




MODULE 2 


PAVEMENT MANAGEMENT SYSTEMS OVERVIEW



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Instructional Objectives

- € Provide a historical perspective of the evolution of PMS over the last 20 years
- € Describe the basic components of a PMS
- € Discuss how the products are used to aid decision making
- € Be aware of current state practice

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Importance of Transportation System

- € Transportation Statistics
- € Economic Importance
- € Movement of Freight

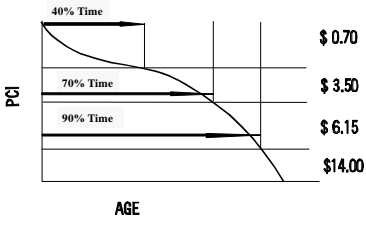
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Importance of Pavements

- € Pavements deteriorate with time
- € Utah study
- € Good roads cost less
 - If maintained at a reasonable level of service
 - If responsive to preventive maintenance


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Effect of Treatment Timing on Costs



The graph plots PCI (Pavement Condition Index) on the y-axis against AGE on the x-axis. A downward-sloping curve shows the relationship. Three horizontal lines represent different PCI levels: 40% Time, 70% Time, and 90% Time. Corresponding cost values are listed to the right of the graph.

PCI Level	Cost
40% Time	\$ 0.70
70% Time	\$ 3.50
90% Time	\$ 6.15
(Baseline)	\$14.00

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Support for PMS

- € FHWA
 - Training courses
 - Seminar and workshops
 - Technical assistance
- € AASHTO
 - Guidelines in 1985, 1990
 - New guidelines 1999?



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Historical Perspective

- Early PMS
- AASHTO & NCHRP research
- 1985 AASHTO Guidelines on P M
- 1989 FHWA Policy on PM
- 1990 AASHTO Guidelines for PMS
- ISTEA of 1991



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Early PMS

- Washington
- Arizona
- Utah
- South Dakota
- US Army Corps of Engineers



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1986 AASHTO Guidelines

- Introduced and defined PMS
- Supported development and implementation of PMS



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1989 FHWA PMS Policy

- Required all states to have PMS to manage their Federal Aid Highways (Interstate, Principal)
- Condition of funding



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1990 AASHTO Guidelines for PMS

- Developed under guidance of AASHTO Task Force on Pavement Management
- Specific project with limited scope
- Prepared by F. Finn and D. Peterson
- Limited to 35 pages



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Scope of 1990 AASHTO Guidelines

- Described the basic characteristics
- Identified the components of a PMS and role
- Described development, implementation and operation steps
- Described the products
- Defined the role of communications



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Intermodal Surface Transportation Efficiency Act of 1991

- € Required all States to have a PMS that covered all Federal - Aid Highways
- € Tripled network covered
 - 916,200 centerline miles
- € Rescinded in 1995
- € Regulations
- € Components



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Data Collection

- € Inventory
- € History
- € Condition Survey
- € Traffic
- € Data Base



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Analysis

- € Condition Analysis
- € Performance Analysis
- € Investment Analysis
- € Engineering Analysis
- € Feedback Analysis



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Proposed Resolution National PMS Workshop New Orleans, July 1997

Proposed resolution centered on:

- € PMS is good business practice
- € Objective measures and protocols for pavement condition
- € Local/regional criteria necessary
- € Transparent modeling/analysis
- € Top level management support



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1990 AASHTO Guidelines for PMS

“A Pavement Management System is designed to provide objective information and useful data for analysis so that highway managers can make consistent, cost-effective, and defensible decisions related to the preservation of a pavement network.”



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Typical Modules of a PMS

- € Database
- € Analysis
- € Feedback



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Types of Data

- € Inventory
- € Information relative to pavement condition
- € Construction, maintenance, and rehabilitation history
- € Traffic
- € Cost data



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Database Reports

- € Pavement Condition Deficiency Reports
- € Pavement Condition Performance Histories
- € MR&R Actions
- € Pavement Inventory and Ranking



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Analysis Methods

- € Pavement Condition Analysis
- € Priority Assessment Models
- € Network Optimization Models



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Condition Analysis

- € Combines the pavement distress data into a score or index
- € Represents overall pavement condition
 - Describes system condition
 - Uses priority ranking scheme
 - Uses decision tree approach as primary criteria to select project, timing, and treatments



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Condition Analysis Outputs

- € Ranking of pavement segments by condition index
- € Identification of MR&R strategies and timing for individual pavement segments
- € Estimate of funding needs for selected treatments



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Prioritization Models

- € Optimal MR&R strategies based on life cycle costs
- € Projects are prioritized at the network level
- € Benefit/cost ratio and cost effectiveness are more prevalent methods



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Prioritization Output

- € **Prioritized listing of projects requiring action**
- € **Costs for MR&R treatments**
- € **Funding needs to meet desired network condition**
- € **Single-year and multi-year with segments treatment timing and cost identified**



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Optimization Models

- € **Identifies network MR&R strategies by:**
 - Maximize total network benefits or
 - Minimize network costs
- € **Simultaneously evaluates entire network**



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Optimization Output

- € **Similar to prioritizing model**
- € **Identifies an optimally balanced MR&R program**
- € **Optimization models do not normally identify segment priorities**



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Feedback Process

- € **A variety of processes are used to confirm reliability of PMS**



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Network Level PMS

- € **Establish network budget requirements**
- € **Allocate funds to network priorities**
- € **Schedule MR&R actions**



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Network Level Products

- € **Pavement network condition**
- € **MR&R policies**
- € **Budget requirements**
- € **Network priorities**



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Project Level PMS

- € Primary objective is to provide information for specific pavement segments:
 - Preferred MR&R for each project
 - MR&R costs
 - Expected MR&R performance.



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Budget Requirements

- € Provide an estimate of budget requirements
- € At prescribed levels of performance



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Data Collection Needs

- € Inventory
- € Traffic/ Load
- € Pavement Condition Survey



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Inventory Data

- € Route Number
- € Functional Class
- € Length
- € Pavement Type
- € Pavement Width
- € Lane Number and Width
- € Shoulder Type and Width
- € Layer Thickness
- € MR&R History



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Traffic/Load Data

- € ADT (used to establish priorities)
- € ESAL (for prediction and treatment selection)



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Pavement Condition Survey

- € Ride quality or roughness
- € Physical distress
- € Structural capacity
- € Safety



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Pavement Condition Survey (other issues)

- € **Historical**
 - Rate of deterioration over time under accumulated traffic loads
- € **Frequency**
 - Depends on the type and age of pavement measured as well as the cost of the survey and the need for timely data
- € **Quality Control**
 - Inventory and condition data is essential to the success of a PMS



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Current State of Practice in PMS

- € **Different PM methodologies Used**
- € **50% use**
 - pavement condition analysis
- € **50% use**
 - network optimization
 - priority assessment
 - other approach
- € **FHWA 1996 Survey**
 - Detailed survey of state in workbook



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