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Why Pavement Management???

- Pavements are expensive
- Budget constraints
- Accountable for infrastructure assets
- Move from reactive to proactive management of pavement repairs
Some Challenges of Starting a PM System

- A different way of doing business
- Staffing issues
- Start up costs
- Tried it before…never worked out
Different Way of Doing Business

Pavement Management supports this new way of doing business
Different Way of Doing Business

Change The Way Assets Are Managed

- Increase service life
- Improve performance
- Preserve asset value
- Reduce annualized costs

Tell The Story More Effectively

- Document needs
- Improve accountability in decisions
- Assess and manage risk
- Make better use of technology
What Is Pavement Management?

• ...a management approach used by personnel to make cost-effective decisions about a road network.

  AASHTO Pavement Management Guide (2001)

• A pavement management system is a set of tools or methods that assist decision-makers in finding optimum strategies for providing, evaluating, and maintaining pavements in a serviceable condition over a period of time.

Pavement Management Concept

- $X/mile
- $~4X/mile
- $~6-10X/mile
- $>10X/mile

Pavement Condition:
- 40% of life
- 70% of life
- 90% of life

Pavement Age:
Three Levels of Pavement Management

• Network Level
  – Collect condition information on the network
  – Analyze condition information
  – Provide information to upper management to assist in making strategic decisions
  – Provide information to other users to support project selection, design, and other types of analyses
Three Levels of Pavement Management

- **Strategic (Policy) Level**
  - Make policy decisions
  - Set funding allocations
  - Establish preservation strategies
  - Identify corridor projects

- **Project Level**
  - Determine final project recommendations
  - Design rehabilitation strategies
  - Conduct special studies
Benefits of Pavement Management

• More efficient use of available resources
• Ability to justify funding needs
• More accurate and accessible information on the pavement network
• Ability to track pavement performance
• Present consequences of different treatments and timing
• Improved communication

AASHTO Pavement Management Guide (2001)
Pavement Management Components

- Network Inventory
- Network Definition
- Condition Assessment
- Database
  - Reports
  - Analysis Tools
  - System Customization (Models, Costs, Treatment Rules)

Pavement Management System
Network Inventory

• Type of Data to be Collected
  – Physical characteristics
  – Construction and maintenance history
  – Traffic levels and/or street classification
  – Soils information

• Minimal Amount of Information Required
  – Surface type
  – Physical dimensions (length, width, area), From/To
  – Last construction date (or best guess)
Street Segmentation

• The general rules for segmentation are
  – Same surface type
  – Similar construction age, condition range
  – Contiguous
  – Similar maintenance and traffic characteristics
  – Think of them as management units
    • Those that are managed together get segmented together
All pavement management recommendations are based on the most recent condition assessment.

Therefore, the assessment of current condition MUST be objective, repeatable, and reflect current conditions.
Types of Pavement Condition Data Collected

- Surface distress (ex. cracking, surface deformation)
- Roughness (ride quality)
- Faulting
- Rutting
- Structure (pavement strength and deflection)
Pavement Distress

• Type – what kind?
• Severity – how bad?
• Quantity – how much?
Methods for Quantifying Pavement Condition

• Pavement Condition Index (PCI)
  – ASTM D6433
• Modified PCI
• Windshields
Customization Activities

• Performance models
• Priority ranking
• Viable treatment options (& conditions to apply)
  – Maintenance (ex. crack sealing, patching, etc.)
  – Major repair (overlay, slab replacements, reconstruction, etc.)
• Costs
  – Unit costs, annual budgets
Why Use Performance Models?

- Needs assessment $$$
- Multi-year workplans
- Predict condition
- Predict M&R
- What-if analysis

Performance models
Example Performance Model

Curve flattens (age 12–20 yrs)

Age (each line represents 3 years)
Family Modeling Approach

- Group pavement sections by characteristics
- Reduces number of variables and models
- Assume similar deterioration
- Reflects average deterioration for family
- Allows ranges of values to be used for developing families
Other Customization Activities

• **Treatment Costs**
  – Based on recent bid documents
  – May vary based on certain factors (location, street network, and so on)

• **Budgets**
  – Funds available for each analysis year
  – Some agencies have separate budgets for maintenance and rehabilitation activities
Methods of Managing Assets

Pavement Condition

Good

Poor

Traditional Worst First Strategy

Preservation Approach
What Is Pavement Preservation?

- Preventive Maintenance
- Routine/Corrective Maintenance
- Rehabilitation
- Reconstruction

Pavement Condition vs. Time: Good to Poor Condition
Getting the Most Bang for Your Buck

Condition Deterioration & Treatment Triggers / Resets

From Utah DOT
Keys to Success

- Be **proactive**
- Keep roads from dropping into poor condition
- Incorporate a **mix of fixes** into your program

A pavement management system helps identify **what** treatments are needed and **when** they are cost-effective.
Resource Allocation and Utilization

• Sample network distribution
  – Initial distribution: 25 mi in good, 50 mi in fair, and 25 mi in poor

• 20 year repair cycle = 5%/year = 5 mi/year
• 10% deterioration from good & fair each year
• $500 available ($100/mi to fix poor & $25/mi to fix fair)

• Scenario 1: Fix roads in poor condition
  Scenario 2: Fix some roads in poor & some in fair
Sample Outputs After 3 Years

Now

Scenario 1

Scenario 2

Legend:
- Good
- Fair
- Poor
Demonstrating Pavement Preservation Benefits

Average Pavement Condition over Time

- **Pavement Condition Rating**
- **Year**
- **Worst First**
- **Pavement Preservation**
Using Pavement Management To Tell Your Story
5 Core Questions

1. What is the current state of our pavements?
   • What do we own?
   • Where is it?
   • What condition is it in?
   • What is the remaining service life and economic value?
5 Core Questions

2. What is the required level of service?
• What do stakeholders expect?
• How different is this from actual conditions?
3. What level of deterioration is acceptable?

• How do these assets deteriorate?
• What are the likelihood and consequences of deterioration?
5 Core Questions

4. What are the feasible strategies to consider?
   • What repair options are most feasible for our agency?
   • How do these strategies impact system performance?
5 Core Questions

5. Which long-term funding strategy should be selected?

• Does the selected strategy align with policy goals?
Reporting Network Conditions
Determining Impacts of Program Choices

![Bar chart showing Pavement Condition Index (PCI) for different years and programs.](chart.png)

- **Pavement Condition Index (PCI)**
- **Program Year**
- **Alternate Repair Program**
- **Recommended Repair Program**
Compare Various Budget Scenarios

- Unlimited Funding
- No Funding
- Eliminate Backlog in Five Years
- Maintain Condition

Year (2014-2024)
PCI (50-100)
Setting Agency Goals

Cumulative Cost ($)

- 70% in Good
- Expected $
- 75% in Good

Year

1 2 3 4 5

$0 $500,000 $1,000,000 $1,500,000 $2,000,000 $2,500,000 $3,000,000 $3,500,000

70% in Good 75% in Good Expected $
Presenting Results to Stakeholders

- **Network Level**
  - City Counsel/County Board
  - Senior agency management
  - Public

- **Project Level**
  - Design engineers
  - Mid-level management
Don’t Take My Word For It…

• “Due to the state of the economy, the pavement management system has become more important” – City of Naperville, IL

• “We are now able to reduce political pressure” – Champaign County, IL

• “Complete the right work at the right time for the right reasons” – Edgar County, IL

• “We wanted to have more engineering behind decisions.” – Stark County, IL
Take Away Points

• Start with the basics, then grow it
• Identify your agency’s PM champion
• Don’t rely on a worst first strategy
  – Use a mix of fixes that includes preventive maintenance treatments on roads in good or fair condition
• Consider the use of pavement management tools to:
  – Help you make the best use of your road $
  – Help you tell your story
Questions?
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