New Tools that Support Use of Pavement Management Data in Engineering Applications

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Pavement Management Systems are Maturing

- Historical pavement performance data is now available covering multiple pavement rehab cycles
- New Information Technology developments provide enhanced and integrated data analysis capabilities
- Relational databases, network level pavement structural data, and powerful software such as SAS now allow large scale analysis of performance
Historical Performance Data

- Pavement Condition Survey data is available in Florida back to 1976
- This allows pavement rehab cycles to be determined even when not all project data is available
- Changes in Rating Technologies and Policies create challenges in analysis
  - New rating equipment such as lasers replacing ultrasonics
  - Rating scale changes
  - Missing years
New Information Technologies

- **Internet and Intranet**
  - Thin client web browsers allow graphical user interfaces with minimal development time and maintenance
  - Internet protocols and tools allow seamless integration of multiple applications
  - Desktop color laser printers provide enhanced reporting capabilities
Relational Databases and Networks make Access to Data faster

- Intuitive data tables, Structured Query Language (SQL), and SAS software for data manipulation and analysis make development of analysis programs easier
- Additional data now available as more systems are automated and historical data is kept in databases
- High speed networks and integration of mainframe and server applications allow quick analysis of huge volumes on data
Integrated Applications Examples

- Rated Pavement Sections linked to video logs
- Video logs linked to web based GIS maps
- Statewide pavement coring and as-built data linked from Turnpike Enterprise Asset Management System (TEAMS)
- Hidden form elements and XML used to pass parameters between applications
Florida Department of Transportation

Pavement Management Online Reports

Performance Information - reads and reports on the following data:
- Pavement Condition
- PCS x Road Names
- PCS Cycles
- Performance Analysis
- Pavement Rutting Report
(Modified: 20-Jan-2004)

Materials Information - reads and reports on the following data:
- CQR: Lab Report Info
- CQR: Lab Report Info (Excel Output)
- Gmm Statistics
- Gmm Statistics by Job No
- Mix Design
- Type Mix
(Modified: 20-Jan-2004)

Inventory Information - reads and reports on the following data:
- As-Built
- Coring Report
- Existing Pavement Structure
(Modified: 21-Jan-2004)
## Rated Pavement Sections

**performance charts**

and links to video log

### Pavement Condition Survey

*For Leon County*

*Other Conditions: Critical Value=6.4, Section=320*

<table>
<thead>
<tr>
<th>Roadway ID # (section graph)</th>
<th>SR</th>
<th>US</th>
<th>Begin Mile Point (history link)</th>
<th>End Mile Point</th>
<th>Rtery Side</th>
<th>Posted Speed</th>
<th>AADT</th>
<th>Tentatively Planned Project</th>
<th>Current Point Age In Yrs</th>
<th>Cracking 2005</th>
<th>Ride 2006</th>
<th>Rutting 2006</th>
<th>Video Log</th>
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<td>Picture</td>
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*This request took 3.42 seconds of real time (VR 1 Build 1461).*
Pavement Condition Survey

History for Roadway ID 55320000

Milepoints 15.665 to 22.2, Roadwayside = R

2011 forecast created using simple linear regression.
Roadway Name: INTERSTATE 10
Frame Date: 03/28/2005
Frame: 1684

- Front Full-sized Frame
- Right Full-sized Frame

Frame Backward  Play Backward  Stop  Play Forward  Frame Forward

Play Speed: 1 fps 2 fps 3 fps 4 fps

Message: Roadway Segment

Email questions and comments to the Webmaster or webmaster@dot.state.fl.us

FDOT Office of Information Systems
Video log linked to web based GIS

[Image of a web-based Geographic Information System (GIS) interface with a map and various layers and options for data visualization.]
Pavement Coring and As-built Data

Florida Department of Transportation

Pavement Inventory Information

- Pavement Evaluation Coring and Condition Data - reads and reports on PCR data. (Modified: 30 May 2003)
- As-Built Data - reads and reports on As-built Pavement Data. (Modified: 8 Jan 2004)
- As-Built Input Check - reads and reports on Mix Design Data. (Modified: 8 Jan 2004)
- Existing Pavement Structure - reads and reports on the following data: (Modified: 17 Feb 2004)

All of the above reports use the SAS/IntrNet® product to read mainframe data.

**Important Note:** The graphics produced in these reports are optimized for Internet Explorer, the Department standard. They should work with Netscape 4.x but will not work with Netscape 6.

If there is additional information you would like to see on the reports or you have a suggestion for a new report, please contact us: If you get a "cannot connect to server" message, contact your help desk and tell them that the SAS/IntrNet server is down.
Statewide pavement inventory reporting also linked from TEAMS system

- Turnpike Enterprise Asset Management System (TEAMS) crosses district geographical boundaries and has unique features
- It is a Web based system based on Turnpike Regions for data selection
- Linking with the statewide pavement inventory application was possible with minor modifications
- Data parameters are passed by defining the data through XML
## Pavement Evaluation Coring and Condition Data Report

Click on an **Item** link to view the Pavement Evaluation Coring and Condition Data Report.

<table>
<thead>
<tr>
<th>Item - Seg</th>
<th>Roadway ID</th>
<th>Typical Section #</th>
<th>Lane</th>
<th>Beg MP</th>
<th>End MP</th>
<th>Local Name</th>
<th>Limits From</th>
<th>Limits To</th>
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<td>L1</td>
<td>31.074</td>
<td>34.968</td>
<td>RESURFACE ST. LUCIE</td>
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</table>

*Output produced by "pccd2.sas" program.*

*This request took 0.89 seconds of real time (v9.1 build 1461).*
Statistical Analysis of structural performance

- Network Level Structural information in databases can be combined with performance history database
- Average performance comparisons in near term
- Survival analysis for longer term
- Example: 5 year performance comparison of Superpave and Marshall mix design performance
Superpave and Marshall Mix Design Performance Comparison by Region

![Bar chart showing Mean Rut Rating over Years after Construction for North and South Marshall and SuperPave designs.](chart.png)
Performance Analysis Challenges

- Quality and completeness of data
- Minor rated section limit changes from year to year complicate combining data
- Project limits different from rated section limits
- How to account for sections overlaid for capacity purposes rather than condition
- Engineering judgement still needed and data must pass the test of common sense