

Overview of pavement management system

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Abstract

The pavement management system plays an important role in the maintenance and management of the road, and it is a very important part of the modern road maintenance project. This article mainly is carried on the elaboration to the road surface management system from the origin, the development, the function, the management activity as well as the composition divides several aspects .

Keywords

pavement management system

1. Introduction

Not long ago, the Ministry of transport of China issued the "2015 transportation industry development statistics report". The report shows that, as of the end of 2015, the total mileage of the national highway reaches a total of more than 4577.3 thousand kilometers, an increase of 113.4 thousand kilometers, an increase of 2.54%. Road density reached 47.68 kilometers / 100 square kilometers, increased by 1.18 kilometers / 100 square kilometers. National highway mileage is 4046.3 thousand kilometers, than last year increase 145.5 thousand kilometers. Grade highway accounts is the total mileage of 88.4%, increased by 1.0%. Among them, second level and above the highway mileage is 574.9 thousand kilometers, increases of 29.2 thousand kilometers and accounts for the total highway mileage 12.6%, increased by 0.3 percentage points. National highway mileage is 123.5 thousand kilometers, than at the end of last year increased 11.6 thousand kilometers. Among them, the national highway is 79.6 thousand kilometers, increases 6.5 thousand kilometers. National highway mileage is 548.4 thousand kilometers, increases 52.8 thousand kilometers. Highway maintenance mileage is 4465.6 thousand kilometers, accounting for 97.56% of the total road mileage. After more than thirty years for development, China has become a major highway country, and not only the highway mileage but the total mileage of the world is the first in the world. As of the end of 2015, China's highway maintenance mileage is 4577.3 thousand kilometers, accounting for 97.56% of the total mileage of the highway. It is clear that China has become a major highway maintenance. At the same time, at present, the construction of "pavement management system" is not perfect and mature. Therefore, it is urgent to speed up and increase the construction of "pavement management system" in our country.

2. Origin and development

Road management technology research began from the beginning of the last century, the early seventy's North America. At that time, the United States experienced a large-scale road construction and faced with a large number of road maintenance problems at the same time. In order to solve this problem, the researchers developed a pavement distress data detection equipment, set up a database, and developed a corresponding evaluation methods, standards and priority conservation order model. Later, people put the computer as the tool of pavement management technology called "pavement management system", referred to as PMS.

3. Main function

After decades of development, "pavement management system" is more perfect, it is important that the pavement maintenance management system has played a major role, mainly in the following points:

- (1) By using the objective data collected by the monitoring system to analyze and determine the existing condition of the road surface, through the evaluation, sort and optimize the appropriate measures in time.
- (2) through the system quickly and timely to be access to relevant management information, data and materials, etc., using objective data to analyze and solve problems encountered in daily management and improve the decision-making more scientifically and efficiently.
- (3) with a certain reliability of pavement performance prediction model to predict the time of maintenance and rebuilding ,the aftereffect of maintenance and rebuilding countermeasures, and the road network traffic changes in the future of development.
- (4) To take the objective data for investment basis and demonstrate different levels of investment under the influence of freeway network status and level of service.

4. Management activities structure

The pavement management system can be divided into its structures according to the management activities. The following table is the general structure of pavement management activities.

Table1 The General Structure of Pavement Management Activities

Management activities	Network level management system (administrative technology decision)	Project level management system (technical management decision)
1 Date	1 Section division 2 Data collection: the use of performance (roughness, damage...); other (traffic, cost...) 3 Data processing	1 Detailed data collection: structure, materials, transportation, climate unit price; 2 Road segment; 3 Data processing
2 Decision criteria	1 Minimum service capability (or flatness), antisliding coefficient, structural capacity, maximum damage; 2 Program selection criteria, the most effective, cost - effective.	1 Maximum roughness, minimum structural capacity, minimum slip resistance index; 2 Maximum project cost; 3. Program selection criteria: the lowest total cost
3 Analyses	1 Road network needs; 2 Performance estimation and future needs; 3 Maintenance and reconstruction program; 4 Technical and economic evaluation; 5 Order analysis; 6 Evaluation of various budget plans	1 Project plan; 2 Experimental and technical analysis (using performance and damage estimates); 3 Life cycle cost analysis.
4 Choices	1 Optimization of the project plan; 2 Maintenance plan	1 The best project (new or rebuilt road); 2 maintenance measures.
5 implementation	1 Schedule, contract; 2 Implementation of the supervision plan; 3 Changes in budget and financial plans	1 Construction: construction records, contract supervision; 2 Maintenance ; Maintenance Management Records.

5. Component Division

5.1 from the physical structure of the Division

The physical structure of the pavement management system is the carrier of the system, which can be divided into the following three aspects:

data acquisition equipment

The data acquisition device comprises a data index detection device, such as a flatness gauge, a level gauge, a level ruler, etc., and also comprises a data storage, processing equipment and a device connected with the database.

database

Database is the foundation of "pavement management system", which is mainly used in the input and storage of all kinds of data, and the data can be put forward by software system.

software system

Software system is the core of the "road management system", including a variety of evaluation model, ranking model, optimization model, etc.. Through the software system, you can directly call the database data, analysis, to be used as a manager's decision.

5.2 division from the scope of application

According to the scope of application, "pavement management system" is divided into network level pavement management system and project level pavement management system. They are adapted to different management levels and have different functions and structures.

network level pavement management system

The network level pavement management system is a macro analysis system which involves the whole highway network, which is used to make the road network maintenance policy and determines the network maintenance demand and maintenance cost optimization distribution. It is mainly using the data information in the database, through the evaluation of pavement condition and pavement use performance prediction, prediction of road user costs, maintenance and efficiency analysis and sorting optimization decision, in order to achieve the following functions:

- (1) the current performance evaluation of road network;
- (2) analyses of the future maintenance needs of the road surface;
- (3) forecast and evaluation of road network;
- (4) optimization of pavement maintenance level (standard);
- (5) optimization of maintenance budget;
- (6) the sensitivity and risk analysis of conservation investment;
- (7) the investment benefit analysis of the newly built and rebuilt projects.

project level pavement management system

Project level pavement management system is based on a section of the object, and analyze and make maintenance plan from the view of technical and economic point. Its the main task is for the management department of a large and medium sized repair project to provide a solution to the technical decision-making and select the cost effectiveness of the best program.

The basic elements of the project management system and the relationship between the basic elements of the project management system and the network level management system are shown in figure 1-1. The output of the network management system can achieve the three objectives of a project: the action goal (to take what kind of maintenance, alteration or new measures), target cost (can be assigned to the maximum amount of investment) and the use of performance objectives (in a predetermined period of internal performance index). These three aspects are the constraint conditions of the project plan.

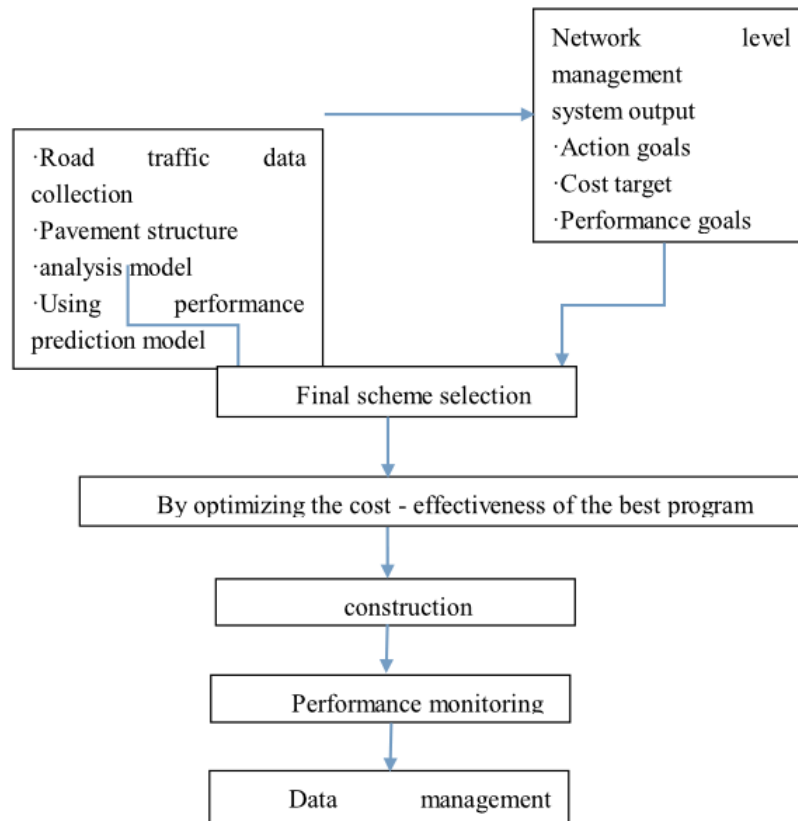


Figure 1 Basic elements of the project level management system

6. Conclusion

In foreign countries, since the last century, seventy years, Europe and the United States has been on the road to a comprehensive road maintenance stage, as result the "pavement management system" developed. And now, almost its development is very mature. Compared with foreign, the pavement management system in China began to develop in the eighties of the last century, however, since China is still in the large-scale highway construction period (at least in China within five years have), our "pavement management system" construction level is not very high, the construction level of "pavement management system" in our country is still not very high, the level of conservation of various provinces and cities in the country is uneven , the road network management technology has not achieved the National Sharing Platform and only a few of the developed provinces and cities are better. But in the near future, once our country highway construction reached saturation, the highway construction of our country will enter "road maintenance" time in the period of the great revolution, at the appointed time, pavement management system is more and more important,. So ,by learning foreign and China's experience and on the basis of the results, our management system of road surface will get rapid development. It is worth the inevitable trend, and is for us worth looking forward to.

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