

Pavement Management 101

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What is Pavement Management?

It is 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.

*AASHTO Guide for Design of
Pavement Structures (1993)*

What is Pavement Management?: Plain Language Version

- When (PM 101)
- Which roadways (PM 101)
- What treatment (PM 101)
- How much money (PM 102)
- System-wide planning (PM 102)

To make these decisions, we must first know the “why”

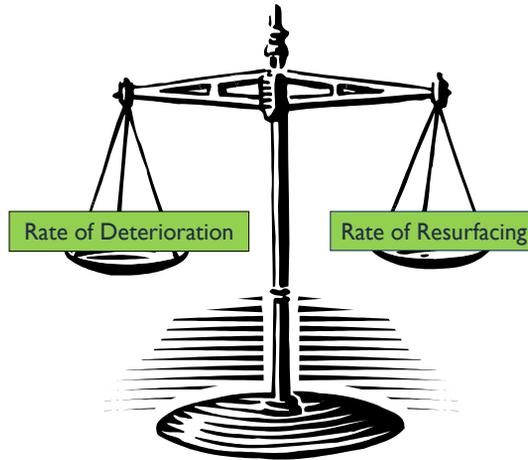
3

Why We Resurface Roads

- Long Range Objective – Preserve the State Highway System
- Short Range Objective – Through the Tentative Work Program, ensure that 80% of pavement on the SHS meets Department standards

4

Section 334.046 of Florida Statutes: "Ensuring that 80% of the pavement on the SHS meets Department Standards"



Achieved by balancing the rate of deterioration with the rate of resurfacing

5

Why We Resurface Roads

- Projects are chosen in accordance with the criteria of *safety*, *preservation of the system* (cracking or other structural deficiency), *ride* (roughness), or other as needed to maintain the System's integrity.

Safety: Wheelpath Rutting, Friction

Preservation: Cracking, Delamination, Potholes, Spalling, Raveling, Patching, Depressions

Ride: Rippling, Faulting, Utilities, Public Complaints

6

Project Eligibility Criteria

- Projects are programmed to correct deficient segments.
- The Pavement Condition Survey (PCS) rates pavement segments on a scale of 0 (worst)-to-10 (best). Flexible pavements are rated for rutting, cracking, and ride. Rigid pavements are rated on defect and ride.
- Pavement segments having any rating ≤ 6.4 are classified as deficient.
 - Exception: A segment with a posted speed limit of < 50 mph and whose ride rating is between 5.5 and 6.4 while its other ratings are greater than 6.4.

7

Project Eligibility Criteria

Work Program Instructions:

Construction phases for pavement segments rated 7 and projected to be deficient by the year of construction may be gamed for adoption in the third year of the new five-year work program.

However, due to the variability in pavement deterioration rates, *it is not recommended* that construction phases be gamed for non-deficient sections in the last two years of the work program.

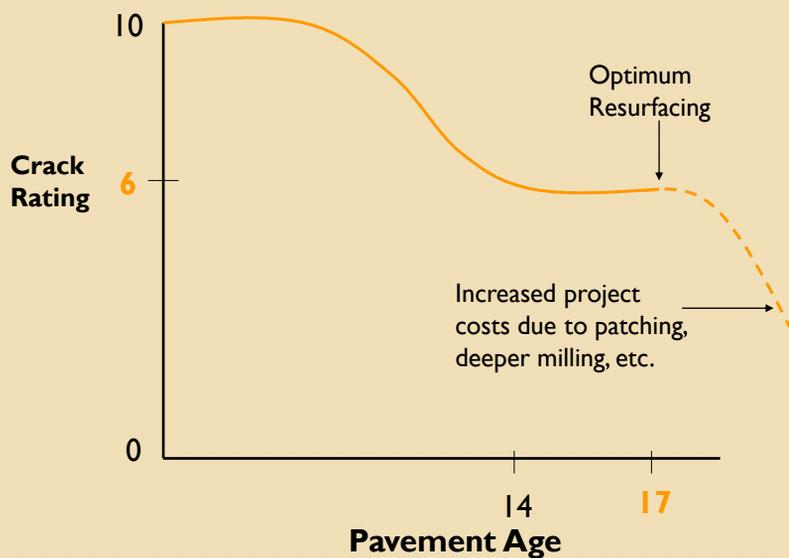
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When to Resurface

- New resurfacing projects are programmed for the new 3rd year of the 5 year work program.
- Pavement condition deterioration typically accelerates with time.
- In order to resurface pavements at the *optimum time*, they need to have been identified, gamed in the work program, and designed prior to reaching that critical stage.

9

Graph Showing Typical Optimum Time for Resurfacing



10

Which Roadways?

- Complicated process involving many factors
 - Pavement Condition Ratings
 - Type of Distress
 - AADT
 - Truck Volume
 - Age
 - Surface Type
 - Location
 - Maintenance Issues

Ultimately, the decision to rehabilitate a roadway segment comes down to engineering judgment, based on the available information and experience.

11

Which Roadways?: Pavement Condition Ratings

- Good starting point:
 - Easily identify deficient roadways
 - Easily identify good performers
 - Allows initial screening:
 - Definitely needs to be resurfaced
 - Maybe needs to be resurfaced
 - Definitely does not need to be resurfaced
- Not nuanced enough for complete picture
- Sorting through the “maybes” requires other analysis

12

Which Roadways?: Pavement Condition Ratings

- Type of Distress:
 - Wheelpath Rutting:
 - Most critical concern, least prevalent distress
 - Safety issue at high speeds
 - Cracking:
 - Most common distress
 - Allows infiltration of water into pavement structure
 - Left untreated, can lead to reconstruction
 - Ride Quality:
 - Forms public opinion
 - Poor ride leads to user costs in the form of vehicle maintenance

13

Which Roadways?: Other Factors

- AADT:
 - Increases the costs and benefits of resurfacing
 - Delays associated with resurfacing (lane closures)
 - Higher construction cost with higher AADT
 - Benefits of resurfacing reach a larger number of people
- Truck Volume:
 - Trucks contribute about 95% of all damage done to roadways
 - Higher truck volume tends to increase the rate of pavement deterioration

14

Which Roadways?: Other Factors

- Age:
 - Average non-deficient life for FDOT pavements: \approx 14 years
 - Standard deviation: \approx 5 years
 - Average age at resurfacing: \approx 17 years
 - Older pavements are more likely to experience a sudden, dramatic decrease in functionality than new pavements
- Surface Type:
 - Dense-graded: Typical age \approx 18 years
 - Open-graded: Typical age \approx 12 years
 - OGFC more susceptible to raveling
 - OGFC more likely to have rim marks from large trucks

15

Which Roadways?: Other Factors

- Location:
 - South Florida pavements generally deteriorate at a slower rate than those in North Florida
 - surface proximity of limerock
 - soil variability
 - construction methods
 - Presence of muck or other unsuitable embankment material
- Maintenance Issues:
 - Recurring roadway patches
 - Depressions at cross drains
 - Standing water during heavy rains

16

Which Roadways?: Finding Information

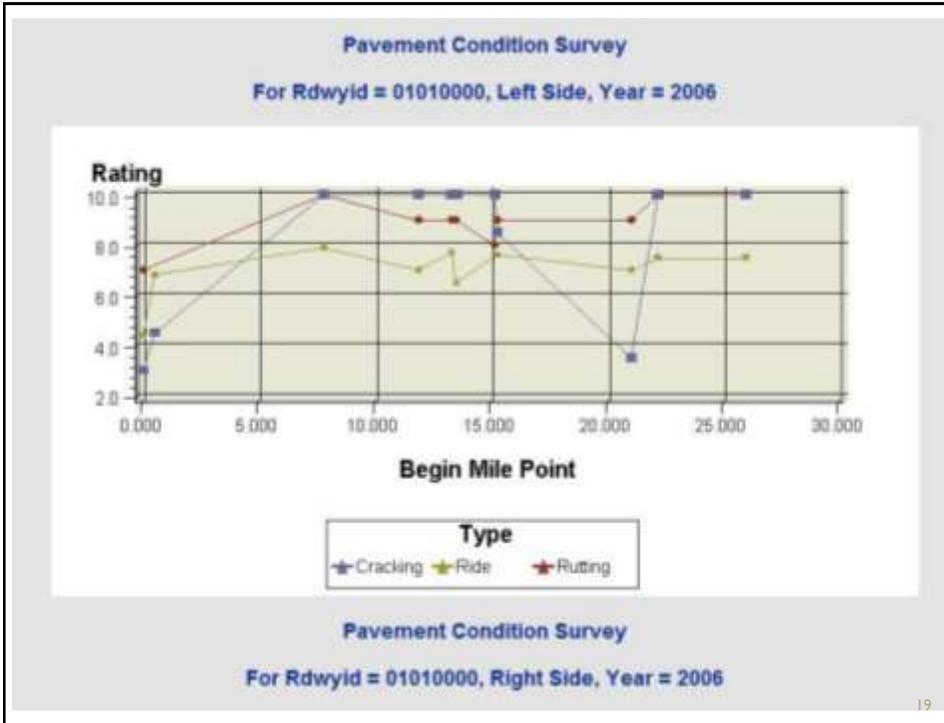
- Pavement Management Infonet
 - Numerous reports to provide necessary information
 - Includes data from PCS, RCI, Work Program, Construction, and Core Reports
 - Prepared reports issued in printer-friendly format
 - Dynamic reports allow specific, user-defined parameters

<http://infonet.dot.state.fl.us/PavementManagement/>

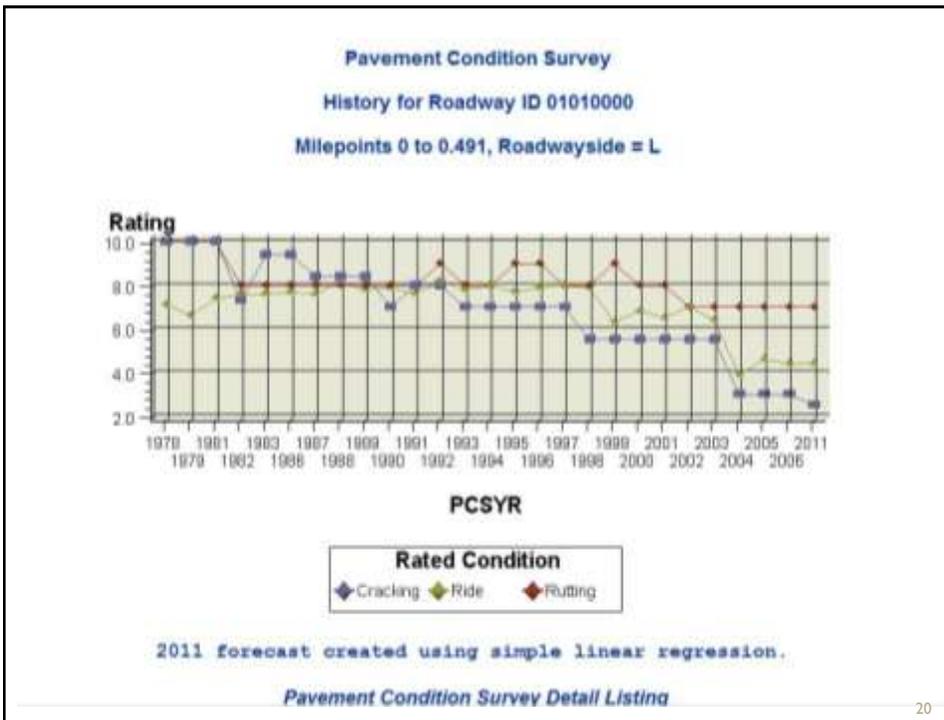
**Pavement Condition Survey
For District 1
Other Conditions: Critical Value=6.4**

Survey ID #	SR	US	Begin Mile Point (Station) (mi)	End Mile Point	Rwy	Posted Speed	AADT	Item Segment	Tentatively Planned Project				Current Pmtl Age in Yrs	Cracking 2006	Ride 2006	Rutting 2006	Vision Loss	
									Begin Mile Point	End Mile Point	Rwy	Year Bgn						
0000	45	41	0.000	0.481	L	65	3988	190001	8.000	5.427	E	2005/0012	25	3.1	4.4	7.0	Excl	
0000	45	41	0.000	7.777	R	85	1788	190002	8.000	5.427	E	2005/0012	38				Excl	
0000	45	41	0.000	4.868	L	65	1788	190003	8.000	5.427	E	2005/0012	29	4.5	6.8		Excl	
0000	45	41	0.000	7.777	L	65	1788	410004	5.400	7.717	E	2005/0012	38				Excl	
0000	45	41	0.000	11.887	L	65	3988						8	10.0	7.0	18.0	Excl	
0000	45	41	0.000	11.887	R	65	3988						8	8.5	8.1	18.0	Excl	
0000	45	41	0.000														9.0	Excl
0000	45	41	0.000														9.0	Excl
0000	45	41	0.000														9.0	Excl
0000	45	41	0.000														9.0	Excl
0000	45	41	10.125	10.235	C	65	3988						11	10.0			8.0	Excl
0000	45	41	10.235	21.621	L	45	4988						11	8.5	7.8		9.0	Excl
0000	45	41	10.235	21.621	R	45	4988						11	8.5	8.1		9.0	Excl
0000	45	41	20.001	22.145	L	45	4088	417201	21.021	22.142	E	2007/0012	17	3.5	7.0	9.0	Excl	
0000	45	41	21.001	22.145	R	45	4088	417201	21.021	22.142	E	2007/0012	17	3.5	6.8	9.0	Excl	
0000	45	41	20.145	25.946	L	55	3488						2	10.0	7.5	18.0	Excl	
0000	45	41	20.145	25.946	R	55	3488						2	10.0	7.5	18.0	Excl	
0000	45	41	0.000	0.190	C	45	2788						11	10.0			8.0	Excl
1101	45	41	7.326	2.942	C	35	2788	415401	1.326	2.942	L	2006/0012	23	8.5	4.3	7.0	Excl	
0000	35	17	0.000	18.337	C	65	1932	190702	8.000	12.000	E	2005/0012	21	4.5	7.5	8.0	Excl	
0000	35	17	0.000	0.867	C	35	658	190812	8.010	8.999	E	2006/0012	12	9.8	1.4	8.0	Excl	
0000	35	17	0.867	1.478	C	45	908						8	8.5	7.4	8.0	Excl	
0000	35	17	1.478	2.978	L	55	1988						12	7.5	7.4	9.0	Excl	

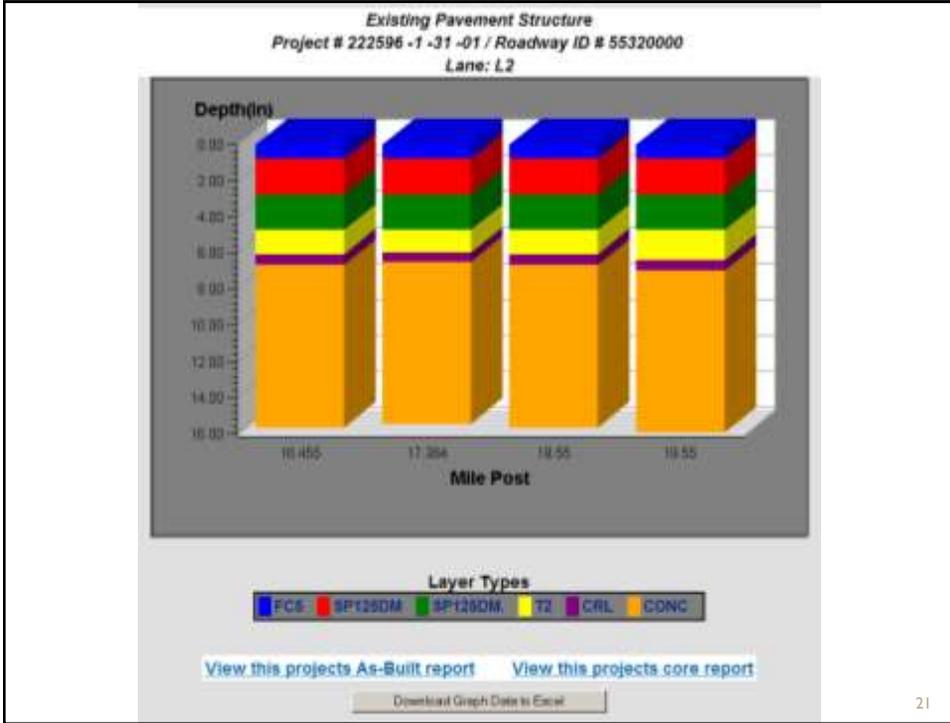
Following are examples of on-line reports available to aid the Districts in picking candidate resurfacing projects...



19



20



FLORIDA DEPARTMENT OF TRANSPORTATION 13:13 W
INTERSTATE SYSTEM PAVEMENT CONDITION FORECAST
 PAVEMENT IMPROVEMENT PROJECTS IN FM WPA TENTATIVE PLAN - 2008 - 2013, EXTRACTED ON 06/04/2008
 SORT BY RDWYID MILEPOST R ASCENDING L DESCENDING

DISTRICT = 5 COUNTY = DUMFRIES

RDWYID	SR	INTEN	ITMS1	CONT	ITMS2	DISTRESS SURVEYED YEAR	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	FUTURE
18130	93					1996														
						1997														
						1998														
						1999														
						2000														
						2001														
						2002														
						2003														
						2004														
						2005														
						2006														
						2007														
						2008														
						2013														
						(RFG)														
						CRACKING	10.0			10.0	9.4	9.4	9.4	9.4	10.0	7.0	7.0	7.0	7.5	
						RIDE	8.7			8.8	8.9	8.3	8.0	8.6	8.6	8.2	8.4	8.7	7.9	
						RUTTING	10.0			8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	
						CRACKING	5.5*	4.5*	3.5*		10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	8.0	7.5
						RIDE	7.7	7.7	7.7		9.0	9.1	9.1	9.0	8.6	8.5	8.3	8.1	7.9	7.2
						RUTTING	9.0	9.0	9.0		10.0	10.0	9.0	10.0	9.0	9.0	9.0	9.0	9.0	8.0
2426531						0.000	14.480													
						C 1997														
						0012														
						S														
						CRACKING	10.0													
						RIDE	8.0													
						RUTTING	8.0													
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						RIDE	8.0													
						RUTTING	10.0													
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						RUTTING	10.0													
						CRACKING	10.0													
						RIDE	8.0													
						RUTTING	10.0													

22

Which Roadways?: Engineering Judgment

- Field Review:
 - Single most important factor
 - Don't let numbers cloud the way of good judgment
 - Video Log not adequate – often outdated
 - Walk alongside the roadway at various points, see what is happening
 - Many distresses are not visible from the cab of a vehicle at traveling speed, but can be easily spotted from the roadway shoulder
 - Experience leads to knowledge about how certain distresses are likely to worsen over time, and which ones are most critical

23

Example of typical top-down fatigue cracking



24

Beginning of crack spalling, typically after 3 years deficient



25

Severe spalling with extensive patching (i.e., waiting too long to fix).



26

Patching operations are expensive and inconvenient to the public.



27

What Treatment?

- Overlaps with Pavement Design
- Depends upon the distress
 - Thin mill and overlay is typically used to treat surface distresses
 - Deeper mill and overlay may be needed to address deeper cracking or unstable pavement layers that are causing rutting
 - Reconstruction used in areas where the causes of pavement distress are deep within the pavement structure, including base and subgrade layers

28

What Treatment?

- Alternative Treatments:
 - Often applicable to a very specific set of conditions
 - FDOT studying a variety of different treatments:
 - Hot-in-place recycling
 - Bonded friction course
 - Microsurfacing
 - Full depth reclamation
 - Crack sealing
 - Crack relief layers
 - Can generally be constructed cheaper than conventional methods
 - Generally have a limited life-cycle, although some treatments may provide a longer life, but have other drawbacks

29

Questions?

30