

# Considerations for Establishing a Pavement Preservation Program

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## ABSTRACT

Maintenance crews for transportation agencies have been performing pavement preservation for many years, but without a programmatic structure, agencies cannot systematically related activities, cost, and condition evaluation to quantify benefits and service life extension. A programmatic framework enables optimization and defensible pavement preservation decisions by providing the information needed to analyze and justify budget trade-off decisions.

This paper discusses the essential characteristics of pavement preservation programs along with common pavement preservation strategies. The information was synthesized by reviewing programs at eight state transportation agencies and is expected to be useful to agencies that are considering the establishment of a pavement preservation program. Moreover, the paper discusses the potential obstacles and barriers that agencies may face in establishing a pavement preservation program.

Word Count:  $4,856 + 250 * 5 = 6,106$

Submitted for presentation at the 85<sup>th</sup> Annual Meeting of the Transportation Research Board Washington, D.C., and for publication in the Transportation Research Record (*Journal of the Transportation Research Board*).

## INTRODUCTION

Well maintained highways are important for meeting the nation's transportation needs. In recent years, the amount of travel on the highway system has increased significantly, yet the number of lane-miles in the system has not. Maintenance budgets fail to keep pace with the relative growth in vehicle miles traveled. Pavement preservation continues to get attention as transportation agencies strive to find cost-effective maintenance solutions (1).

The cost-effectiveness of pavement preservation is well documented. According to the Federal Highway Administration (FHWA), each dollar spent now on preventive maintenance, saves up to six dollars in the future (2). Case studies show that pavement preservation programs can be established with relatively small investments and can lead to significant cost savings. According to one study, for every dollar spent in the pavement preservation, \$4 to \$10 is saved in rehabilitation (3). These facts drive transportation agencies to establish pavement preservation programs.

Actually, agencies have been doing pavement preservation for a long time and its strategies are well known, however to realize the full benefits, agencies must think of pavement preservation as a programmatic and on-going business function. This paper presents essential considerations for developing a pavement preservation program at transportation agency.

Pavement preservation programs at eight states transportation agencies were reviewed: California (Caltrans), Delaware (DelDOT), Michigan (MDOT), Minnesota (Mn/DOT), Montana (MDT), North Carolina (NCDOT), Ohio (ODOT) and Pennsylvania (PennDOT). One objective of the review was to identify common pavement preservation strategies along with standards for implementation, unit cost, life extension, and major distresses. Another objective was to identify common and essential programmatic features for a successful pavement preservation program. Ten features were identified:

- Cost-Effectiveness of Maintenance Budgets is the Motivating Driver
- Preservation is Integrated with Overall Pavement Management Decision-Making
- Consistent State-Wide Guidelines for Selecting Pavement Preservation Projects
- Remaining Service Life (RSL) is an Important Factor in Project Selection
- Consistent State-Wide Process for Selecting Preservation Strategies
- Pavement Preservation Planning
- Dedicated Budget for Pavement Preservation
- Program Management for Selecting Group of Projects
- Employees Must be Educated on the Concepts and Benefits of Pavement Preservation
- On-going Program Evaluation, Continuous Improvement and Performance Measurement

Finally, the possible obstacles for establishing pavement preservation programs are addressed. These addressed challenges help the transportation agencies recognize the barriers and prepare them beforehand.

The scope of the study is preventive maintenance of asphalt and concrete highway pavement, not including bridge decks. The sources of information are documents published by the Federal Highway Administration (FHWA) and each state Departments of Transportation (DOT) as well as personal communication.

## PAVEMENT PRESERVATION DEFINED

The FHWA Pavement Preservation Experts Task Group (4) describes a pavement preservation program as a network level, long-term treatments program that enhances pavement performance by using an integrated, cost-effective set of strategies to extend pavement life, improve safety

and meet motorist expectations. A comprehensive pavement preservation program includes preventive maintenance, minor rehabilitation (non structural), and routine maintenance activities. Preventive maintenance is a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration and maintains or improves the functional condition of the system without increasing structural capacity (5). Minor rehabilitation consists of non-structural enhancements made to the existing pavement sections to eliminate of age-related, top-down surface cracking due to environmental exposure. Because of the non-structural nature of minor rehabilitation techniques, these types of rehabilitation techniques are placed in the category of pavement preservation (4). Routine maintenance consists of work that is planned and performed on a routine basis to maintain and preserve the condition of the highway system or to respond to specific conditions and events that restore the highway system to an adequate level of service (4).

Not all states have adopted the FHWA definition or organize their preventive maintenance strategies the way AASHTO defines them. For example, DelDOT distinguishes between routine and preventive maintenance by defining preventive maintenance as cost-effective treatments applied to the entire pavement surface while routine maintenance are localized treatments like crack sealing and pothole patching (6).

FHWA's definition excludes major rehabilitation that is intended to restore serviceability or structural capacity. The obvious difference between pavement preservation and major rehabilitation is that preservation addresses the functional condition of a road whereas rehabilitation addresses the structural condition (7). Another definition describes pavement preservation as intended to arrest light deterioration, retard progressive failure, and reduce the need for routine maintenance and service activities (8). Although similar to FHWA, this definition emphasizes that pavement preservation can reduce the need for costly maintenance in the future (9).

## **PRESERVATION STRATEGIES**

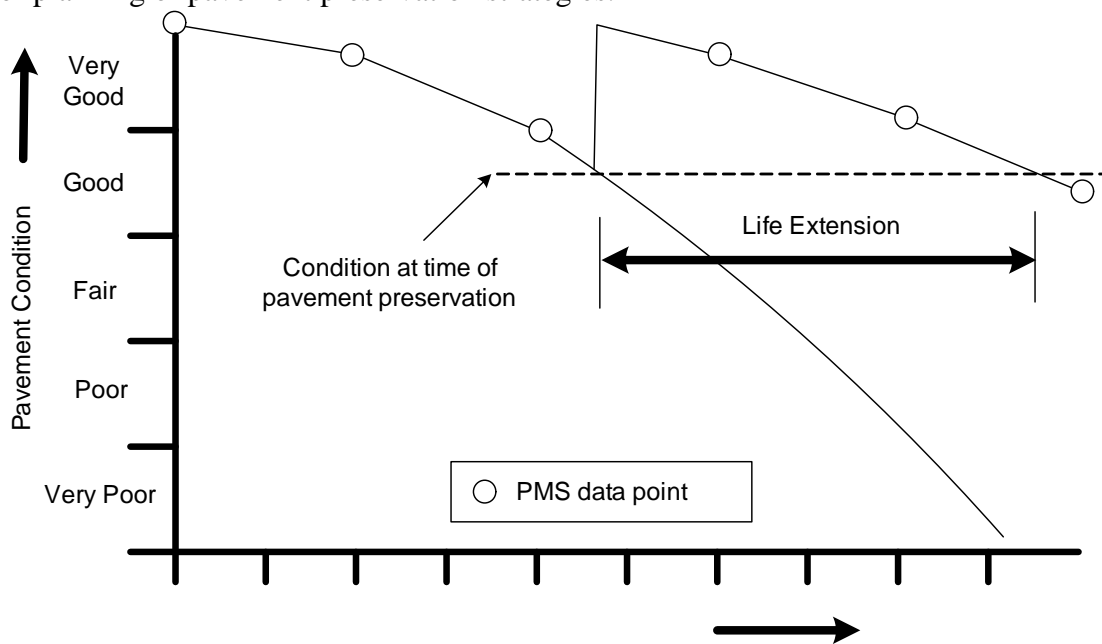
Pavement preservation strategies vary from state to state. Common strategies for flexible and rigid pavements are listed in Tables 1 and 2. For each strategy, the tables list the average cost, expected service life extension, and distresses that can be treated. Although at least 4 of the 8 agencies use the flexible pavement strategies and at least 3 of the 8 agencies use the rigid pavement strategies, many cells in the table are left blank because details are not available. The average unit cost for preservation strategies varies widely among the agencies. Some costs are inclusive of traffic control and contingencies. Differences in standard specifications, material specifications, project scope and scale, and labor costs may also account for these variations.

The benefits of pavement preservation are expressed in terms of expected service life extension before rehabilitation or reconstruction is necessary. The concept is illustrated in Figure 1. Pavement preservation improves the condition of a treated pavement for a period until the pavement returns to the condition before the treatment. The duration over which the pavement condition was improved by the treatment is the life extension given to the original pavement, or the extended service life (1).

The range of expected life varies widely among the state agencies. To maximize life extension, the trick is to select the right strategy for the pavement condition and to apply the preservation strategy at the optimal time, not too early or too late (1). Some states use remaining service life (RSL) as a criterion for determining the applicability of a pavement preservation strategy. Pavements with little remaining service life are not good candidates for preservation. Michigan DOT has a well organized set of standard thresholds for determining the applicability

of certain preventive maintenance strategies. In addition to RSL, Michigan DOT uses threshold for engineering indices, DI (Distress Index) and RQI (Ride Quality Index).

Quantified gain in service life is useful information to decision makers but the wide range of expected life introduces considerable uncertainty into the decision process and leads to situations for inconsistent maintenance strategy selection. The threshold for pavement preservation is different from that of other maintenance. For decision making, the life extension from pavement preservation strategies needs to be compared with life extension from other maintenance strategies such as major rehabilitation or reconstruction. But the decision maker must be aware that the timing for pavement preservation is very different from that of major rehabilitation or reconstruction. The transportation agencies that want to develop a pavement preservation program must understand these concepts of life extension and this will be helpful for planning of pavement preservation strategies.



**FIGURE 1 Life-extending benefit of Preventive Maintenance treatment (1)**

**TABLE 1 Common Preservation Strategies for Flexible Pavement (10, 11, 12, 13)**

Strategy	Agency	Average cost (per lane mile)	Expected life (years)	Distresses
Thin Overlays	Montana	\$40,700		
	Michigan		5-10	Longitudinal crack, transverse crack, block crack, patching, rutting
	Ohio	\$17,000-\$25,000	8-12	Raveling, bleeding, longitudinal crack
Micro-Surfacing	Montana	\$16,900-\$39,700		
	Michigan		3-6	Rutting, surface irregularities, polished surface, raveling
	Ohio	\$8,000-\$16,000	5-8	Debonding
Crack Seal/ Crack Treatment	California	\$4,000-\$4,500	1-4	Cracks (wider than 1/4")
	Michigan	\$2,900-\$11,750	Up to 3	Longitudinal crack, transverse crack, raveling
	Ohio	\$1,000-\$4,000	1-4	Raveling
Chip Seal	California	\$8,000-\$20,000	3-6	
	Michigan	\$12,240	3-7	Longitudinal crack, transverse crack, raveling, block crack, flushing
	Ohio	\$8,000-\$12,000	5-8	Debonding, longitudinal crack, edge crack, rutting
Mill and Overlay	Michigan	\$51,700	4-10	Raveling, multiple longitudinal crack, transverse crack, block crack, rutting
Seal Coat	Minnesota		5-7	Raveling, longitudinal crack, transverse crack, block crack, polishing

**TABLE 2 Common Preservation Strategies for Rigid Pavement (11, 12, 14)**

Strategy	Agency	Average cost (per lane mile)	Expected life (years)	Distress
Crack Sealing	Michigan		Up to 3	
	Minnesota		7-11	
	Ohio	\$1,000-\$4,000	1-4	cracks (wider than 1/8", less than 1/4")
Diamond Grinding	Michigan		3-5	Joint crack faults (<6mm), rut (depth< 6mm), polishing
Clean & Seal Joint	Michigan	\$6.30/foot <sup>1</sup>		Joint crack (<25mm)
	Minnesota		7-11	Joint crack (<25mm)
Dowel Bar Retrofit	Michigan		2-3	Joint crack (<7mm), faulting (<3mm)
Concrete Pavement Restoration	Michigan			Combination of various treatments
Patching				
Drainage Preservation	Michigan		10	

<sup>1</sup> Neoprene: \$2.25/foot, hot rubber: \$1.80/foot, silicone: \$2.25/foot

**TABLE 3 Standard Threshold for Pavement Preservation used at MDOT (11)**

Pavement Type	Strategy	Standards	
Flexible	Thin Overlays	RSL $\geq$ 3yrs DI<40 RQI<70 Rut Depth <12mm	
	Micro-Surfacing	Multiple courses RSL $\geq$ 5yrs DI<30 RQI<53 Rut Depth<25mm	Single Course RSL $\geq$ 10yrs DI<15
	Crack Seal/ Crack Treatment	RSL $\geq$ 10yrs DI<15 RQI<54 Rut Depth<3mm	
	Chip Seal	Double RSL $\geq$ 5yrs DI<30 RQI<54 Rut Depth<3mm	Single RSL $\geq$ 6yrs DI<25
	Mill and Overlay	RSL $\geq$ 3yrs DI<40 RQI<80 Rut Depth<25mm	
Rigid	Crack Sealing	RSL $\geq$ 10 yrs DI<15 RQI<54	
	Diamond Grinding	RSL $\geq$ 12 yrs DI<10 RQI>4	
	Clean & Seal Joint	RSL $\geq$ 10 yrs DI<15 RQI<54	
	Dowel Bar Retrofit	RSL $\geq$ 10 yrs DI<15 RQI<54	
	Concrete Pavement Restoration	RSL $\geq$ 3 yrs DI<40 RQI<80	
	Patching	Damage < 50 - 75 mm (2 - 3 inches) deep Area < 1 m <sup>2</sup> (10.8 ft <sup>2</sup> )	

## **CHARACTERISTICS OF PAVEMENT PRESERVATION PROGRAM**

Documents on the pavement preservation programs at eight state agencies were reviewed as a means for gathering information on the objectives and motivations for establishing the programs as well as descriptions of the program structures, management, funding sources and decision processes. Characteristics of these programs can provide the baseline information that may be useful in establishing a pavement preservation program. Ten common features were identified.

### **Cost-Effectiveness of Maintenance Budgets is the Motivating Driver**

The primary motivation for establishing a pavement preservation program is to achieve cost saving by extending the life of pavement. In terms of cost per year of service life, pavement preservation is more cost-effective than major rehabilitation and reconstruction. Rehabilitation and reconstruction of pavement with no remaining service life creates a new pavement structure with 10 to 25 years of life; preservation maintenance, when done at the right time, can add 5 to 10 years of life to an existing pavement. Taking the cost per year for each year of added life into consideration, pavement preservation projects are at least six times more cost-effective than rehabilitation or reconstruction project (15).

Another motivation for establishing a pavement preservation program is to improve overall ride quality and serviceability. That's the prescribed intent of California DOT's preservation program in addition to maintenance cost savings (13). Since the treatment focus on the surface, preservation maintains the existing pavement at levels of good ride quality and serviceability. Additionally, the preservation treatments increase the remaining service life and reduce the need for maintenance by preventing water infiltration into the pavement base.

A third motivation for establishing a pavement preservation program is to provide a way to manage and balance needs in all maintenance categories: Routine, Preventive, Reactive, Rehabilitation and Reconstruction. Preventive maintenance delays the cost-consuming rehabilitation and reconstruction maintenance. Minnesota DOT uses their preservation program to balance the RSL across the highway network (14). Over time, the program leads to steady-state in maintenance needs by keeping a constant mileage in each maintenance category, allowing pre-design, construction, and maintenance contractors to maintain a balanced workload and work force.

Finally, benefits achieved by one states can motivation another to establish a pavement preservation program. The preservation program at North Carolina DOT was motivated by the successes of the programs at Michigan, California and Georgia. Agency leadership began to recognize they were falling behind with "worst first" strategies (16). NCDOT program was established with top management support and legislative funding.

### **Preservation is Integrated with Overall Pavement Management Decision-Making**

Agencies with successful pavement preservation programs integrate the selection of preservation projects and treatments with decision making for capital improvements and investments. At these agencies the decisions on where and when to spend preservation funds are tied to decisions for where and when to spend major rehabilitation and reconstruction funds. The point here is that pavement preservation not be regarded as solely a highway operation function focusing on pavements not slated for projects in the

improvement program. The preventive maintenance and improvement programs should be coordinated as a total care program for each pavement. The result is coordinated optimization of strategy and expenditures.

At Delaware DOT, preventive maintenance, is one of five different maintenance categories (routine, preventive, deferred, rehabilitation, and reconstruction) and is integrated into the agency's overall pavement management strategy planning (6). Deferred maintenance is a category for roads in condition beyond when pavement preservation can be effective, but not yet to the point of needing major rehabilitation. Similarly, Minnesota DOT uses a software package, Highway Pavement Management Application (HPMA) to determine what types of maintenance are needed and to anticipate how many miles are candidate for each maintenance category. The software package determines the appropriate treatment for any given pavement section and helps in allocating maintenance funds to preserve the serviceable road (14).

### **Consistent State-Wide Guidelines for Selecting Pavement Preservation Projects**

Consistent project selection guidelines are important for maximizing programmatic benefits. It is also extremely important if agencies wish to develop reliable measures for the impact of certain strategies. A consistent selection process leads to consistent service life increase that can be obtained from each treatment.

The project selection process differs among the agencies but each agency has an established decision process that is applied consistency to all highways in the state. The project selection processes are both centralized and decentralized. In some cases, decisions are made centrally by considering projects recommended by the regions or districts. In other cases, the regions or districts make decisions following consistent guidelines and databases.

In California, districts submit project candidates with formal documentation to the pavement management engineer at the central office. A task force of pavement management engineers and district program coordinators review the projects and make final decisions (13). At Montana DOT, district level engineers conduct pavement management analysis including condition analysis and structural analysis. Based on the analysis, the district engineer selects projects for their district. The central pavement management system is used to screen and validate the project proposal from the districts (10).

In contrast, at some agencies, decision authority is given at the district or region level and then reported to the central office. At the Michigan DOT, project selection for is the responsibility of each region. To insure that decision-making is consistent statewide, project selection guidelines use engineering measures of RSL, DI, RQI and rut depth and each region uses data from a state-wide pavement management system (17). At Minnesota DOT, districts engineers run the HPMA software to get consistent input on maintenance needs and preservation project recommendations. District pavement engineers make the final preservation project decisions (14). At Ohio DOT, districts develop a list of projects for further evaluation by a team consisting of a district pavement manager, a district planner, a county manager and a representative from Federal Highway Administration (FHWA). The team evaluates the projects to ensure they are suitable for preservation (12).

### **Remaining Service Life (RSL) is an Important Factor in Project Selection**

Pavements that remain untreated continuously deteriorate. By implementing the right preservation strategy at the right place and time, deterioration is arrested at the lowest cost. Pavement preservation strategies are usually applied when the pavement is still young and severe distresses have not appeared on the pavement surface. Because the timing of pavement preservation impacts the cost-effectiveness, pavements that meet a minimum Remaining Service Life (RSL) criterion are eligible for preservation treatment. At some agencies, RSL is also an important factor for selecting the appropriate pavement preservation strategy.

The minimum RSL criterion varies widely. At Minnesota DOT, pavement preservation treatments are applied on pavements with a RSL greater than eight years (14). At the Michigan DOT, pavements with a RSL of two or more years are candidates for pavement preservation treatment (11). The variation in RSL for eligibility can be attributed to the range of activities that are considered preventive at each agency. The point here is that RSL is an important criterion for pavement preservation eligibility.

### **Consistent State-Wide Criteria for Selecting Preservation Strategies**

The measurement of pavement condition leads to consistent selection of preservation treatments at the project level and throughout the network. The state agencies have tools or procedures in place to ensure consistency in selecting a preservation treatment. Consistency appears to be the key for optimizing decisions and achieving cost-effective outcomes.

Though each agency has different processes and criteria, they are applied consistently statewide. At Montana DOT, if the districts selects a project treatment that differs from the recommendation of the agency's centralized pavement management system then further review and justification are required before the project is approved (10). At Michigan DOT, strategy selection follows a well established set of criteria (see Table 3) that characterize pavement condition: RSL, Distress Index (DI), Ride Quality Index (RQI), and Rut Depth (11). Delaware DOT uses decision trees that relate type, severity and extent of distresses to preservation strategies (6). At California DOT, the maintenance strategies are determined through the use of a general guideline table. The table indicates the expected performance levels (good, fair, poor, and not recommended) for each treatment given the pavement condition, and other parameters such as climate condition and traffic volume (13).

At North Carolina DOT, road problems are divided into eight distresses: alligator cracking, transverse cracking, rutting, raveling, bleeding, ride quality, patching and oxidation (aging). Each category, except oxidation, has 3 severity levels: light, moderate and severe (16). Possible treatments, including none, are specified for each distress and severity level. The treatment selected from the possible choices depends on the available budget.

### **Pavement Preservation Planning**

To achieve the maximum benefit, pavement preservation strategies are applied early, 5 to 10 years after construction, when severe distresses are not yet present. Agencies must develop procedures for anticipating preservation maintenance needs and budget

accordingly. The first step is to consider the necessary funding to maintain newly constructed, rehabilitated, or reconstructed highways.

At some agencies, preservation planning is mandated. At Michigan DOT, each region is required to develop a five-year preventive maintenance plan for newly constructed pavement structures (11). At Ohio DOT, each district is responsible for establishing a ten-year preventive maintenance program and updating the program annually as part of the District's work plan (12). The anticipation of maintenance needs is challenging, yet planning leads agencies to prepare for expected maintenance in advance.

### **Dedicated Budget for Pavement Preservation**

It is difficult to compare funding practices between states due to the many variables that exist within each state's government. However, a dedicated budget of both federal and states funds appears to be a necessary feature of a successful pavement preservation program. In Minnesota and North Carolina, pavement preservation strategies are eligible for federal support when they can be demonstrated to extend the useful life of Federal-aid highways (14). Moreover in North Carolina, a special provision of the State budget bill directs a portion of the Highway Trust Fund towards pavement preservation on the primary highway system (16).

Though the amount of funding varies by state, each state has dedicated funds necessary to support ongoing pavement preservation. In 2000, California dedicated \$50 million statewide to preventive maintenance efforts with federal participation (18). The pavement preventive maintenance program budget at Michigan DOT was \$60 million 2002 and increased to \$73.5 million in 2003 (11).

### **Program Management for Selecting Group of Projects**

Maintenance budgets are usually not large enough to satisfy the demands so selection among competing projects will be necessary. That selection process should optimize the long term effect of pavement preservation dollars. Furthermore, since maintenance budgets do not rise and fall according to needs, an allocation strategy is necessary to optimize long term benefits from what money is available and when. The Delaware DOT has two different project selection prioritizations: single year prioritization and multi-year prioritization. The single year plan is based on common ranking criteria such as pavement condition, initial cost, life cycle cost and benefit- cost ratio. For multiple year programming, analysis of the long-term impact of accelerating or postponing projects is considered for optimizing the strategy for a given budget (6).

An investment plan that balances pavement preservation and the "worst first" strategy may be necessary to satisfy public demand as the agency works toward optimizing long term impact. Table 4 shows an example of how Minnesota DOT allocates preventive maintenance funds to the districts. Once the total preventive maintenance needs in each district are determined, the total budget is allocated to the districts based on their percentage of the total statewide need (19). Even small amounts of money moved toward pavement preservation can begin to make a difference in the cost effectiveness of maintenance budgets (6). Delaware DOT uses a strategy that over time allocates an increasingly larger portion of the available funds toward pavement preservation.

**TABLE 4 Sample Strategy for Allocating Pavement Maintenance a Budget (19)**

Region	Total Preventive Maintenance Needs (\$ Millions)	Percent of Total Needs	Recommended Preventive Maintenance Spending (\$40 Million Budget)
1	\$20.45	9.30%	\$3.72
2	\$23.52	10.70%	\$4.28
3	\$23.25	10.57%	\$4.23
4	\$27.07	12.31%	\$4.92
6	\$24.77	11.26%	\$4.50
7	\$29.37	13.36%	\$5.34
8	\$21.90	9.96%	\$3.98
Metro	\$49.56	22.54%	\$9.01
Total	\$49.56	100%	\$40.00

### **Employees Must be Educated on the Concepts and Benefits of Pavement Preservation**

Educating employees is necessary to ensure program implementation and buy-in. Some employees will be challenged to abandon the worst-first strategies in lieu of maintenance expenditures on seemingly good pavements. The National Highway Institute offers courses on preventive maintenance strategies and strategies selection. Employee education will lead to quicker adoption and consistent participation. An education plan should give the employees sound technical and economic information about preventive maintenance but also a philosophical framework to argue the merits of preventive maintenance.

### **On-going Program Evaluation, Continuous Improvement, and Performance Measurement**

Program assessment is a way for transportation agencies to measure long-term savings and to refine the processes for identifying strategies and selecting projects. Program evaluation can be done internal task force or an external independent consultant Michigan DOT hired a consultant to evaluate its program and pavement preservation projects. Over a period of three years (from 1999 to 2001), the consultants evaluated 23 preservation projects to measure the life extending value relative to the original pavement and warranty threshold criteria (17). The findings provide convincing evidence that the agency's program is cost-effective for extending pavement life.

On going program evaluation leads to continuous improvement if agencies build in ways to capture essential decision data. Rather than wait until the preservation projects are complete to begin program performance assessment, agencies should employ database strategies to capture essential project data as decision are being made. Tools created to support decisions can also capture the relevant data of those decisions such as strategy selection inputs and outputs, project selection inputs and outputs, estimated costs and expected life extension. To be fully useful, agencies will need to include pavement

section identifiers for linking with detailed design and condition data in the agency's pavement inventory systems, actual project costs and actual life extension.

The data set is a resource for generating a wide range of performance measures useful for continuously improving a preventive maintenance program and for demonstrating its value. With hard data to show the anticipated maintenance needs, the backlog and expected long term benefits from increased funding, agency leaders have what they need to advocate for preventive maintenance programs.

### **OBSTACLES TO ESTABLISHING PAVEMENT PRESERVATION PROGRAM**

A number of potential obstacles can impose real challenges to defining and implementing a pavement preservation program. Agencies that anticipate these barriers can prepare for the challenges in advance.

The first challenge may be to educate the public and state legislators so they are aware of and understand the benefits of pavement preservation. If the public and legislators see maintenance work being done on highways that are in seemingly serviceable condition, the perception is that the agency has too much money or is acting irresponsibly (20).

A second challenge closely relates to the first. A lack of data on the costs and benefits of preservation maintenance may make these programs an easy target to cut or defer. Deferred pavement maintenance must be thought of as increasing the backlog of work and subsequently increasing the rate of pavement deterioration (8). One approach is to argue for pavement preservation as a low-level capital improvement effort. If decision makers and the public understand that pavement preservation extends the capital life of assets then the programs are more likely to get continuous dedicated funds. .

Another potential obstacle is reaching agreement and buy-in across the agency. The underlying purpose of the program, the pavement preservation strategies, project selection process, data collection and decision process all require buy-in from participating organizational units. Ohio DOT gets buy-in at the district level by tying asset performance to the employees' job performance review and pay raises (12).

### **SUMMARY AND RECOMMENDATION**

Pavement preservation strategies are well known among pavement engineers. The establishments of pavement preservation programs are being considered as means for optimizing the cost-effectiveness of the strategies. To assist agencies in successfully launching pavement preservation program, the pavement preservation programs at eight state agencies were reviewed. Ten characteristics of successful programs were identified:

- The motivations for establishing the program should be clear. These may include cost savings through pavement life extension, improved ride quality and serviceability of pavements, and the ability to control the backlog of pavement maintenance needs.
- Pavement preservation should be considered as low-level capital improvement. The pavement preservation and improvement programs should be coordinated so together they manage the total care of each pavement section.
- To maximize programmatic benefits, preservation projects and strategies must be selected using consistent guidelines and databases.
- Remaining Service Life (RSL) is an important criteria for pavement preservation eligibility because the timing of pavement preservation impacts the cost-effectiveness,

- Agencies must develop procedures for anticipating preservation maintenance needs and budget accordingly.
- A dedicated budget with federal support is necessary for a successful pavement preservation program.
- Program management must include an allocation strategy that distributes funds to maximize the long term effect of pavement preservation dollars.
- Educating employees is necessary to ensure program implementation and buy-in.
- On going program evaluation leads to continuous improvement of the project and strategy selection guidelines and cost effectiveness measures.

These should be used as a checklist by agencies as they implement pavement preservation strategies and establish pavement preservation programs. Furthermore agencies are well advised to begin their effort by educating the public and state legislators so they are aware of and understand the benefits of pavement preservation.

### **ACKNOWLEDGEMENT**

This work was supported by the Wisconsin Department of Transportation through the Transportation Operations and Safety Laboratory Work Order #15 and performed in cooperation with the Midwest Regional University Transportation Center at the University of Wisconsin-Madison. Alison Lebwohl, WisDOT Compass Program Manager served as the agency project manager.

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