Infrared Asphalt Repair

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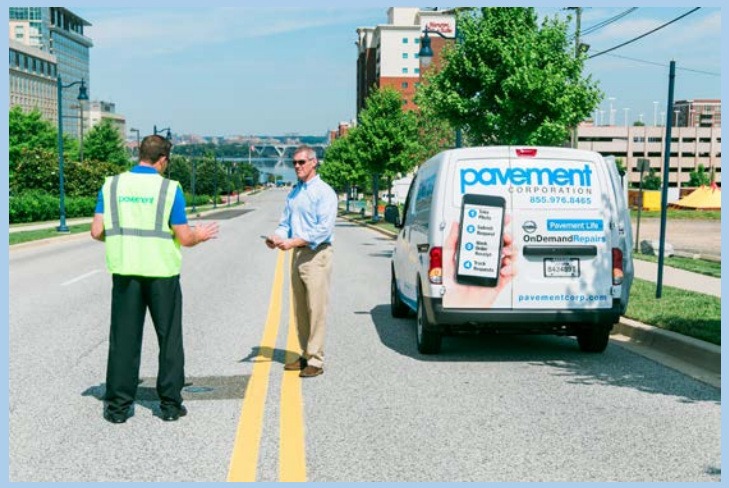

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Maryland Technology Enterprise Institute

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pavement
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Overview

- What is Infrared Asphalt Repair?
- MIPS Project – Phase 1 – Quality Assurance
- MIPS Project – Phase 2 – State Certification
- Prince George’s County Pilot Program
- Other Municipal Infrared Repair Participants

What Is Infrared Asphalt Repair?

What Is Infrared Asphalt Repair?

Infrared repair is a remedial asphalt technique

- Potholes
- Depressions
- Limited cracking
- Localized defects
- Around grates and manholes

Infrared Pothole Repair

Infrared Seam Failure Repair

Current Infrared Issues

In spite of the potential benefits, very little research has been done on infrared pothole patching.

This inhibits the creation of robust QA/QC procedures.

- #1 - Optimum temperature control of the heater.
- #2 - Properties of asphalt materials post-patching.
- #3 - Proportioning and proper application of rejuvenators.

Infrared Versus Conventional Repair Methods

Bottom Line

Infrared Patching is cost effective and competitive

- Longevity of the repairs (14x throw and roll)
- Year long application potential

Nazzal Kim and Abbas, "Evaluation of Winter Pothole Patching Methods", 2014

Maryland Industrial Partnership's Response (Phase 1)

Improve Control of Production Process

- Provide suggestions for heating techniques based on field verified theoretical models.
- Provide recommendations on rejuvenator application.
- Develop in-the-field friendly QA/QC testing.

Maryland Industrial Partnership's Response (Phase 1)

Confirm Material Integrity and Properties

- Provide experimental verification of patch properties.

Document Findings

Develop Model Specification

- Allows for the approved adoption and use by local, county and state agencies.

Issue #2-Material Properties

UMD-1		
	Average Bulk Density	Avg. Dry ITT (psi)
In-situ Pavement	2.42	177.1
Heated in-situ Pavement	Na	180.9
New Patch	2.34	165.7
Joint	Na	177.7

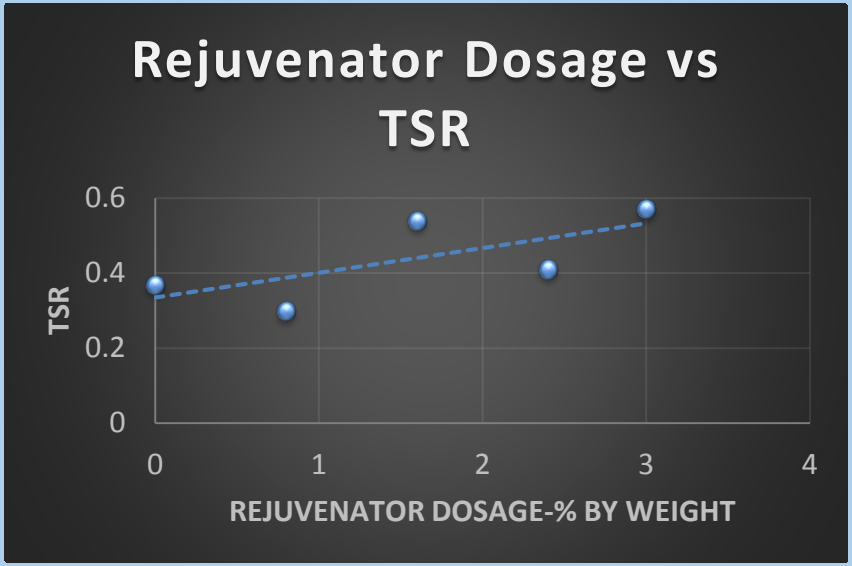
Main Points:

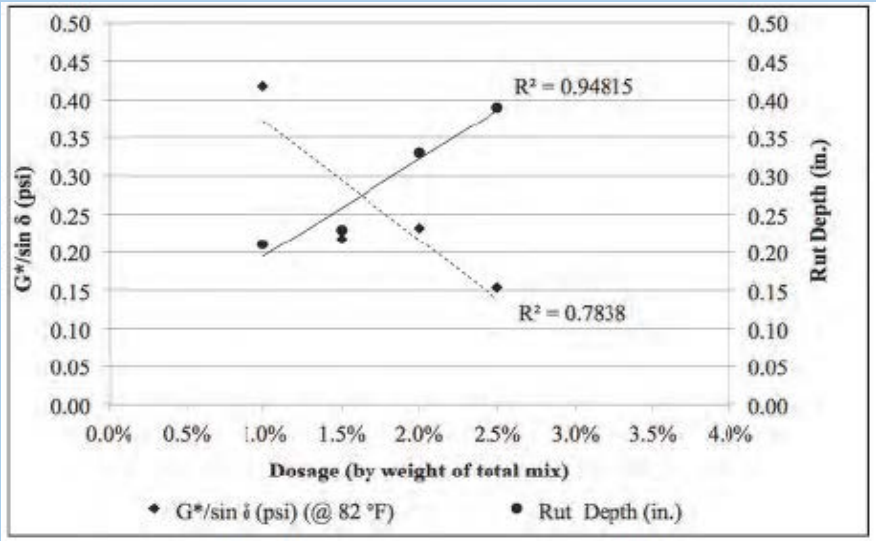
- Heated area is not effected.
- Joint has good thermal bonding.
- Two stage heating contributes to good thermal bonding with underlying layer.

UMD-3 Site				
Location	Average Bulk Specific Gravity	Average Dry IDT (psi)	Average Wet IDT (psi)	TSR
Native Pavement	2.38	316.9	83.9	0.26
I-Normal Patch	2.28	205.8	40.7	0.20
II-Heavy Compaction	2.28	198.9	51.8	0.26
III-Two Stage Heating	2.28	188.8	85.5	0.45
IV-Two Stage Heating	2.28	202	85.3	0.42

Issue #3 Proper Rejuvenator Use

UMD-3 Site				
Location	Average Bulk Specific Gravity	Average Dry IDT (psi)	Average Wet IDT (psi)	TSR
V-0% BW	2.28	213.6	78.9	0.37
VI-.8% BW	2.22	133.9	39.7	0.30
VII-1.6% BW	2.26	156.9	85.2	0.54
VIII-2.4% BW	2.27	146.2	59.8	0.41
IX-3% BW	2.30	158.4	89.7	0.57





Data From: Carruth, W. D., and Mejias-Santiago, M. "In-Place Asphalt Recycling for Small Airfield Repairs in Remote Locations", *2014*

MIPS Specifications

AASHTO

>Compact with steel drum roller
>18 month Warrantee period
>Allow to cool to 175F before opening to traffic

Canon City, CO

>Use of wind shield if windy conditions
>Compact with vibratory roller

Somerset, NJ

>Surface Temp checked with a thermometer during heating
>Remove top 1/2"
>6 month Warrantee period
>Entire process shall not take longer than 25 minutes to prevent excessive cooling

> Clean area prior to heating
>Surface Temp not to exceed 350F
>Depth of 2” heat penetration needed
>Heating is done when surface is workable with rake to 2” depth.
>Scarify the surface 3” around repair
>Compact to grade

>Rejuvenator is to be used
>Virgin HMA is added
>Compact edges first to ensure bond

MIPS Specifications - QA/QC Documentation

Codified in Publication

- Specified rejuvenator amount.
- Specified construction practices.
- Specified verification and warranty data.
- Construction documentation.

QA/QC PROJECT REPORT

GENERAL INFORMATION

Date:_____ Location:_____

Property Owner:_____ Foreman on Site: _____

Air Temperature:_____ Weather (i.e. Wind, Rain, Sunny):_____

Additional Notes:_____

MATERIAL INFORMATION

HMA

Asphalt Plant:_____

Time of Pickup:_____

Initial Temp (F) :_____

HMA Binder:_____

HMA Gradation:_____

Asphalt Rejuvenator

Product Name:_____

Water Ratio:_____

Amount Applied:

Patch 1:_____(gal)

Patch 2:_____(gal)

Temperature of HMA in Hotbox:

Time:							
Temp:							

Additional Notes:_____

SITE INFORMATION

Number of Patches:_____ (See Back for Additional)

Patch ID	Issue (i.e. crack, pothole)	Depth to Issue	Patch Square Footage
1			
2			

Additional Notes:_____

HEATING INFORMATION

Pavement Temp. After Heating:_____ Duration of Heating:_____

Temp. During Compaction:_____ Temp. At Opening To Traffic:_____

Additional Notes:_____

COMPACTION INFORMATION

Roller Used:_____ Number of Lifts:_____ Number of Passes per Lift:_____

Native Pavement Density:_____ Patch Densities:_____

Additional Notes:_____

Maryland Industrial Partnership's Response (Phase 2)

- Develop multi-solution decision support tool for pavement maintenance and repair.
  - Infrared repair plus other repair strategies (e.g., full depth patching, surface sealing).
  - "Road test" at commercial property chains (e.g., Wawa).
- Gain wider acceptance of infrared repair via spec adoption by Maryland State Highway Administration.
- Pursue wider promotion of infrared repair strategies through forums like the Maryland SHA Recycled Materials Task Force and similar.

Infrared Asphalt Repair Participation

Infrared Pilot Program
Prince George's County 2015-2016

Total repairs (April 2015 – August 2016)	1,350
Average repairs per day	16
Cost per repair	$375

- 8 assigned roads.
- On call infrared repairs.

Other Municipal Infrared Participants 2015 -2017

VDOT

- 80 repairs
- Interstates 95,495 and 64

WSSC

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