Pavement Preservation in the City of Los Angeles

By
Nazario Sauceda
Assistant Director
Bureau of Street Services

With a street network comprised of approximately 6,500 centerline miles of streets and 800 centerline miles of alleys, the City of Los Angeles not only has the largest municipal street system in the nation, but also the most congested.

To monitor, maintain, and manage this gigantic street network, the Bureau of Street Services relies on its Pavement Preservation Program which gravitates around a solid and dependable Pavement Management System.

Pavement Management by definition is a systematic, consistent method for selecting maintenance and rehabilitation needs, and for determining the optimal time of repair by predicting future pavement condition. It is a methodology that provides information for maintenance and rehabilitation (M&R) planning, programming and budgeting. Furthermore, it is an analysis tool that provides statistical and historical data and an instrument to support the decision making process.

Ultimately, a Pavement Management System is used in the BSS to cost-effectively manage street pavements.

In addition to its remarkable magnitude and heavy congestion, the City of Los Angeles' street network is also one of the oldest in the country. A significant number of streets were originally constructed almost one hundred years ago and approximately fifty percent of the entire street network was built before World War II; consequently, pavement preservation has been a challenge for quite some time and has forced the BSS to consistently go through a "pavement preservation metamorphosis."

Pavement Preservation in the "Good Old Days" included among some other strategies:

- Setting routine maintenance cycles
- Prioritizing on a "worst first" basis
- Scheduling work based on "citizen complaints"
- Considering political priority and
- Following the recommendation from the "old Superintendent"

However, during the mid nineties, there was a noticeable need to modernize the Bureau's methodologies by incorporating computers and sophisticated engineering-based knowledge and technologies. The BSS acknowledged that taking this step would fully provide the organization with the benefits of a modern Pavement Management System.

In 1998, the Bureau of Street Services adopted Micro PAVER™, a "State of the Art" Pavement Management System that allows the selection of the most economical maintenance and rehabilitation strategy for the street system. Projection of future condition requires the ability to measure street condition in an objective, repeatable scale, such as the Pavement Condition Index (PCI).

The PCI is a numerical index ranging from 0 for a failed pavement to 100 for a pavement in perfect condition (Fig.1). Developed at the U.S. Army Construction Engineering Research Laboratory, the PCI is obtained by analyzing type, severity, and quantity of pavement distresses identified during a pavement condition survey. The use of PCI for roads and airports has received an overwhelming acceptance worldwide and has been adopted as standard to rate pavement condition by the American Society of Testing Materials (ASTM).

Pavement Condition Index (PCI)

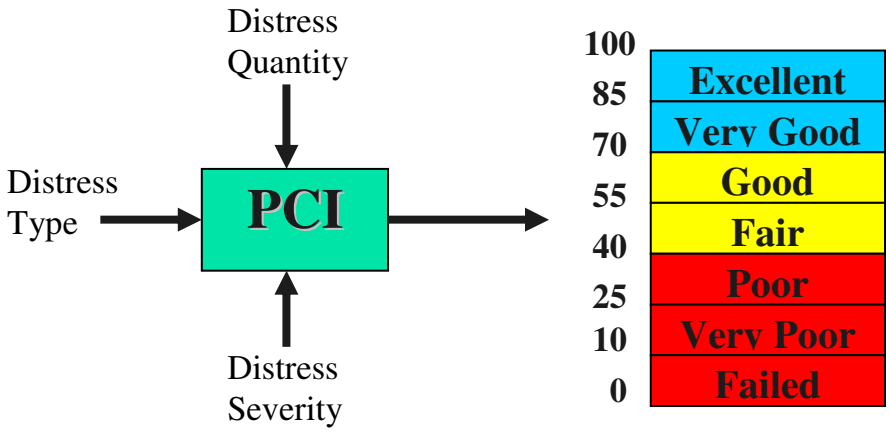

Fig. 1

To get the average Pavement Condition Index (PCI) of the entire street network, the Pavement Management Section of the Bureau of Street Services follows the typical Micro PAVER™ five-step methodology:

Inventory: The City's street network has over 69,000 pavement segments that were inventoried and entered into a computer database.

Routing: Prior to performing the survey of the pavement sections, all 69,000 segments were routed manually. Routing of the streets in the network ensures the most time efficient way for the survey teams to capture accurate pavement data.
Survey (Gathering of Data): The BSS currently utilizes two automated vans to collect pavement distress data. Each van is equipped with a computerized work station, cameras to take digital images of the street surface, and lasers to capture roadway roughness and rutting data (Fig. 2).

Semi-Automated Survey Van
Fig. 2

Data Processing: The surface distress information captured by the City vans is processed at a workstation in the office. Laser data and digital images are analyzed using custom software. The distresses on each one of the 69,000 street segments are identified and evaluated for type, quantity and severity. Each segment is equivalent to one city block.

Micro PAVER™ Analysis: The processed information is imported into Micro PAVER™, which analyzes the distress information and calculates a PCI for the pavement. Life Cycle curves are developed and the critical PCI is established. Using the critical PCI, an optimum maintenance/rehabilitation strategy can be developed, budget needs can be determined, and future roadway conditions can be projected based on different budget scenarios. (Fig. 3a and 3b)

Pavement Management Life Cycle Curve

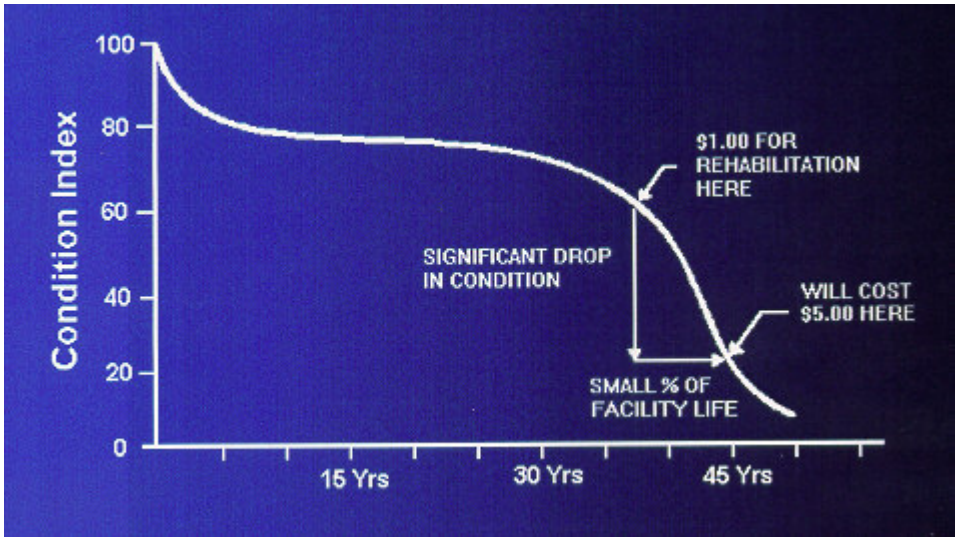

Fig. 3a

Condition Prediction Modeling
Section Prediction in relation to Family Model

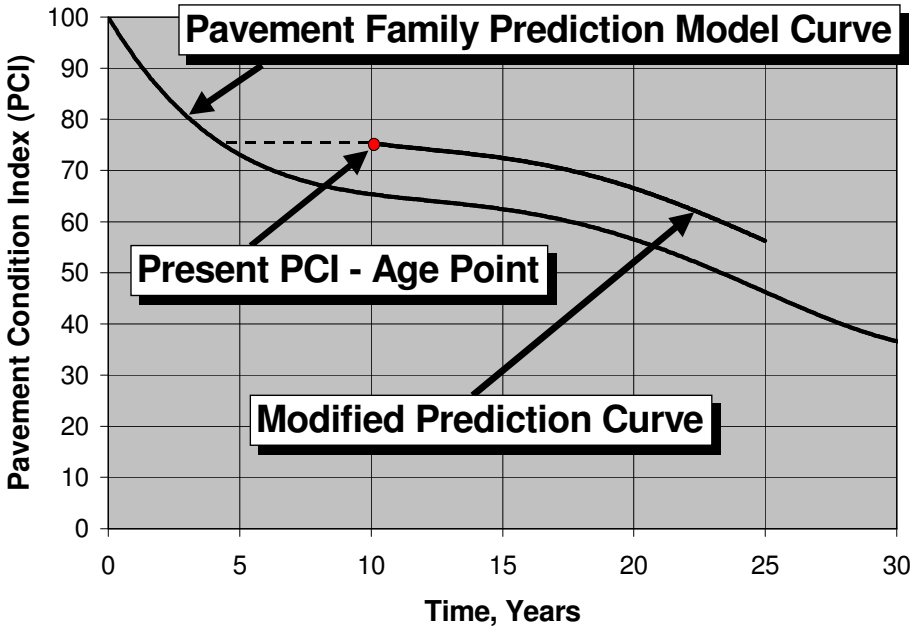

Fig. 3b

With a strong commitment to pavement preservation, the BSS must ensure that every single dollar allocated for street maintenance and rehabilitation is intelligently and strategically expended; therefore, the Bureau has focused its attention on determining the optimal time of repair of the streets by predicting future pavement condition. Acknowledging that the current budget allocation is not sufficient to improve the current pavement condition of the street network, the Bureau's pavement preservation strategy has placed an emphasis on **"saving" as many streets as possible before they get to the point in their life cycle where it will cost three to five times to repair them.** The Bureau has adopted a "sustainability mode" until the right level of resurfacing funding is available.

The Maintenance and Rehabilitation (M&R) work planning of the BSS is comprised as follows:

Maintenance -Pothole Repairs
-Crack Sealing
-Slurry Sealing

Rehabilitation -Asphalt Overlays
-Resurfacing
-Reconstruction

In a typical year, the BSS repairs approximately 250,000 potholes. The Fiscal Year 2006-2007 saw this number increase to 300,000, and for the 2007-2008 Fiscal Year, the Bureau has raised its goal to 350,000; an unprecedented number considering that additional maintenance funding was not allocated to accomplish this monumental task.

Crack sealing and Slurry Sealing are two Bureau operations that take place in a correlated fashion. The annual goal for crack sealing is 100 miles and generally speaking, the goal is accomplished while preparing streets that are part of the Slurry Seal Program. A rubberized sealer is used to successfully fill the street cracks.

Slurry sealing has been proven to be one of the most efficacious and economical preventive methods to extend the life of the pavements in the City of Los Angeles.

For decades, the BSS used conventional slurry seal with a decent level of success; however, there were always several problems associated with its use. For example, inconvenient base camps in neighborhoods were required to stage large pieces of equipment and materials; in addition, environmental concerns such as dust, noise, and odors were a constant point of discontent for the neighborhood residents. Lastly, constant failed test results forced the Bureau to perform several "re-dos" which subsequently increased the cost of the program.

Approximately eight years ago, the BSS set a goal to improve the quality and productivity of the slurry sealing program; the goal also contemplated the reduction of the environmental impact to the community. After testing different options, a pre-mixed rubberized application was determined to be the best solution and the Bureau partnered with Petrochem Marketing, Inc. (PMI) to utilize a slurry seal material produced at a central mix plant and delivered ready for application on the project site.
The Bureau's Slurry Seal Program in accomplished through the use of PMI applicator trucks under the direction and labor work of Bureau forces.

While historically, the slurry program was typically funded for 100 miles, the last two fiscal years saw an increase to 300 miles and the current 2007-2008 Fiscal Year has been augmented to an unprecedented 400 miles.

The use of a pre-mixed, rubberized slurry seal has proven to be an excellent and intrinsic part of the Bureau's Pavement Preservation Program not only because it provides consistent acceptable test results (improved quality) but also because it eliminates the need for equipment and materials storage in the neighborhoods. Moreover, it reduces the street closing time, and overall, it provides neighborhoods with a fresh and clean new appearance that results in increased customer satisfaction. Furthermore, the use of a rubberized mix provides the city with the following crucial environmental benefits:

- Recycling of 26,000 waste tires for every 100 miles of streets slurry sealed
- Conservation of valuable landfill capacity
- Reduction in dust and noise pollution, and
- Elimination of noxious odors during the on-site mixing of materials

The BSS' Rehabilitation Program is typically funded for 200 miles per year although during the last decade, the annual resurfaced miles fluctuated from 135 to 270 miles.

Through the use of Micro PAVER™, the BSS has determined that in order to maintain the current average PCI of the street network, it is required to resurface 275 centerline miles every year; consequently, every year that the Bureau is not funded for such mileage, the condition of the street system is negatively impacted.

Since the right level of funding is not foreseeable in the near future, the Bureau has proactively adopted a stronger recycling approach.

Currently, the Bureau's two municipal asphalt plants are capable of producing approximately 600, 000 tons of hot mix per year that contain 20% to 25% Reclaimed Asphalt Pavement (RAP). Efforts and studies are currently taking place to elevate the use of RAP to 50% in the near future.

The latest addition to the Bureau's Pavement Preservation Program is the acquisition of the Cold-In-Place Recycling (CIPR) technology (Fig. 4). In 2004, the BSS conducted its first pilot project and immediately it was determined that when CIPR is compared to the conventional methods of street reconstruction, the most noticeable advantages are:

- Reduction in the demand for virgin aggregates
- Reduction of construction time
- Reduction in truck traffic through city neighborhoods
- Reduction on environmental impact, and
- Reduction on traffic congestion

Cold-In-Place Recycling Machine

Fig. 4

All the preceding advantages can be simply summarized into two words: cost savings.

In times of limited funding, it is always gratifying to know that that the efficiencies generated by incorporating the CIPR technology to the Bureau's Pavement Preservation Program generate enough savings to pay for an additional ten miles of asphalt overlays.

With almost a century of Pavement Preservation experience, the BSS of the City of Los Angeles has clearly demonstrated that the main benefits of a Pavement Preservation Program are:

- Higher customer satisfaction with the street network
- Enhanced ability to make better and more intelligent decisions
- Use of the most appropriate maintenance or rehabilitation techniques
- Significant improvement of pavement conditions over time and
- Remarked reduction of the overall costs for maintaining the street network

Managers and engineers in all levels of government who have adopted a Pavement Preservation Program understand and agree that street management is a matter of “Pay now, or pay much more later”