Asphalt Pavement: Management and Rehabilitation
Learning Objectives

- Overview of pavement asset management
- Applicability of Paver software
- Optimization of asphalt rehabilitation options
Road Map

- Overview of a pavement asset management plan using the Pavement Condition Index (PCI)-(Khankarli, UTA)
- Overview of applicability of PCI to the City of Weatherford pavement asset management program-(Leppla, Weatherford)
- Overview of the Accelerated Pavement Testing (APT) process for HMAC pavement solutions-(Romanoschi/Khankarli, UTA)
Pavement Asset Management

• Background:
  ◦ Need to have a systematic approach to prioritize project needs
  ◦ Need to balance costs, opportunities and risks with expected performance
  ◦ Use of an analytical process with a life cycle component

• Key benefits:
  ◦ Improved financial performance
  ◦ Improved investments decisions, efficiency and effectiveness
  ◦ Improved management of risks
  ◦ Improved transparency and compliance
Pavement Asset Management

- Key success points:
  - Clear mission/vision
  - Alignment with mission
  - Full integration
  - Full commitment

- Organizational goals set the target performance

- Applicable standards:
  - ASTM D6433
  - ISO 55000
Steps in the Rehabilitation Process

1. Pavement Data Collection
2. Project Evaluation
3. Select Feasible Alternatives
4. Reconstruction, Restoration, Recycling, Resurfacing

Monitor Performance:

- Detailed PS & E
- Construction

Select Preferred Alternatives:

- Life-cycle costs
- Non-monetary factors
Pavement Condition Index (PCI)

- PCI is the quantitative analysis needed to develop the optimal solution.
- PCI uses a scale of 0-100 with 100 being the best.
- It is based on type, severity and extent of "individual" defects to yield 'deduct' points subtracted from 100.
- A correction factor is used to account for the combination of different distresses.
What do you measure to determine pavement condition?

- **Surface Distress**
  - Collected by visual survey, Image processing, photo log
  - In practice, the condition is described by quantifying defects:
    - Type
    - Severity
    - Extent

- **Structural Integrity**
  - Falling Weight Deflectometer (FWD)

- **Ride Quality**
  - Observer rating
  - Vehicle Response Meter
  - Profile Measurement

- **Skid Resistance**
  - Portable skid tester
  - Rolling/locked wheel
Typical Section
Flexible Pavement

HMAC
Base Course
Subbase /Treated Subgrade
Subgrade

G. A. Khankarli
Pavement Condition Index (PCI)
Applicability of PCI to the City of Weatherford’s AM Program
Overview:

- 189 miles of roadway
- $1.3M maintenance budget
Implementation

- Why is there a need?
  - Prioritize efforts
  - Develop annual budget
  - Strengthen Community

- Pavement Survey

- Software...Integration with Cityworks and MicroPaver

- Day to day maintenance work needs to reflect O.C.I.
Overall

- Approximately 6 miles of road maintenance annually
- Community Goal: Road Network O.C.I. >65

<table>
<thead>
<tr>
<th>Maintenance Type</th>
<th>Total Segments</th>
<th>1920 (189 Miles)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Depth Rehabilitation</td>
<td>346</td>
<td>18%</td>
<td></td>
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<tr>
<td>Overlay</td>
<td>330</td>
<td>18%</td>
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<tr>
<td>Preventative Maintenance</td>
<td>535</td>
<td>28%</td>
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<tr>
<td>Limited Action</td>
<td>708</td>
<td>37%</td>
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</tr>
</tbody>
</table>
Current Pavement Condition
USE of APT for Optimal HMAC Solutions

- Standard approach
  - Trial/error
  - “This is how we have done it in the past”

- APT concept: APT is generally defined as “a controlled application of a realistic wheel loading to a pavement system simulating long-term, in-service loading conditions”.

- APT advantage:
  - It uses of a test track with actual traffic and/or a specialized load frame that applies an adjustable weighted load in a linear or circular setup.
  - It allows the monitoring of a pavement system’s performance and response to accumulation of damage within a short time frame.

- Can be customized to locality through field testing prior to implementation of the conceptual solutions

- This ws for cost savings realization
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USE of APT for Optimal HMAC Solutions
Example Savings on a TxDOT Project

- **Experiment**: Evaluated the fatigue cracking, reflection cracking and rutting resistance of four asphalt surface mixes: one with no recycles material, one with 19% RAP, one with 15%RAP and 3%RAS and one mix with 15%RAP and 3%RAS but designed with the Balance Mix Design (BMD) concept

- **Value**: Since approximately 10 million tons of HMA with RAP/RAS is placed every year in TxDOT projects, at an average cost of $70 per ton, only a 5% performance increase of these mixes due to the implementation of the research findings from this project brings an estimated 35 million dollars in annual savings to TxDOT

- This approach may result in further optimization of the use of your resources
Summary

- Using an integrated Asset Management program will help optimize use of scarce resources while providing longer performing pavements.
- Use of an APT customization approach will help you with the optimized use of your scarcely available funds.
- A pooled effort can be used to perform the APT test.
Q & A

- THANK YOU!
Other References

- Texas Department of Transportation (TxDOT). 2014. *Standard Specifications for Highways and Bridges*. TxDOT