

Analysis on the present situation and Future Prospect of bus priority in China

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ABSTRACT. *The traffic jam is a problem to be solved in our country, and it is found that the public transport priority can solve the problem effectively. This paper, from the basic contents of the public transport, the comparison of the public transport priority at home and abroad, can draw the successful experience from abroad, and put forward the suggestions of the measures to implement the public transport priority in our country and the prospect of the development of the public transport.*

KEYWORDS: *traffic congestion, public transport, priority development, implementation measures*

1. Present situation of Travel Traffic structure

With the increasing number of cars in China, more and more residents choose private transport travel, resulting in the contradiction between public transport and private transport travel. The road space of the city is limited, and the priority of road surface is not clear, which leads to a large number of pavement demands. In order to solve this problem, China has implemented a series of measures, such as the construction of expressway and widening of the ground road. The development of underground traffic, but still has not solved the increasing contradiction between private traffic and buses, so we can optimize the traffic structure, vigorously develop public transport with high road utilization ratio, attach importance to public transport priority, and give special road rights to public transport for relieving the pressure of road traffic.

2. Comparison of priority Development of Public Transport at Home and abroad

After the Ford Company's first automobile production line appeared, in the face of more and more vehicles pouring into limited roads, traffic congestion has become a headache for all countries in the world. In order to solve this problem, each country also exerts its own wisdom and formulates some effective public transport priorities. As the technology of traffic engineering planning in China still needs to be improved, this paper will compare and analyze the traffic priority

strategies and present situation of London, Berlin, Germany, Hangzhou and Chengdu, China, so as to learn the efficient means of absorbing other countries and advanced methods.

2.1. London bus priority

The most essential feature of traffic in London is to improve the feeling of passengers in the traffic process for the purpose of developing traffic. London is a city with high car ownership rate, the road network is developed, in theory, private car travel is very convenient. But the London city government is still actively taking various measures to develop public transport and reduce private car travel. One of the main reasons is to consider the "human" factor, on the one hand, some families in London still do not have private cars, travel still needs to rely on the bus system; On the other hand, the law does not allow minors, the elderly, patients and other vulnerable groups to drive.[1]. In addition, the area of the urban road is limited, and it is not possible to meet all the car travel requirements. In this way, from a fair point of view, the Government has developed a variety of transport priority policies.

The specific measures are as follows:

(1) Bus lanes such as bus lanes and reverse bus lanes are set up on the side of the road to ensure the independence of bus line operation.

(2) Congestion fees are charged in the central area of the city, and all cars entering the area will pay a certain tax to control the area of road use in the central area of the city in an economically adjusted manner.[2]

(3) Reduce the number of parking spaces in the core area and reduce the number of cars entering the center of the city.

(4) The illegal occupation of bus lanes should be fined heavily, and the priority of public transport should be guaranteed from the point of view of traffic management.[2]

(5) Reduce bus fares and improve the attractiveness of traffic travel.

(6) Increase gasoline cost, increase car travel cost and reduce car travel rate.

2.2 Berlin bus priority

Berlin, with an area of 883 square kilometers and a population of 3.4 million, has a total of 1.4 million cars, of which 1 million are owned, with an average of one car for every three people. These cars put a lot of pressure on urban traffic.[1]

In the course of the development of the public transport priority, the city of the city of Berlin has taken a number of ways, which is where we need to pay attention. In the 1990s, the focus of German public transport was on the construction of tram tunnels under the commercial district and the development of light rail transit system.[1]. After 2000, Germans realized that the most important factor in the competitive relationship between public transport and cars was the time cost of running. The most important thing that can affect people's choice of travel mode is the time spent by different modes of transportation. However, it is limited to

reduce the running time of public transport only through the construction of underground tunnels. On the other hand, the cost of underground rail transit is high, and the regular maintenance is not a small expenditure. In contrast, reducing the time loss caused by short-term delay in the process of public transport operation can more effectively promote the development of public transport. As a result, traffic priorities in Berlin and across Germany are shifting to how to improve public transport organization and avoid interference with other road users.

The specific measures in Berlin are as follows:

(1) Change port parking to car corner; reduce unnecessary stations appropriately. The time of parking station is reduced effectively.

(2) The advanced automatic vehicle detection system (AVM) is used to control the signal period of the intersection in real time, and a longer green signal time for the public transport vehicle is given.

(3) The number of cars entering the city center is restricted; vehicles are strictly prohibited from crossing the tram lane from the left; and special lanes for public transport vehicles are set up, which effectively reduces the interference time of other vehicles.

(4) The city adopts the multi-center mode to disperse the traffic flow, integrate the urban function, mix the function properly, and shorten the travel time of the residents.

The bus priority system in Berlin is mainly used to reduce the travel time, so that the traffic congestion of public transport is improved, the efficiency of the public transport system is improved, the bus operation reliability is improved, and the construction of the underground rail transit is more efficient than the blind extension road. The invention can not only meet the travel demand of the residents, improve the attraction of public transport, but also reduce the investment of the government and save the resources.

2.3 Public transport priority in Hangzhou

Hangzhou is the cultural, political and economic center of Zhejiang Province, and the traffic problem is very prominent. One of the top ten congested sections of the morning and evening rush hour is Desheng Road to Chaohui Road from north to south. The average speed of the morning and evening rush hour is only 11.1 kilometers per hour [3] in order to alleviate the traffic congestion problem. The government has also issued a variety of policies and put forward the "bus priority" strategy.

Hangzhou's "bus priority" strategy adopts a multi-pronged approach, which is carried out from the aspects of information dispatching, financial subsidy, controlling car travel, speeding up the construction of public transport infrastructure and so on.

Specific measures include:

(1) Improving the environment of public transport, reduce public transport fares, and improve the attractiveness of public transport

(2) Through the information platform to release vehicle-related information,

effectively guide citizens to travel.

(3) Putting in public bicycles to improve another convenient green and healthy way of travel for the public.

(4) Speeding up the construction of public transport lanes and the control of urban main roads, and improve the efficiency of public transport operation.

(5) The rapid growth of the total amount of the car is controlled by means of "Shake No."; through "business day limit", "cross-peak travel" and other initiatives, the traffic jam is relieved.

Through a series of measures mentioned above, the traffic situation in Hangzhou has improved, but the traffic congestion problem has not been well solved, among which there are the following main problems.

(1) The bus station is not guaranteed and the number is small, so it is impossible to realize high density departure.

(2) Lacking of unified management, many departments have not formed a unified planning, unified management.

(3) There are problems in the traffic layout, and there is a lack of fast trunk roads, so it is necessary to speed up the construction of fast trunk roads..

2.4 Chengdu bus priority

Chengdu, as a mega-city in southwest China, has an urban area about 2129 square kilometers, The number of motor vehicles are more than 3 million. The daily travel amount is huge, which brings great test to the urban traffic.

In the face of growing traffic flow, Chengdu puts forward relevant policy opinions. According to the principle of "people-oriented, optimizing structure and convenient travel", Chengdu puts forward the clear objectives of bus network system and related policy measures.[4]

The specific measures are as follows:

(1) Improving the performance grade and comfort of traffic vehicles, and realize the unified operation and management of public transport vehicles.

(2) vigorously promote the intelligent construction of public transport and improve the efficiency of public transport operation.

(3) Speeding up the Construction of Urban Rail Transit and share the passenger flow on the ground effectively.

(4) Increasing the financial subsidies for bus travel, further reduce fares, improving the quality of service.

(5) Traffic control in the central city, control the number of vehicles entering the city center.

Various arrangements and measures carried out in Chengdu have made some achievements, which have effectively alleviated the problem of traffic congestion, but there are still some problems to be solved, such as the uneven development of urban and rural public transport, resulting in low network density in some areas. Insufficient input in transportation capacity; Residents' consciousness of daily travel bus is not strong enough, and the idea of car-oriented still exists widely.

3. Priority role of public transport

Public transport has the characteristics of environmental protection, high road utilization rate and so on. There are more people in our country and less land, more people choose traffic travel with low road utilization rate, resulting in traffic congestion, which cannot be effectively solved only by increasing traffic supply. In order to solve the above problems, bus priority is the most effective way to solve traffic congestion, and it is also of great significance in saving energy and reducing automobile exhaust emissions.

4. Public transport priority measures

4.1 Raise residents' awareness of public transport priorities

The urban residents are encouraged to use public transport, improve the quality of public transport, such as air-conditioning in the vehicle and the comfort of the seat; carry out scientific bus network planning so as to make the bus service more passengers and provide the "door-to-door" service as much as possible; and the bicycle with low road utilization rate can be used, the non-public transit motor vehicle is classified according to the residential area, then the number group is carried out, and the grouping limit number is carried out; the government further increases the financial subsidies and the subsidies for the public transport, so that the public transport cost and the private traffic cost are pulled apart; and the public transport advantages are greatly promoted, such as environmental protection and high comfort, low price, high service level

4.2 Set up bus lanes

The bus lane is set up to relieve the traffic pressure on the road, but if the traffic interval of the bus lane is large, it is often idle, because the free time to speed up the operation speed is not utilized, and the non-bus lane is overcrowded. Then the establishment of bus lanes does not solve the problem, but aggravates the traffic congestion. In order to alleviate the above phenomenon, the bus is special for public transport. Road establishment After that, indicators can be developed to control the special purpose of public transport .Tao utilization The efficiency, for example, the minimum value of one-way bus traffic at the peak hour or the public transit passenger flow proportion account for the lowest value of the passenger flow percentage of the road motor vehicle. A bus lane is established on a standard-compliant road to improve road utilization.

Setting up private roads is not only to set aside special bus sections, but also to reserve bus stations and intersections. It can also be considered to set up a special bus entrance road at the intersection to speed up the operation speed of the bus by reducing the node delay.

4.3 When the intersection signal is optimized

4.3.1 Optimization method for cycle length

The signal period of the intersection is determined according to the minimum total delay of the person, and the average passenger capacity of the bus is the largest in all traffic modes, so the method is an embodiment of the bus priority. The increase of the period duration can reduce the signal loss caused by the phase change and increase the peer-to-peer capability of the intersection, but the period length is too long, which can lead to a long signal period of the red light and an increase in the number of queued vehicles, which can cause the driver to lose patience. Therefore, the idea of the method is to determine the maximum period and the shortest period, and to find a period in which the total delay is minimized from the intermediate range.

4.3.2 Optimization method of green signal ratio

The green signal ratio is proportional to the passenger flow ratio, so that the green signal ratio can be set according to the minimum total delay of human beings. The same optimization method of cycle length is an embodiment of bus priority. When a phase of the green light period Long Include Basic green time, excess green time. The green signal ratio has two constraints, thus excluding the possibility that some phase saturation or the green light time is less than the minimum allowable green time due to the low passenger flow, and the maximum saturation value and the minimum green light time are constrained. The minimum green signal ratio is selected from the calculated green signal ratio which meets the above constraints, and then the excess green light time is judged at each intersection, and if so, it is allocated to each phase. The sum of the basic street lamp time and the excess green light time determined by the minimum green signal ratio is the green light time of one phase.

References

- [1] Lu Dongxu, Cong Xijing, Xu Kexin. Foreign Public Transport priority Development Research, Urban Development and Planning Congress, 2011
- [2] Zhou Jiao, Cheng Xiaoming. Research on priority Planning and Design of bus Rights in Old District of Nanjing [J], Intelligent City, 2018
- [3] Zhang Yi, Wu Haomin, Song Ting, Yang Yongyao. A study on the bottleneck and Countermeasures of the implementation of bus priority Strategy in Hangzhou, 2013
- [4] Qiu Fa Jun. Research on the implementation Strategy of bus priority in Chengdu: [dissertation]. Chengdu: southwest Jiaotong University, 2012
- [5] Zhang Weihua, Lu Huppu, Shiqin, Liu Qiang. Traffic priority signalized intersection timing Optimization method, Tsinghua University, Transportation Research Institute, 2004