Evaluating the Economic Benefit of Pavement Preservation

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Outline of Presentation

• Background
• Material Characterization
• Pavement Design and Field Investigations
• Pavement Management
• Closing thoughts
Background

1. CPATT’s initiative involves an integrated program of field and laboratory research.
2. Focus on emerging and innovative technologies.
4. Train and educate next generation.
5. Sustained partnerships.
6. Provide national and international leadership.
Background

• Leading the Development of the Transportation Association of Canada (TAC) design guide
• Resulted in many positive changes to Canadian standards and specifications
Background

• Examine use/cost effectiveness of Preventive Maintenance (PM)
• Compare PM to Conventional Maintenance Strategies (CMS)
• Uses the Ontario road network as a basis for examination
• Limited long term performance information of PM strategies
Background

- Limited data on cost effectiveness
- Primarily use CMS, based on distress surveys and worst first repair strategies
- Road Network:
  - Provincial System: 25,245km
  - Municipal System: 132,669km
Long-Life Pavement Designs:

- Strain ($\mu\varepsilon$) vs. Time (Sec.)
- Model Validation - Both Perpetual Pavement Model

![Image of pavement design and equipment]
Colored Asphalt

Tailoring the amount of FINE and COARSE aggregate
Colored Asphalt

Tire Marks and Scuffs
Application of RAS into HMA:

2009

2010
Surface Texture and Noise:

Measures noise produced from the vehicle pass-by 1.5 m above road grade.
Asset Valuation:

- Classes/Types of Assets, Locations, Amount of Extent
  - Current Status or Conditions
  - Current Asset Values
  - Current Underperforming (Deficient) Assets

- Potential Future Underperformers
  - Programs – Costs – Returns
  - Future Asset Values

- Decision Process
- Implementation
- Corporative Database and Executive Information System

TAC 2013
Experimental Design

- Road classifications
- Pavement surface type (flexible)
- Traffic level (low, medium, high)
- Performance index (PCI, RCI, DMI)
- Pavement structure (layers, thickness)
Experimental Design

- Geometry extent (one lane km)
- Environmental conditions (Northern or Southern Ontario)
- Subgrade conditions (weak, medium, or strong)
- Timing of PM strategy
Experimental Design

- Provincial (Collector, Minor Arterial, Principal Arterial, Freeway)
- Municipal (Local, Collector, Arterial)
- Northern or Southern
- Urban or Rural
- TOTAL 20 Functional Categories
Experimental Design

- Road classifications
- Pavement surface type (flexible)
- Traffic level (low, medium, high)
- Performance index (PCI, RCI, DMI)
- Pavement structure (layers, thickness)
Experimental Design

Selection of Feasible Alternatives

- Spray Patching
- Crack Sealing
- Hot Mix Patching
- Slurry Seals
- Chip Seals
- Fog Sealing
- Thin Cold Mix Overlay
Experimental Design

Selection of Feasible Alternatives

- Thin Overlay
- Mill & Patch 10%
- Mill & Patch 20%
- Micro-surfacing
- Rout & Seal
- Moderate Overlay
Experimental Design
Experimental Design

- Provincial Northern Urban Collector
  - PCI < 55
    - Yes: Rehabilitation
    - No: Poor Subgrade
      - Mill & Patch 10%
      - Fair Subgrade
        - Spray Patching
      - Good Subgrade
        - Spray Patching
Verification

- Does treatment appear to be appropriate for given design scenario?
- Would plan be consistent with fiscal policy?
- Is treatment available?
- Initial Construction Costs
- Maintenance Costs
- Rehabilitation Costs
- Salvage Value
- Discount Rate
- Analysis Period
Results

- Majority of road classes: Hot Mix Patching 10% and Hot Mix patching 20% was most cost effective
- Higher the traffic level, overlays were more effective
- Seals were most effective on lower traffic volumes
Results

- Some cases where PM only provided slight improvements
- Also indicated that all 15 types of treatments are viable options given road type/environment
- Environmental conditions had an impact on the choice of treatment
Closing Thoughts

• Experimental Design in Engineering Research Important
• Framework presented which uses a near optimization for evaluating effectiveness
• Uses several key design parameters to evaluate PM treatments
• Challenge – is to determine the most appropriate time to apply the treatment
• Develop long term data that provides service lives for maintenance treatments
Thank you

Questions?