

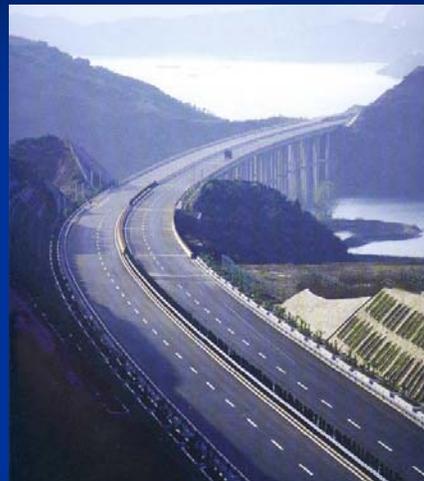
PMS Development in China



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Outline of Presentation

- Introduction
- Pavement Management System Development in China
- Problems and Future Prospects
- Summary and Conclusions



Introduction

- By 2005, 1,900,000 km roads has been constructed in China and among them 40, 000 km roads are expressways.
- According to Highway Network Development Plan (Ministry of Communication of China, 2004), another 15,000 expressways will be constructed by 2010.
- By 2020, a national highway network will be completed with 85,000 expressways

Introduction

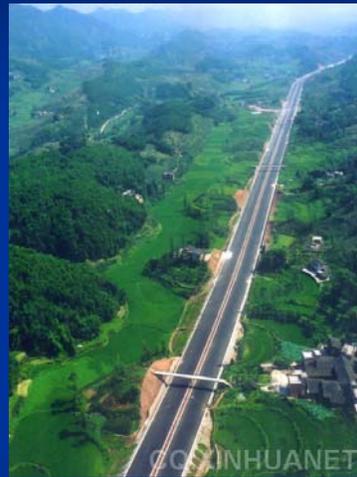


Introduction

- Since the introduction of pavement management systems (PMS) to China in early 1980s, there has been significant progress in research and development of PMS in China
- Development of PMS in Two parallel ways
 - The Research Institute of Highways (RIOH)
 - Universities-based work

Pavement Management Development (PMS) in China

- Research and Development of China Pavement Management System (CPMS) in RIOH
- University-Based Research and Development
- Other Aspects of PMS Development



Research and Development of CPMS by RIOH

- Initialized in 1984
- Gained Experience by Reviewing BSM by UK and HDM-III by World Bank's Transportation Department
- First CPMS was developed in early 1990s with three major components
 - A central database
 - A network-level maintenance management system
 - A project level maintenance management system

Research and Development of CPMS by RIOH

- In 1999, RIOH improved CPMS and upgraded to a new version, CPMS 99.
- CPMS 2001 was developed in 2001 by expanding the functions of CPMS 99
- CPMS 2001 can manage asphalt pavement, concrete pavement and granular pavement with two versions, one for expressways and the other for ordinary roads.

Research and Development of CPMS by RIOH

- Components and Features of CPMS 2001
 - Data info: data information
 - Model Bank: models pertinent to evaluation, decision, prediction, criteria, options etc.
 - Network-Level PMS: pavement evaluation, maintenance need analysis, highway investment-benefit analysis, funding priority analysis, maintenance planning
 - RoMS: routine maintenance system
 - RepGenerator: generating of reports of maintenance analysis

Research and Development of CPMS by RIOH

- Implementation of CPMS
 - Two Phases
 - Phase 1: in 14 provinces with 174, 000 km of arterial roads by 1996
 - Phase 2: highway networks of whole country by 2000



Research and Development of CPMS by RIOH

- Development of Automatic Road Condition Survey Equipments
 - Side Coefficient Routine Investigation Machine (SCRIM)
 - Automatic Deflectograph
 - Single Point Laser Profilometer



SCRIM



Automatic Deflectograph



High-Speed Laser Profilometer



Pavement Condition Image Collection System (CiCS)



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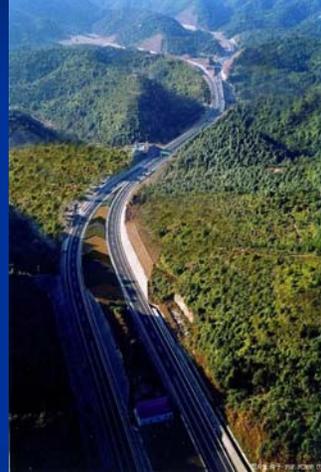
Professional

ALF (Accelerated Loading Facility)



University-Based Research and Development

- Undertaken parallel with those by RIOH
- Tongji University in Shanghai contributed significantly to PMS research and development
- Other Universities also conduct theoretical and practical development on PMS



University-Based Research and Development

- Main Modules in PMS developed in Tongji University
 - Data acquisition
 - Performance prediction
 - Maintenance and rehabilitation options selection
 - Economic analysis and evaluation
 - Ranking and optimization of options

University-Based Research and Development

- Implementations of PMS by Tongji University
 - Asphalt pavement management and maintenance system in Beijing
 - Granular pavement management and maintenance system in Guangdong Province
 - Cement concrete pavement management and maintenance system in Zhejiang Province

Other Aspects of China PMS Development

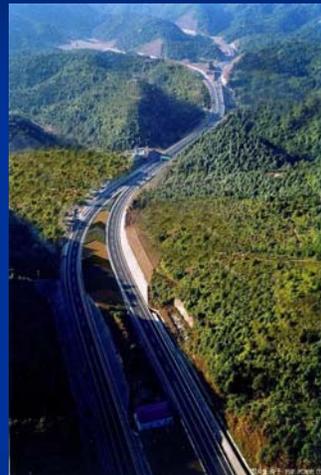
- Integration with other facility management system
 - Shanghai Highway Integrated Management System (HIMS)
 - Four modules: PMS, Bridge Management System (BMS), ancillary management system (AMS) and Drainage Management System (DMS)
 - In charge of 3962km of roads, 3272 bridges, 5500 culverts, 200, 000 m of retaining wall

Other Aspects of China PMS Development

- Integration of GIS with PMS
 - Shanghai HIMSGIS: manage and maintain the arterial roads in Shanghai in GIS mode
 - Shanghai highway authority intends to develop another system by incorporating the GIS system as an aid to manage the road facilities in the outer area of the city
 - RIOH also enriches the CPMS 2001 by adding GIS and Image Information System.

Problems and Future Prospects

- Acceptance and Technical Skills of Staff
- Further Technical Development
- Geographic Coverage



Problems and Future Prospects

- Acceptance and Technical Skills of Staff
 - Application of PMS is still not widely accepted by transportation departments in China
 - Too much focused on road construction, not on road maintenance
 - Level of management sophistication is not high in most transportation departments
 - It is necessary to provide PMS technical training to a substantial number of people, including legislators, administrators, engineers, and technicians

Problems and Future Prospects

- Further Technical Development
 - The development of PMS in China is mainly focused on the network level
 - No interaction between two levels of PMS development
 - More effort should be put into development of project level PMS modules and interaction modules between both levels
 - Future work could also be conducted on the integration PMS with other system (such as ITS)

Problems and Future Prospects

- Geographic Coverage
 - In China, soil conditions and climate conditions vary significantly from place to place, a single PMS throughout the country is not appropriate
 - Local authorities should be encouraged to have considerable flexibility in adapting or developing a PMS to their needs and conditions

Summary and Conclusions

- Since the introduction of PMS into China in early 1980s, significant progress has been made.
- PMS implementation in China has not gone so well as its R&D due to less focus and acceptance
- Acceptance of PMS usage and legislation for ensuring PMS implementation are more important than improvement of technical shortcoming in the future

Summary and Conclusions

- For better application of PMS in China, recommendations are made to conduct training on administrators and technicians for the purpose of wide acceptance of PMS usage and to conduct research into theoretical and practical problems related to PMS
- It is estimated that full implementation of PMS in China may take as least 10 to 20 years

