

Cost Benefits of Pavement Preservation

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meeting**

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Background

- Users want good roads with little congestion
- Agencies do not have the funds to provide all these needs
- Pavement preservation is an approach to stretching the available funding
- Benefits of pavement preservation need to be clearly identified

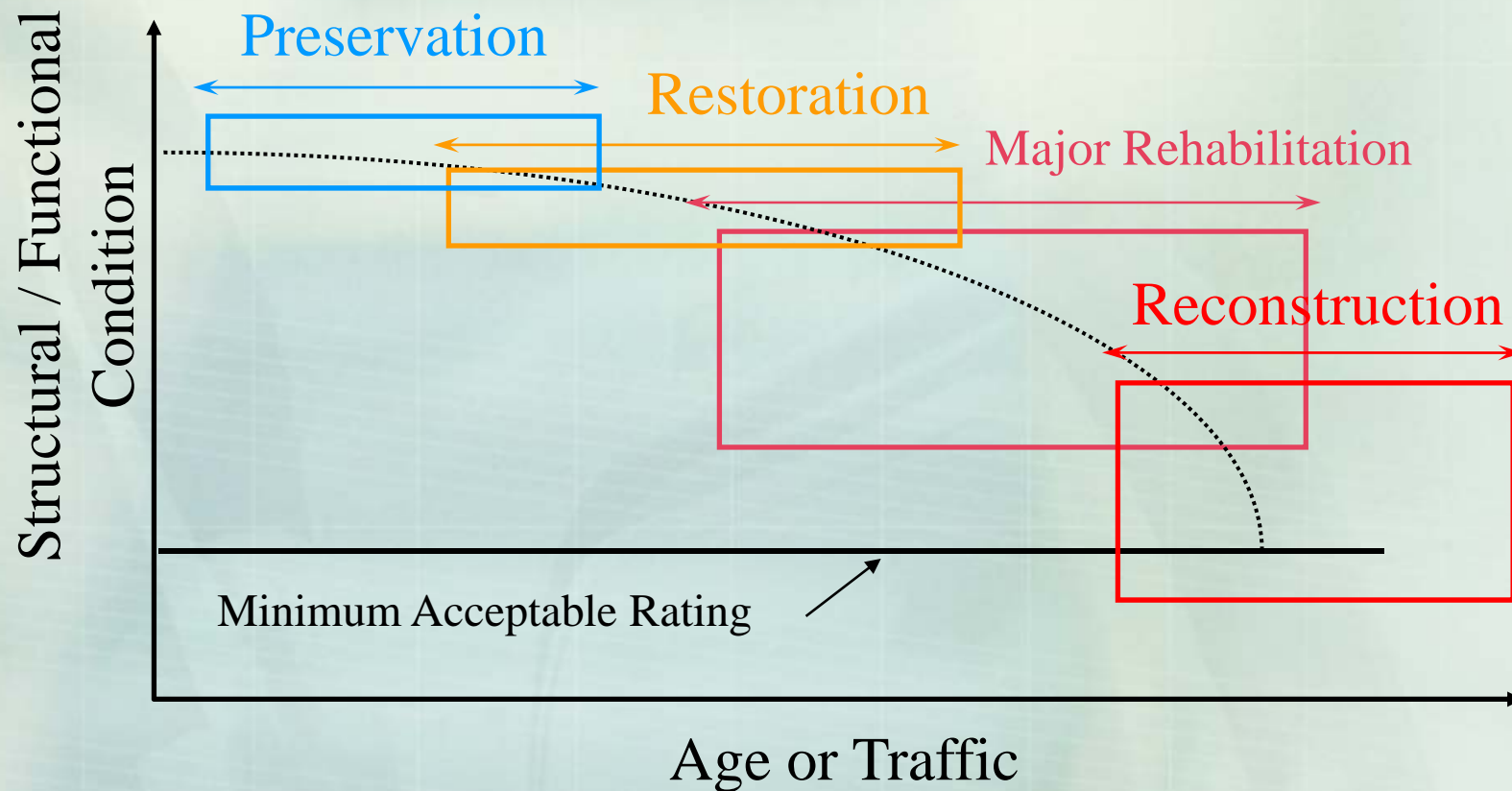
Scope of the Study

- Identify the cost benefits of pavement preservation by tracking the performance of existing preservation strategies
- Determine extended life of the various preservation strategies
- Conduct life cycle cost analysis or other appropriate cost evaluations to determine the cost benefits for various treatments.

Approach

- Collect data from the Caltrans PMS to identify the lives of treatments and extended life of the pavement prior to rehabilitation
- Collect data from local agencies to obtain similar information for their roads
- Collect data at the national level to determine extended life of preservation strategies

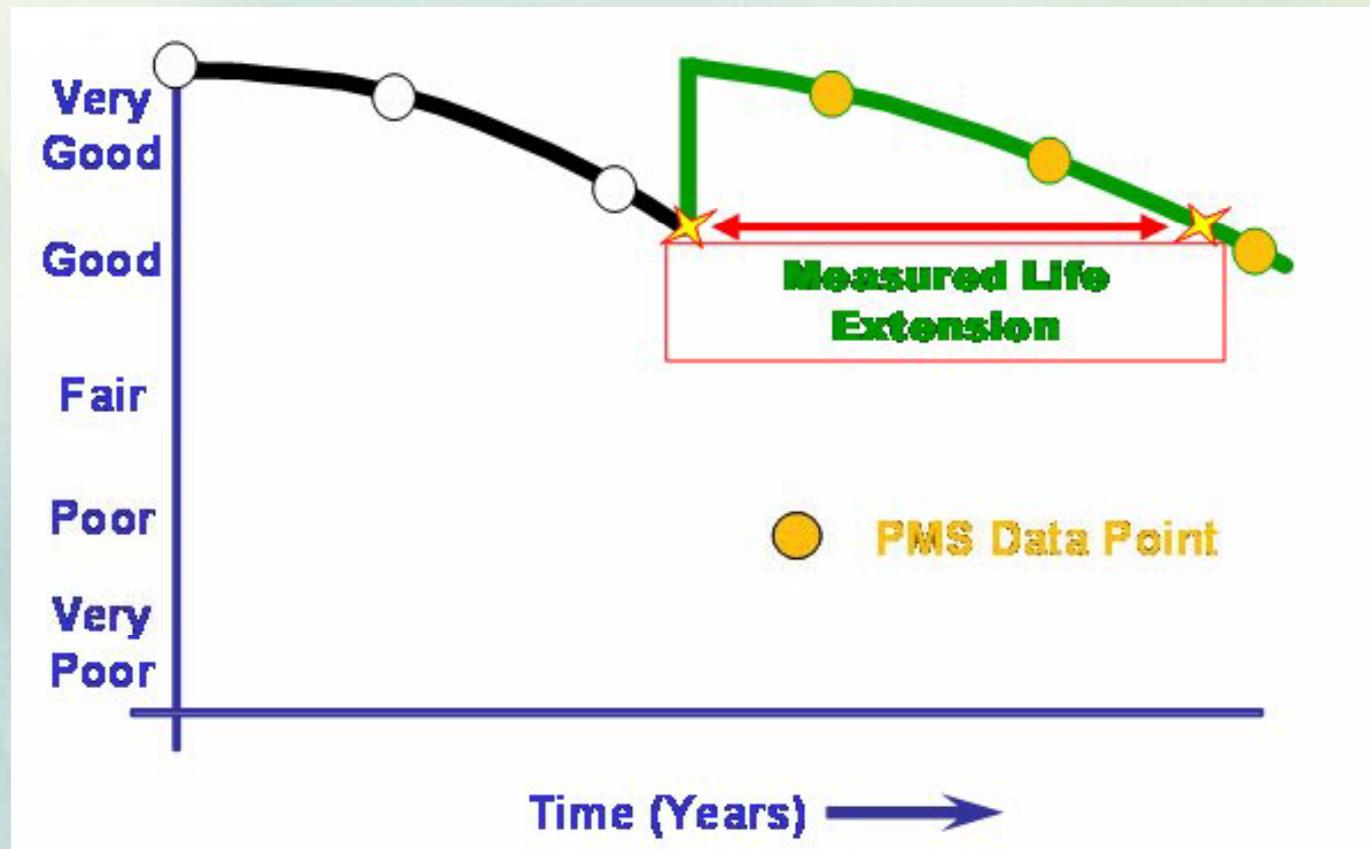
Typical Pavement Performance Curve



Reported Benefits of Pavement Preservation

- Life extension to delay rehabilitation
- Lower treatment costs compared with rehabilitation and reconstruction
- Reduced user costs
- Improved safety to users
- Improved overall network health
- Protect the environment by using less natural resources and recycling

Definition of Life Extension



Questions Which Need to be Answered

- Can we quantify treatment life and life extension using existing PMS data? If not, what other alternatives can we employ to get this information
- Can we quantify the preservation treatment costs compared with rehabilitation and reconstruction?
- Can we estimate the reduced user costs and the improved safety?

Need for this Data

- Are the economic benefits of pavement preservation 6:1 or more as reported by many?
- Regardless, we need to demonstrate the return on investment (ROI) to the agency when using pavement preservation
- Data is needed to support funding to the California Transportation Commission, the state legislature, and regional and local agency management groups

Treatment Lives and Costs-California

- PMS data
 - Limited success in identifying treatment lives and life extension using Caltrans data
 - Limited treatments included in most local agency databases
- Industry experience
 - Considerable anecdotal data available from users and suppliers
 - Politics can play a role in developing this data base

Factors Affecting Treatment Lives

- Existing pavement condition
- Traffic levels, particularly trucks
- Climate in which the treatment is placed
- Quality of construction
- Waterproofing effect of treatments
- Other factors

Typical Lives for Selected Treatments

Treatment	Good condition (PCI = 80)	Fair condition PCI=60	Poor condition PCI = 40
Fog seal	3-5	1-3	1-2
Chip Seal	7-10	3-5	1-3
Slurry seal	7-10	3-5	1-3
Microsurfacing	8-12	5-7	2-4
Thin HMA	8-12	5-7	2-4

Expected Results from Study

- Determine the extended life benefits of various pavement preservations strategies
- Determine treatment life of various pavement preservation treatments
- Conduct life cycle cost analysis & cost evaluation of these treatments
- Demonstrate the return on investment (ROI) to the user agencies

UC Berkeley- Caltrans Data

- Data base includes 718 projects
- 82 % in 3 Caltrans districts (2, 4, and 8)
- Nearly 2/3 of the projects were dense graded asphalt overlays
- Focused on thin overlays and chip seals

Caltrans has lots of data in their database, but it is difficult to retrieve.

LCCA Assumptions

- Used alligator B cracking
- Analysis period 20 or 35 years
- Discount rate fixed at 4 %
- Rehab treatments are dense graded overlays
- HM-1 treatments are thin overlays or chip seals
- All HM-1 treatments applied at less than 10 % cracking

Findings

- It is more cost effective to apply preservation between rehabs than not
- Savings are 15-50% over the life cycle
- Additional savings (up to 15%) can result if the treatment is applied earlier
- Total savings could be 30 to 65% over the life cycle

CP2 Center/MACTEC Study-Local Agencies

- Used the MTC and Micropaver software in the bay area and southern California
- Used similar assumptions on for rehab with and without pavement preservation.
- Used more treatments including slurry/micro surfacings
- Cost savings were 10 to 20 % over the analysis periods
- Why would it be less?

CP2 Center /MACTEC Study-National Data

- Studied performance of preservation treatments in 6 states
 - CA, KS,MI,MN,TX,WA
 - California was dropped from the study even though they had the most treatments and data.
 - What they did not have was a pavement management system to estimate life extension of treatments!

CP2 Center /MACTEC Study-National Data

- Life extensions for flexible pavements
 - Chip seals: 4-8 years
 - Slurry seals: 3-7 years
 - Micros: 3-8 years
 - Crack sealing: 0-4 years
 - Fog Seals: 0-4 years
- These are ranges. It shows not many agencies can estimate life extension

Cost Effectiveness of Pavement Preservation-California

California Highway network

- 50,000 lane miles
- Pavement assets currently worth \$160 billion.
Pavement preservation budget- \$206 million
- SHOPP budget- normally about \$5 Billion (is less the next few years)

Need for preservation

- Protect the assets at \$1-6 per sq.yd.
- Delay the need for costly rehabilitation (6 to 10 times the cost of preservation) or reconstruction (20-50 or more times)
- Improve the overall network condition by keeping good roads good and using innovative treatments like recycling for the reconstruction

Cost Effectiveness of Pavement Preservation-California

Cost savings from pavement preservation

- Rehabilitation- 6 to 10:1 based on first costs only
- Reconstruction- 20 to 50 :1 or more based on first costs
- Over the life cycle- 20 to 50 % from the traditional way where the typical life cycle is 30 years. This assumes a proactive pavement preservation program
- Caltrans SHOPP budget for 30 years = average of \$5 billion per year or \$150 billion
- Savings would be 20-50% of \$150 billion or \$30 to 75 billion

Cost Effectiveness of Pavement Preservation-California

Effect of timing on preservation treatments

- Caltrans currently applies treatments when the cracking is about 25% or in a fair to poor condition
- Additional savings would result if the applied the treatments earlier, less than 10%. This could result in an additional 10-20 % savings
- Total savings over the next 30 years could be 30-70 %. This is no small sum.

Recommendations

- Caltrans currently treats about 2000 km per year with pavement preservation treatments(\$206 million)
- They should be treating about 7000 km per year to have a proactive pavement preservation program
- This means the preservation budget should be increase about 3.5 times. By doing this, Caltrans could save 50% or more in their annual budget.
- The remaining funds could be used to reconstruct the badly distress roads or to improve the overall network condition

Keys to Successful Pavement Preservation Programs

- Simple & Measurable Goals
- Top Management Support
- Dedicated & Continuous Funding
- Assessing & Promoting Benefits
- Relevant Training
- Feedback from PMS

Summary

- LCCA is a decision support tool endorsed by AASHTO.
- The effect of PM techniques on life extension is still not clear in California, but is better in other states.
- Using preventive maintenance treatments reduces life cycle costs.
- Preventive maintenance does not just extend pavement life, it has other attributes too.

**Thank You
Any Questions**

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