train like system and by building the super guideway described above. The pods have less headway distance, hence can follow each other from a minimal distance, thereby reducing congestion up to an extent.

#### 5. Conclusion

Hence from the above articles it can be concluded that a PRT system can be developed as an alternative to MRTS systems and will greatly help in reducing emissions and hence our carbon footprint. However, the system has flaws which need to be addressed and with the proposed solutions, the problems can be addressed.

#### References

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