# HIGH PERFORMANCE SLURRY SYSTEMS

## SLURRY SYSTEMS AND PREVENTIVE MAINTENANCE

## THE RIGHT APPROACH

- IMPROVED SAFETY
- LOWER COSTS
- SMOOTHER RIDE
- BETTER APPEARANCE
- FEWER DELAYS
- GREATER VALUE

INTERNATIONAL SLURRY SURFACING ASSOCIATION

ISSA

*Leaders In Preventive Maintenance*

***FHWA-SA-99-015 Pavement Preservation: A Road Map Of The Future Report***

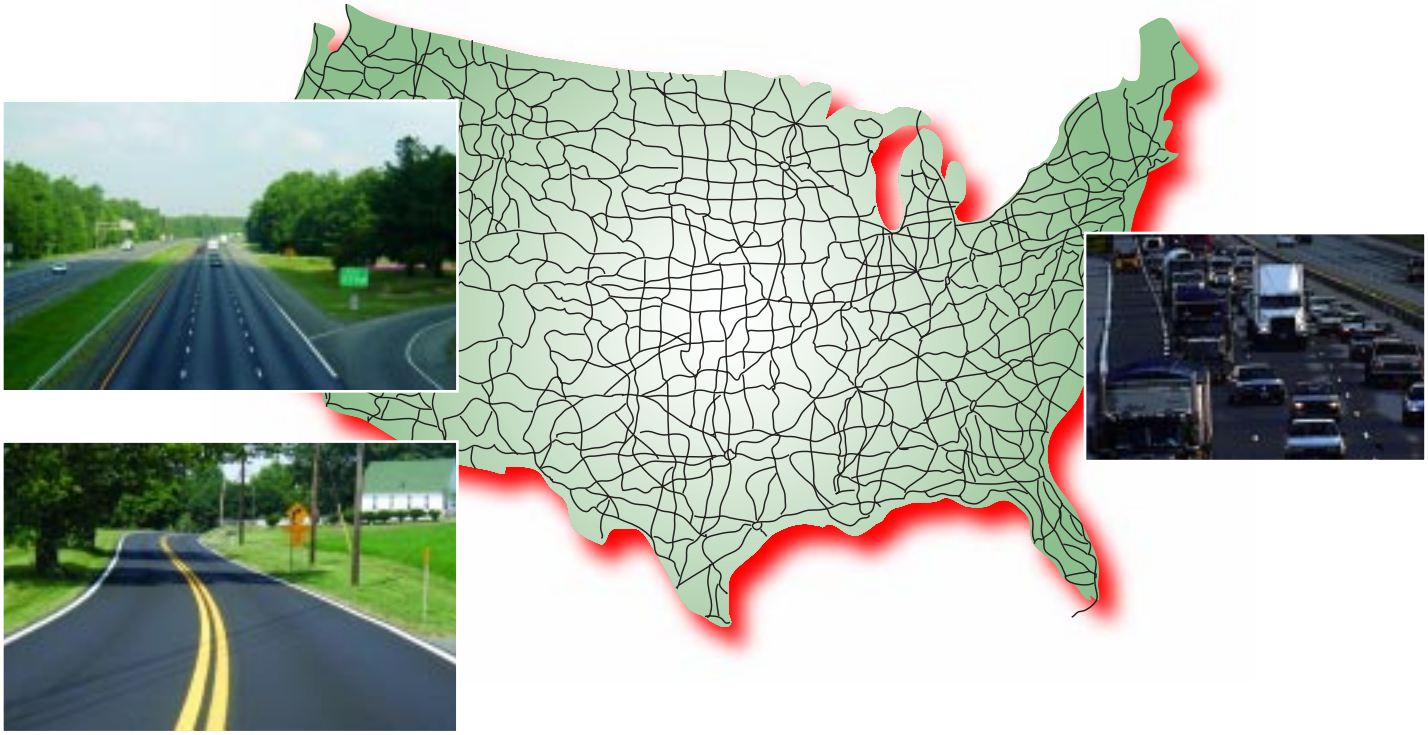
*The building of the Nation's highway and roadway network is essentially complete. Now a significant transition is occurring: preserving our investment in the vast highway infrastructure.*

# THE CHALLENGE

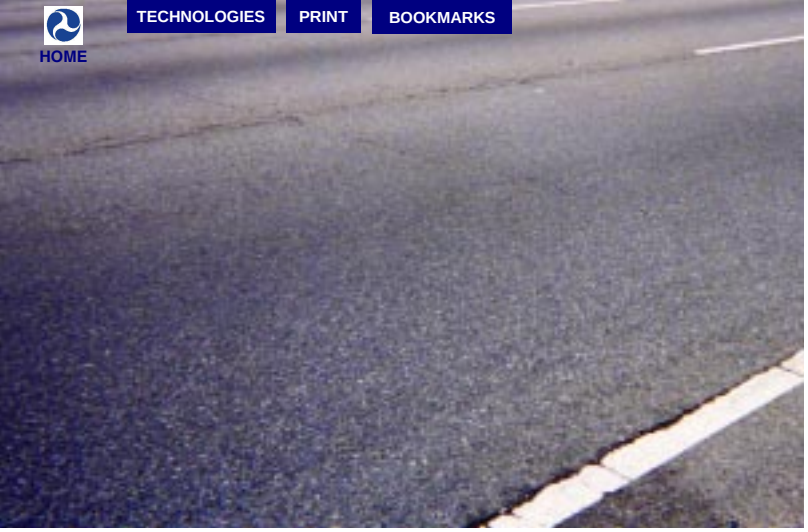
The majority of this vast roadway infrastructure is paved with asphalt. While asphalt has continually proven superior as a roadway construction material, special attention to preventive maintenance is needed to realize the superior life-cycle cost benefits. As asphalt pavements age, they will show signs of wear and deterioration. If left unattended, deterioration can cause safety hazards, maintenance problems and eventually the pavement will become unserviceable—requiring costly repairs.

Performance of the pavement structure and the traveled surface are negatively affected by a number of factors. Traffic loads, tire pressures, road salts, wide temperature fluctuations, sun, heat, rain, and snow and ice removal all impact the expected life and quality of the pavement.

Pavement managers and engineers need an effective strategy to achieve maximum pavement life while ensuring the safety of the highway user.



***High performance Slurry Systems restore critical surface qualities and seal pavement surfaces to ensure outstanding safety and pavement performance.***



*The Michigan Department of Transportation reports that for every dollar spent on Preventive Maintenance (PM) they save six to ten dollars in future reconstruction or rehabilitation cost.*

# THE STRATEGY

Knowing that the traditional strategy of "Worst First" is not the correct approach in managing a pavement network, clearly there is a need for development and implementation of an effective preventive maintenance program. The program is intended to preserve and extend the life of the network and maintain pavement surface quality: "Right Approach."

The primary goal of any road agency is providing residents, taxpayers and the traveling public with safe, high-quality streets, roads and highways. *Preventive maintenance is a key component to achieving this goal by cost effectively maintaining the pavement surface and extending pavement life.*

### A Successful Preventive Maintenance Program Should Consist Of:

- Maintenance treatments that are effective for arresting the deterioration and restoring the necessary pavement surface qualities: "Right Treatment."
- Adequate and consistent funding to treat the portion of the network before the investment is lost: "Right Road."
- Pavement management systems to evaluate pavement condition and the rate of deterioration providing for the application of (PM) at the "Right Time."

### Cost Effective Preventive Maintenance

Slurry Systems - Micro Surfacing and Slurry Seal have proven effective for extending pavement life, enhancing safety and maintaining pavement quality.

***Slurry Systems' success in restoring surface quality, sealing and protecting from water intrusion, enhancement of high surface friction properties, and rut-filling are the outstanding benefits that positively impact safety and pavement performance.***

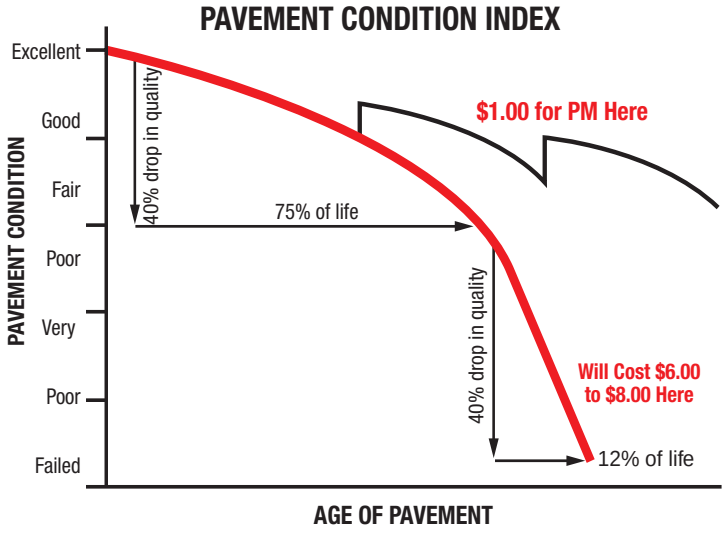
## *Right Treatment, Right Road, Right Time*

# ASSESSING THE PROBLEM: PAVEMENT PERFORMANCE

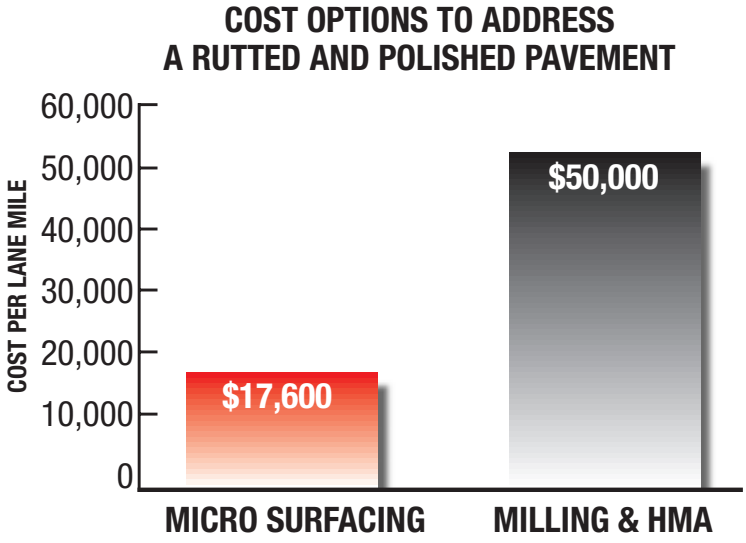
Pavement distress occurs in many forms; rutting, cracking, raveling, flushing, oxidation, loss of friction and diminished ride quality are typical examples. AASHTO's Joint Task Force on Rutting (1987) identified four types of rutting: mechanical deformation, plastic flow, consolidation and surface wear.

Pavement distress is caused by factors or a combination of factors including insufficient structural capacity, improper design, inadequate material selection, poor construction techniques and lack of preventive maintenance (PM).

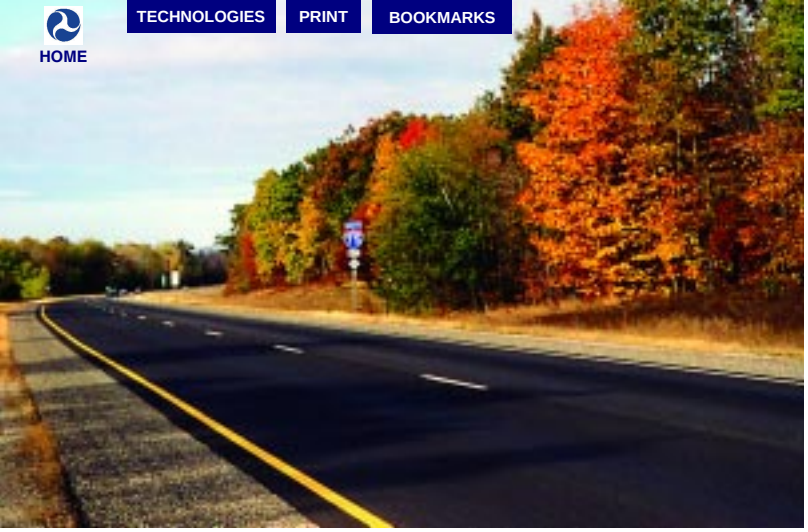
*Quality pavements that show typical age and wear-related distress are best suited for the use of Slurry Systems (PM).*




***Slurry Systems – Micro-Surfacing and Slurry Seal are cost effective treatments that, when utilized properly, will ensure the preventive maintenance effort produces quality results.***




*Slurry Systems should be employed as a preventive maintenance practice to restore pavement quality, assure safety and lower life-cycle costs.*



## HIGH PERFORMANCE SLURRY SYSTEMS...

# MICRO-SURFACING & SLURRY SEAL

Micro-Surfacing and Slurry Seal are superior cold mix blends of high-quality aggregates, asphalt emulsions, water and mineral fillers. The unique characteristics of these processes deliver distinct advantages in pavement sealing, resurfacing and rut-filling applications.

- **Superior durability and wear properties**
- **Penetration of and adhesion to pavement surface with semi-fluid mixture**
- **Low permeability of mixture seals underlying pavement**
- **Typical resurfacing at 1/8 to 3/8 inch eliminates need for casting adjustments, milling along curbs and shoulder gravel**
- **Versatility of up to 1.5 inch in rut-filling for Micro-Surfacing allows proper correction of wheel path rutting**
- **Unique macro texture provides superior surface friction properties**
- **Effective lower cost allows more miles to be preserved**

**SYSTEM COMPARISON CHART**

| Benefits | Slurry Systems | 2" HMA | Thin HMA | Chip Seal |
|---|---|---|---|---|
| *Macro Texture for Improved Safety* | ✔ | | | ✓ |
| *Quality Appearance, Service* | ✔ | ✓ | ✓ | |
| *Corrects Wheel Rutting (<1/2")* | ✔ | ✓ | | |
| *Superior Skid Resistant Properties* | ✔ | | | ✓ |
| *Corrects Minor Surface Distress* | ✔ | ✓ | ✓ | ✓ |
| *Minimizes Curb Loss, Casting Adjustments* | ✔ | | | ✓ |
| *Maintains Ride Quality* | ✔ | ✓ | ✓ | |
| *Impermeable Surface Seal* | ✔ | | | ✓ |
| *Eliminates Dust, Loose Aggregate* | ✔ | ✓ | ✓ | |

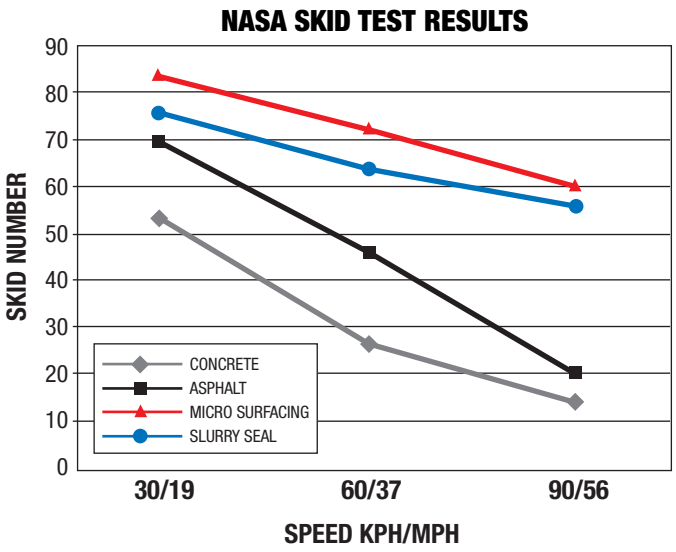
# SAFETY AND COST EFFECTIVENESS WITH

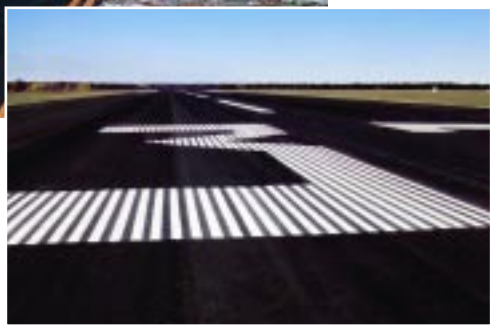
Polished isn't always a good thing. In the case of Prospect Mountain, a section of New York State Route 17 at the I-81 interchange, driving on a polished surface caused problems for motorists. The section, known to Binghamton, NY residents as "Kamikaze Curve," was infamous for treacherous traffic conditions and accidents due to its low skid resistance properties. Crews from Vestal Asphalt, Vestal, NY applied high-friction, quick-setting Micro-surfacing to this high traffic section to provide better friction and durability for safer driving conditions.

***"Slurry Systems are very effective resurfacing treatments to improve pavement quality, preserve pavement life and maintain a more consistent uniform standard over many years."***

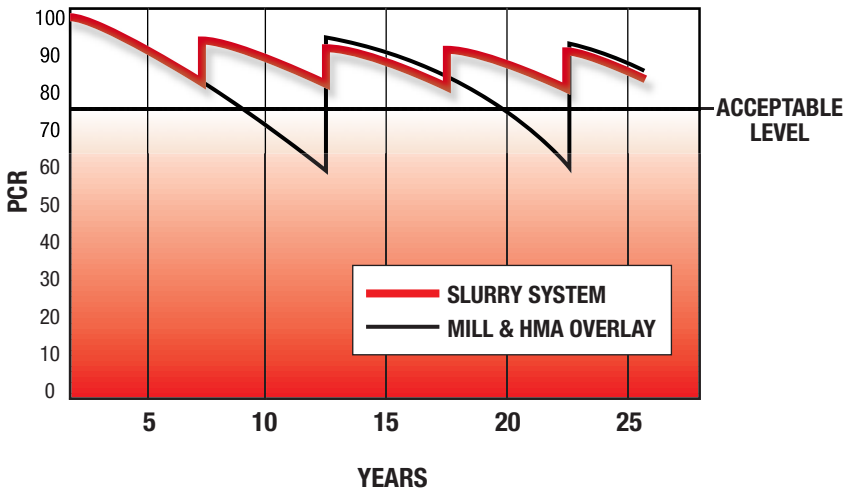
– Past President, ISSA


## Slurry Systems provide a superior macro texture that greatly enhances surface friction as the speed of traffic increases.



***Slurry Systems, when used as preventive maintenance, provide consistently higher quality pavements at less than 1/2 the cost as compared to milling with overlays.***



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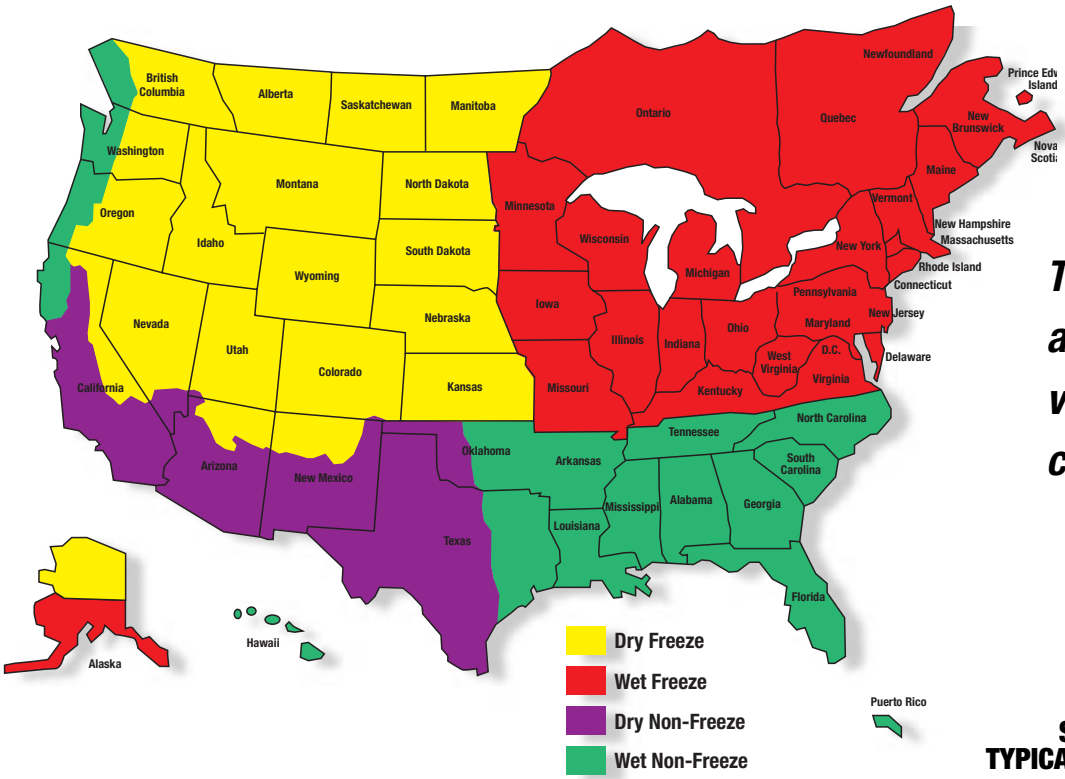
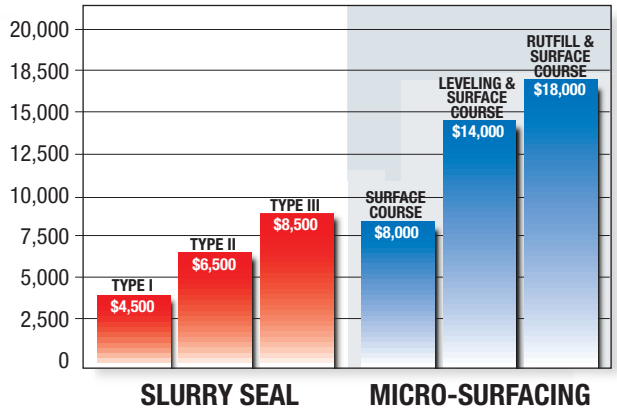



***Treatment costs and service life will vary by region and climate condition***

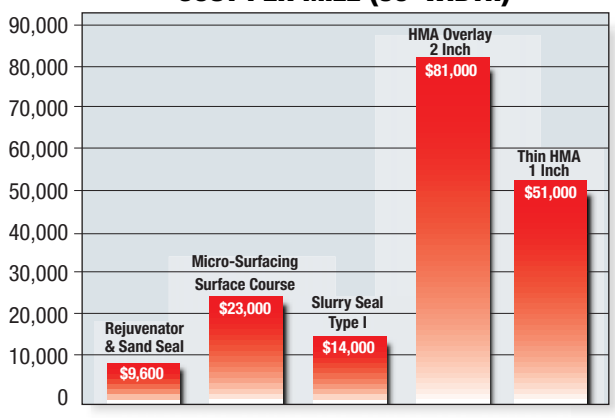
***Other resurfacing options can be as much as 2 to 5 times greater than the cost of Slurry Systems.***

## SLURRY SYSTEMS TYPICAL COST PER LANE MILE



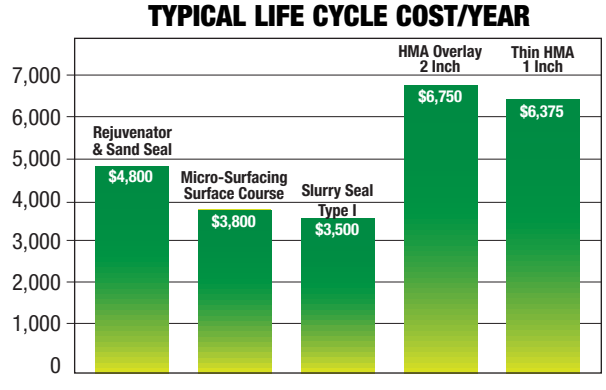

## PREVENTIVE MAINTENANCE FOR CITY STREETS

### COST PER MILE (30' WIDTH)




Includes cost of milling and casting adjustments for HMA treatments

### TYPICAL LIFE CYCLE COST/YEAR




Includes cost of milling and casting adjustments for HMA treatments

*Please note: These charts are typical of midwest region of country. Cost and life cycle will vary based on climate and region.*

# ENSURING QUALITY PERFORMANCE

### Application – System Selection

To perform well, a Slurry System must be appropriate for the pavement condition and meet the criteria of the application. Traffic volume and type, day or night application and traffic control are important factors to consider when designing a Slurry System project.

### Materials

The construction materials available today offer the engineer and contractor many choices in attaining the improved performance and desired results. Careful selection of quality materials and testing system compatibility will go a long way toward ensuring ease of construction and long-term performance.

### Mix Design and Quality Control

The goal of a mix design is to select the appropriate materials and to determine the proper proportions that will withstand the demands of the intended application. ISSA TB-A143 for Micro-Surfacing and TB-A105 for Slurry Seal are excellent guidelines and should be used as a reference for the development of local standards and specifications.

Quality control of the mixture is critical and initial trial runs are necessary to ensure compliance with the mix design. *A quality control manual is available from ISSA and will aid agency personal in assuring a quality Slurry System.*

**SLURRY SYSTEMS MIXTURE CROSS SECTION**


***Slurry Systems offer the treatment types and thickness as required to address a wide variety of pavement needs.***


# PRACTICING PROPER CONSTRUCTION TECHNIQUES

The secret to Slurry System construction success is no secret. Practice proper construction techniques and pay close attention to details.

- **Verify materials and proportions are in compliance with the mix design.**
- **Inspect equipment and tools for adequacy.**
- **Verify equipment calibration of materials output.**
- **Ensure the pavement is prepared and clean.**
- **Inspect traffic control for protection of workers and safety of traveling public.**
- **Monitor placement of mixture for consistency and uniformity.**
- **Ensure workers follow procedures for hand work and constructing joints.**
- **Follow quality control plan.**
- **Operate in suitable weather conditions.**

Experience has shown that Slurry Systems, when properly designed and applied, will be long-lasting, cost-effective treatments that will provide a smooth surface with superior wear and friction properties.

Utilization of Slurry Systems as treatments in a preventive maintenance program will result in a **dramatic increase in pavement performance and will lower life-cycle costs**. The cost of selecting, designing and constructing a high-quality Slurry System is only a fraction of the cost of milling and asphalt paving or reconstruction/rehabilitation.

*An inspectors manual is available from ISSA. This document can be used for development of or as a supplement to existing agency inspection procedures.*

# ECO-EFFICIENT STRATEGY

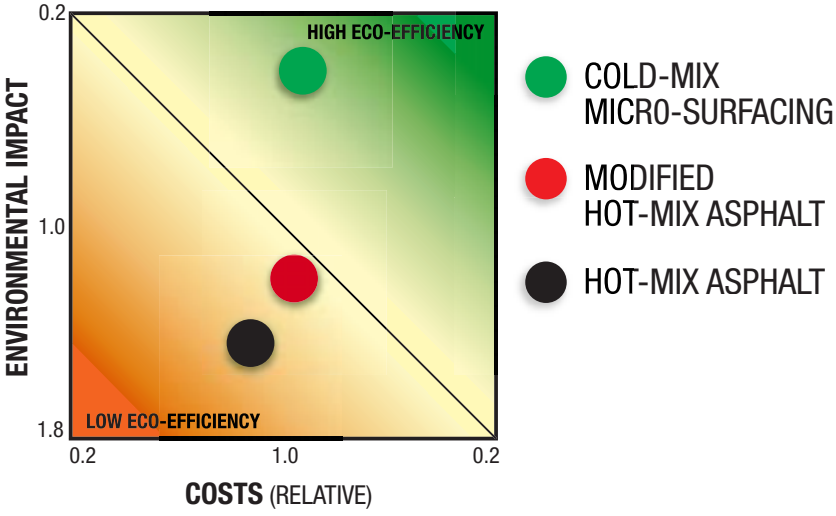
An eco-efficiency analysis developed and performed by BASF Corporation clearly demonstrated that Slurry Systems' Micro-Surfacing provides better balance between cost-effectiveness and environmental impact than thin hot mix overlay technologies.

The study applied the eco-efficiency analysis to the preventive maintenance of existing roadways: comparing Micro-Surfacing, thin hot mix and polymer-modified hot mix asphalt. The main goal of the eco-efficiency analysis is "to offer customers the best possible alternatives with the least environmental impact—at the best cost."

*The analysis focuses on:*

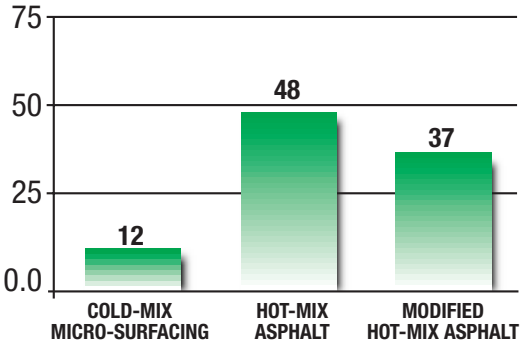
- **Optimum Performance**
- **Raw Material and Energy Consumption**
- **Recycling and Disposal**
- **Ecological and Economic Advantages**

When all factors were considered, Micro-Surfacing had a lower environmental "footprint." The thicker hot mix layer led to a greater use of natural resources, as well as higher energy consumption and emission involved in its manufacture and transportation.

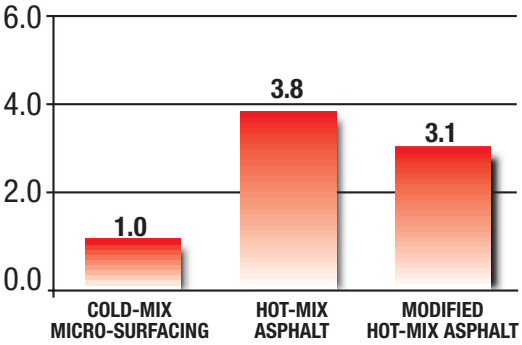



***Eco-efficiency portfolio combines environmental impact with annual treatment costs.***

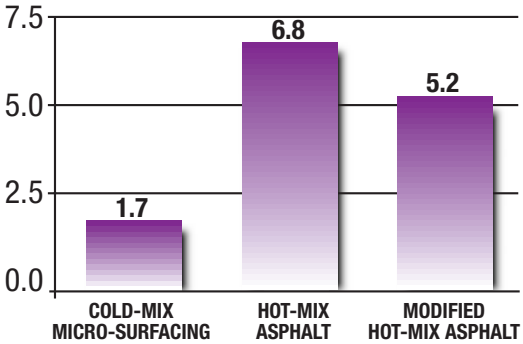
**PHOTOCHEMICAL OZONE CREATION POTENTIAL**
in kg ethene equivalents per lane mile




**GLOBAL WARMING POTENTIAL**
in t $CO_2$-equivalents per lane mile




**ACIDIFICATION POTENTIAL**
in kg $NO_2$-equivalents per lane mile




***Results prove that Micro-Surfacing is more "Eco-Efficient" than hot-mix overlays.***

# SLURRY SYSTEMS THROUGHOUT THE WORLD

The performance history of Micro-Surfacing and Slurry Seal throughout the world verifies their ability to consistently provide quality performance, safety, and extend pavement life at lower costs. The following is a recent list of world wide usage of Slurry Systems.

- **Streets, Roadways, Highways and Interstates**
- **Airport Runways, Taxiways and Ramps**
- **Highway Shoulders**
- **Parking Lots**
- **Service Drives**
- **Park and Access Roads**

**Africa**
**Argentina**
**Australia**
**Austria**
**Belgium**
**Brazil**
**Botswana**
**Bulgaria**
**Canada**
**Chile**
**China**
**Columbia**
**Czech Republic**
**Denmark**
**Finland**
**France**
**Germany**
**Great Britain**
**Greece**
**Hungary**
**Indonesia**
**Italy**
**Japan**
**Korea**
**Malaysia**
**Malawi**
**Mexico**
**Mozambique**
**Namibia**
**New Zealand**
**Norway**
**Peru**
**Poland**
**Portugal**
**Romania**
**Saudi Arabia**
**Slovakian Republic**
**Spain**
**Sweden**
**Switzerland**
**Thailand**
**The Netherlands**
**United States**
**Uruguay**
**Zambia**
**Zimbabwe**

# MICRO-SURFACING – SLURRY SEAL

## Cost Less – More Effective

With the rising cost of materials and limited funding, Micro-Surfacing and Slurry Seal cover more miles of roads with less money and provides the best surface quality.

## Safer – Better Service

Micro-Surfacing and Slurry Seal provide superior wet pavement friction and better traction in freezing conditions. The effective macro texture improves tire contact with the pavement surface in wet conditions and retains road salts longer for better ice control.

## Less Delays – Improved Use of Resources

Surface sealing with Micro-Surfacing and Slurry Seal effectively reduces pavement deterioration and the formation of cracks and potholes. The resulting higher quality pavement provides less exposure of workers to the hazards of traffic, improved safety, more effective use of man-hours and better use of existing funding. Higher quality streets and roadways also mean fewer traffic delays and road closures that frustrate residents, taxpayers and the traveling public.

## Smoother – More Desirable

Utilizing Slurry Systems as surface treatments on pavements in fair to good condition keeps them smooth, safe and maintenance free. Superior performance of Micro-Surfacing and Slurry Seal provides pavements that not only look good but last longer!

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*This publication is produced and distributed worldwide by the International Slurry Surfacing Association (ISSA). ISSA is a non-profit organization composed of governmental agencies, corporations, and individuals who provide the industry with machinery, materials, engineering, design and construction services.*

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