



# Hot-in-Place Recycling

Presented by:  
Patrick A. Faster



# Who is **GALLAGHER** **ASPHALT**?

- Founded in 1928
- 3<sup>rd</sup>-Generation, Family-owned Highway Paving Contractor
- Asphalt Plants throughout the Chicagoland area
- Well-respected and active member of NAPA, ARTBA, NCAT
- Hot-in-Place Recycler for over 35 years
- 3<sup>rd</sup> Largest HIP Recycler in the U.S.



# Who is



Chicago Testing  
Laboratory, Inc.

# ?

- Founded in 1912
- A Full-Service Engineering and Construction Management firm
- Industry leader in QC/QA of asphalt, asphalt materials, liquids, aggregates, concrete and soils
- Provides testing, inspection, training, consulting & research
- Well-respected and active member of NAPA, ARTBA, NCAT
- Provides over 150 years of combined expertise, state-of-the-art facilities and a high degree of professionalism



# 2012 IDOT Contractor of the Year



## Illinois Department of Transportation

Office of the Secretary  
2300 South Dirksen Parkway / Springfield, Illinois / 62754  
Telephone 217/782-5597

October 23, 2012

Mr. Charles J. Gallagher, President  
Gallagher Asphalt Corporation  
18100 South Indiana Avenue  
Thornton, IL 60476

Dear Mr. Gallagher:

Congratulations on your recent nomination for Illinois Department of Transportation's Contractor of the Year Awards in the Hot Mix Asphalt category. The nomination was in recognition of patching and resurfacing along IL 1 (Halsted Street) from 152nd Street to 127th Street in Riverdale, Chicago and Harvey.

I am very pleased to announce the project was selected for the award. The department would like to publicly acknowledge your outstanding performance. A plaque will be presented to you or your firm's representative at the Illinois Road and Transportation Builders Association's annual meeting on December 13, 2012, being held at the Hyatt Regency O'Hare in Rosemont. The awards will be presented from 4:30 to 6:00 p.m. in Rosemont Rooms A and B.

Those persons on your staff who are interested in attending the awards ceremony are welcome. Photographs will be taken during this time.

For additional information and tickets to the dinner, you may contact Mr. Michael J. Sturino, Executive Director, Illinois Road and Transportation Builders Association at telephone number (630) 773-1220.

Thank you for your interest in the Illinois transportation system. Once again, congratulations to you and your staff on this outstanding accomplishment.

Sincerely,

A handwritten signature in black ink, reading "Ann L. Schneider".

Ann L. Schneider  
Secretary

A logo for "Hot in Place" recycling. It features the words "Hot in Place" in a large, bold, sans-serif font, with "RECYCLING" in a smaller font below. To the right of the text is a graphic of three interlocking arrows forming a triangle, with the top arrow pointing right, the bottom-left arrow pointing down, and the bottom-right arrow pointing up. The entire logo is set against a green background with a white recycling symbol.







**ADMINISTRATOR'S MESSAGE:**

The National Highway System (NHS) is extensive, with over 160,000 miles of highway pavements and over 128,000 structures, built using large quantities of asphalt, concrete, steel, and aggregate, and smaller quantities of nonferrous metals, plastics, and other materials. Much of the system was constructed in the 1960's and 70's and is in need of major rehabilitation or total reconstruction; and much of the materials used to build that system can be recycled for use in the new construction.

In order to carry out the mission of the FHWA, i.e., to “improve the quality of the Nation’s highway system,” the NHS must be properly preserved, maintained, rehabilitated, and when necessary, reconstructed. Maintenance of highways and associated structures is critical to our ability to provide the safest, most efficient roadway system possible, while simultaneously providing the greatest level of protection to the human and natural environment.

The same materials used to build the original highway system can be re-used to repair, reconstruct, and maintain them. Where appropriate, recycling of aggregates and other highway construction materials makes sound economic, environmental, and engineering sense. The economic benefits from the re-use of nonrenewable highway materials can provide a great boost to the highway industry. Recycling highway construction materials can be a cost-saving measure, freeing funds for additional highway construction, rehabilitation, preservation or maintenance.

Congress declares that it is in the national interest to promote the use of innovative technologies and practices that increase the efficiency of construction of, improve the safety of, and extend the service life of highways and bridges... The innovative technologies and practices described in paragraph (1) include state-of-the-art intelligent transportation system technologies, elevated performance standards, and new highway construction business practices that improve highway safety and quality, accelerate project delivery, and reduce congestion related to highway construction... such as... ‘(ii) innovative construction equipment, materials, or techniques, including the use of in-place recycling technology and digital 3-dimensional modeling technologies;





## Recycling Course 101

# Not Your Father's.....



# ARRA Recycling Disciplines

	Service Life	Approx. Cost (per Sq. Yd)
• Cold Planing / Milling	Anytime	\$1 - \$3
• Hot in Place Recycling	5-10 Years	\$4 - \$5
• Cold in Place Recycling	7-13 Years	\$8
• Full Depth Reclamation	15 Years Plus	\$18 - \$23
• Soil Stabilization	15 Years Plus	FDR + \$3

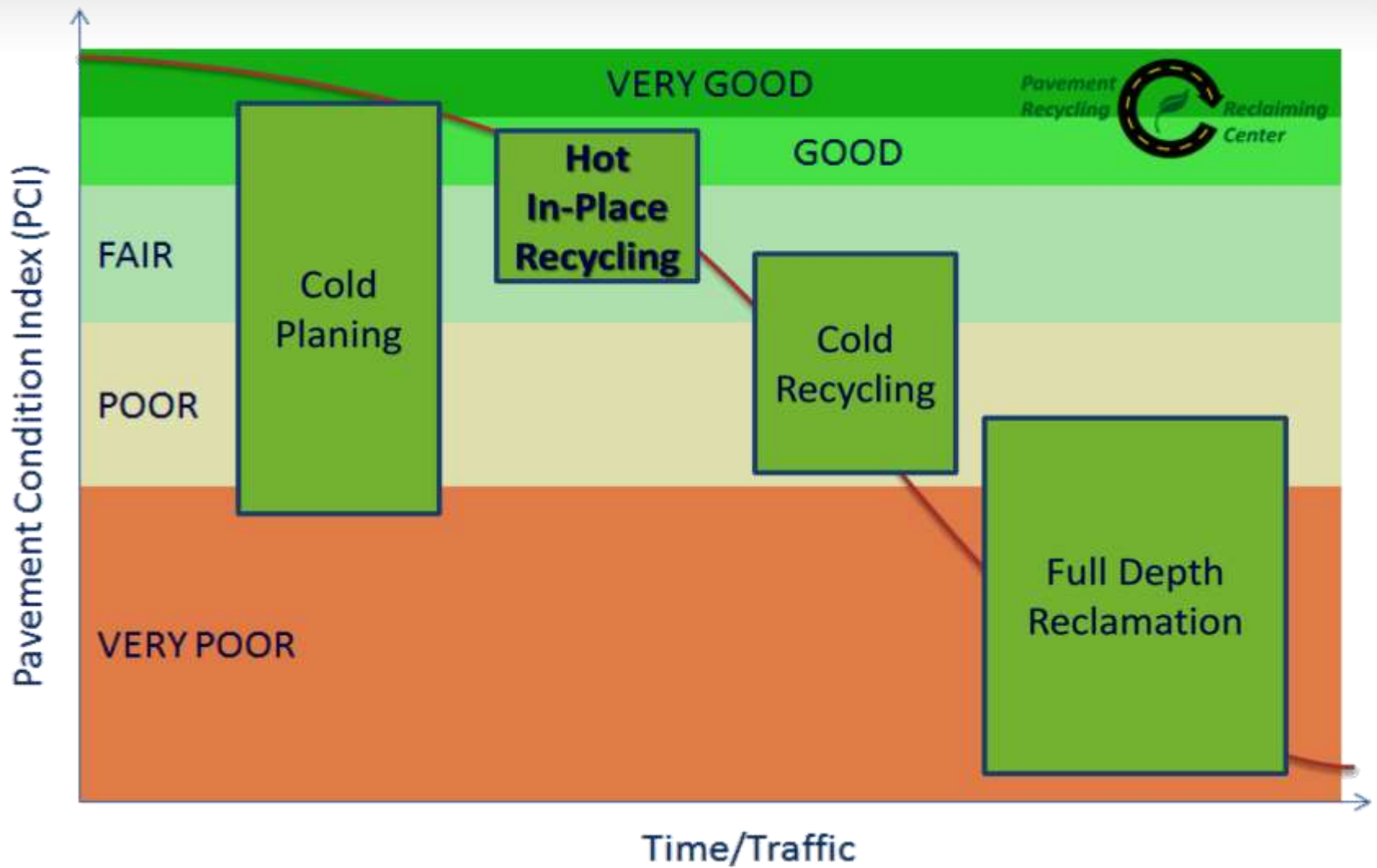


Right Road • Right Fix • Right Time

Inventory

Assess

Perform





# ARRA Sub-categories within the HIR Discipline

- Surface Recycling (ie. Heater Scarification)
- Remixing
- Surface Repaving

# Gallagher Asphalt's Hot-in-Place Recycling Options:

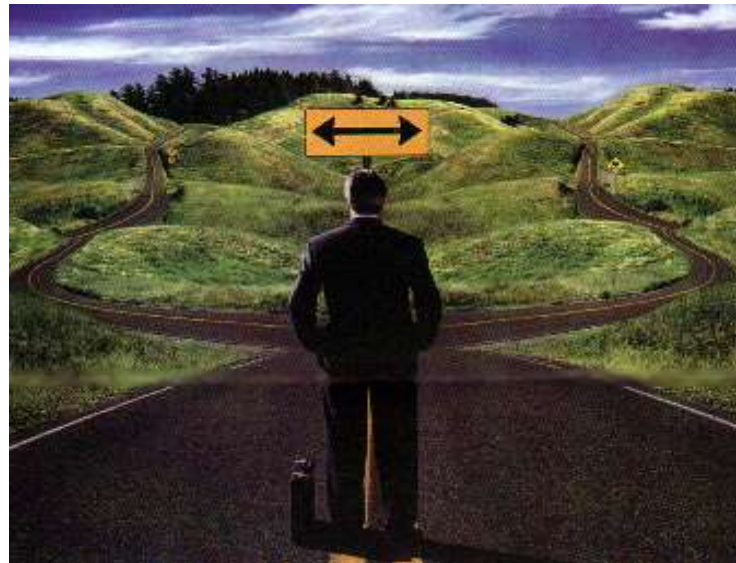
- Surface Recycling (Heater Scarification)
- Re-HEAT



# HIR

## Where Does IT Fit In?

Re-Construction



Preventive

# Typical Grind & Overlay

- Grind to a 2" depth
- Haul grindings away
- Tack course
- Haul leveling course to jobsite
- Place level course
- Roll It
- Haul surface course to jobsite
- Place surface course
- Roll It





# What is the Hot-in-Place Recycling **SURFACE METHOD**?

Hot-In-Place Recycling Surface Method is an on-site, in place, pavement rehabilitation method that consists of **heating, scarifying, mixing, replacing and re-compacting** the existing bituminous pavement.





# Surface Recycling: Step 1

- 1<sup>st</sup> Pre-Heater takes pavement temp to 180 – 200 degrees





# Surface Recycling: Step 2

- 2<sup>nd</sup> Heater takes pavement temp to 280 – 300 degrees





# Surface Recycling: Step 3

- Introduction of rejuvenating agent





# Surface Recycling: Step 4

- Spring-loaded tines set hydraulically at prescribed depth will drag over existing structures to avoid damage





# Surface Recycling: Step 5

- Full width reversible augers to re-mix







# Surface Recycling: Step 6

- Re-profiling with standard paving screed



# Surface Recycling: Step 7

- Roller



# Open to Traffic. . .





# Surface Recycling: Step 8

The now re-plasticized asphalt is ready to receive its final surface course; such as:

- Hotmix
- Microsurface
- Slurry Surface
- Chip Seal



# What is METHOD?

Re-HEAT is an on-site, in place, pavement rehabilitation method that consists of **heating** the existing pavement, **removing** the top surface course, **adding** an asphalt rejuvenating emulsion, **mixing** the material uniformly in an on-board mixing drum, **re-laying** the recycled material, followed by **compacting**.





# Step 1: Heating the Existing Pavement

- The road surface is softened with radiant convection heat.



## Step 2: Removing Top Surface Course

- A rotary blade system dislodges the material for processing.



## Step 3: Adding Asphalt Emulsion

- Additives are injected to reconstitute the rejuvenated asphalt.





## Step 4: On-Board Mixing Plant

- A heated mixing plant uniformly blends the additives with the asphalt.



# Step 5: Relaying Recycled Material

- The rejuvenated asphalt is immediately placed to the correct slope and grade.



# Step 6: Compaction

- While still hot, the newly recycled asphalt pavement is rolled to final compaction.





# Open to Traffic. . .



# Rejuvenating Agent Application Rate

Both HIR process will introduce a rejuvenating agent typically at the rate of 1/10<sup>th</sup> gallon per square yard.

# Pre-requisites for HIR:

- Pavement must be structurally-sound with no base failures
- Pavement must have at least 3” of hotmix asphalt

# What Types of Asphalt Pavements Are Candidates for Hot-in-Place?

# Typical Candidates for HIR:





# NON-Candidates for HIR:







Wisconsin





Missouri



Minnesota







Indiana





Ohio





Tennessee



New Jersey



Oregon







Georgia





# Hot-in-Place Comparison

		
<b>Need for Surface Treatment /Overlay</b>	<b>No</b>	<b>Yes</b>
<b>Materials Added During Process</b>	<b>Asphalt Rejuvenator</b>	<b>Asphalt Rejuvenator</b>
<b>SYs per Day</b>	<b>4,000</b>	<b>9,000</b>
<b>Pavement Penetration Depth</b>	<b>Up to 2" (Depending on Surface Course Thickness)</b>	<b>Up to 1.5" (Depending on Surface Course Thickness)</b>
<b>In-Place Mixing Capability</b>	<b>On-board drum mixer</b>	<b>Scarifying Tines &amp; Augers</b>
<b>Thermal Bond Effect</b>	<b>Moderate - High</b>	<b>Low - Moderate</b>
<b>Mat Re-Placement</b>	<b>Conventional paving screed</b>	<b>Conventional paving screed</b>
<b>Compaction Equipment</b>	<b>Double Drum Vibratory Roller</b>	<b>Double Drum Vibratory Roller</b>
<b>Budgetary Price per SY</b>	<b>\$13.50 Total</b>	<b>~ \$4.50 plus Surface Treatment/Overlay</b>

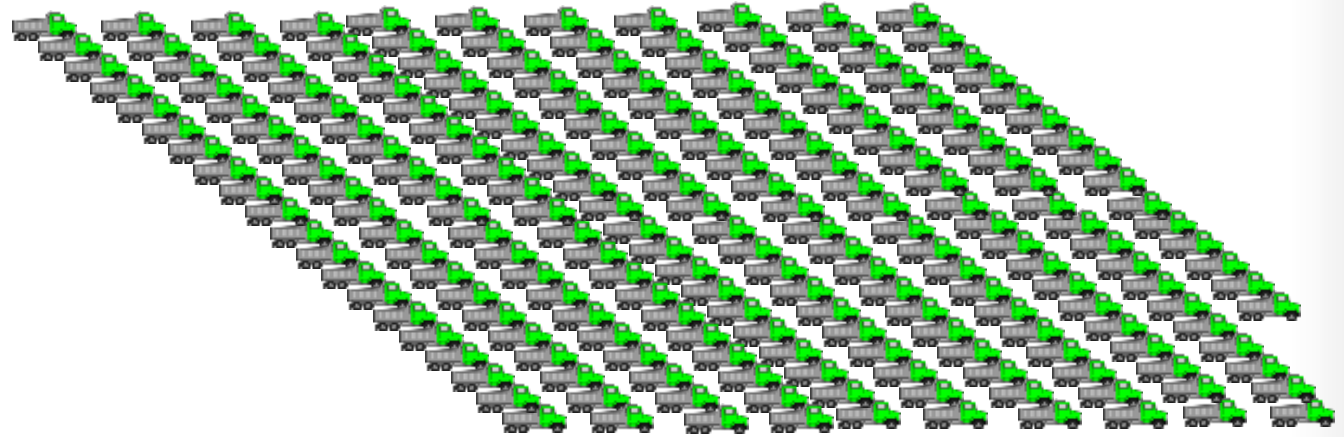


# So What Have We Done?

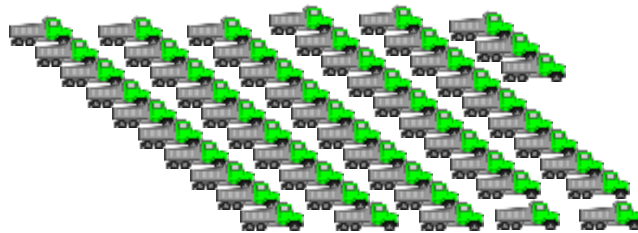


# Comparison: # of Truck Trips / Mile

**Standard 2 ¼ " Mill  
& Overlay**  
(215 trucks)



**HIR w/ 1" Hotmix  
Overlay**  
(53 trucks)





# Go Green, Save Green!

- Saves time & reduces “user delays”
- Minimizes the demand on oil & aggregate (non-renewable resources)
- Re-uses/recycles the existing materials – liquid asphalt & aggregates
- Eliminates milling dust & hassles
- Eliminates trucking pollution & traffic
- Reduces carbon footprint by 28-63%
- Uses propane – a cleaner energy source
- Uses a dual stage incineration system to protect air quality during operation



# Conestoga-Rovers Carbon Footprint Analysis



COMPARATIVE CARBON FOOTPRINT ANALYSIS:  
HOT-IN-PLACE RECYCLING (HEATER  
SCARIFICATION/SURFACE RECYCLING AND RE-  
HEAT) VERSUS TRADITIONAL ASPHALT PAVING

Prepared for:

Gallagher Asphalt

One of the leaders in Paving Excellence



DISCLAIMER:  
SOME INFORMATION CARRIED MAY BE IN ERROR OR INCOMPLETE.  
THE ORIGINAL DOCUMENT HAS BEEN REVIEWED TO CORRECT, HOWEVER,  
THE ORIGINAL CONTENT REMAINS UNCHANGED.

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Prepared by:  
Conestoga-Rovers  
& Associates

14456 Chestnut Road  
Suite 200  
Plymouth, Michigan 48170  
Office: (734) 453-4123  
Fax: (734) 453-5281

web: <http://www.craincorp.com>

WORLDWIDE ENGINEERING, ENVIRONMENTAL, CONSTRUCTION, AND IT SERVICES



# Conestoga-Rovers Carbon Footprint Analysis

- Versus Conventional asphalt paving with 20% RAP Hotmix:
  - Heater Scarification emits 28% less GHGs
  - Re-HEAT emits 62% less GHGs

# CTL Rejuvenator Study



PROPERTIES OF RECOVERED HOT  
IN PLACE REJUVENATED  
MATERIAL  
PRODUCT COMPARISON

Chicago Testing Laboratory, Inc.  
8/18/2011



# CTL Rejuvenator Study

- Samples were taken from an HIR project to represent existing material after the heating process and material after the rejuvenation process
- Results:
  - Air voids improved from 10.1% to 4.9% (3-5% is acceptable)
  - Viscosity & penetration improved over 21%
  - Total bitumen content increased from 4.8% to 5.9% after addition of rejuvenating agent
  - Stability & flow of the compacted material after treatment was statistically the same as prior to treatment
  - Tensile Strength Ratio (TSR) of the material improved nearly 8% and increased the stripping resistance of the pavement from a typically failing test to a passing one
  - Hamburg Wheel Analysis of the rejuvenated sample resulted in a 3.56mm average rut depth (a very rut resistant pavement)



# CTL Hamburg Wheel Study



Hamburg Wheel Track Study

Hot In Place Recycled Cores  
Rockdale County, Georgia

Chicago Testing Laboratory, Inc.  
10/20/2013

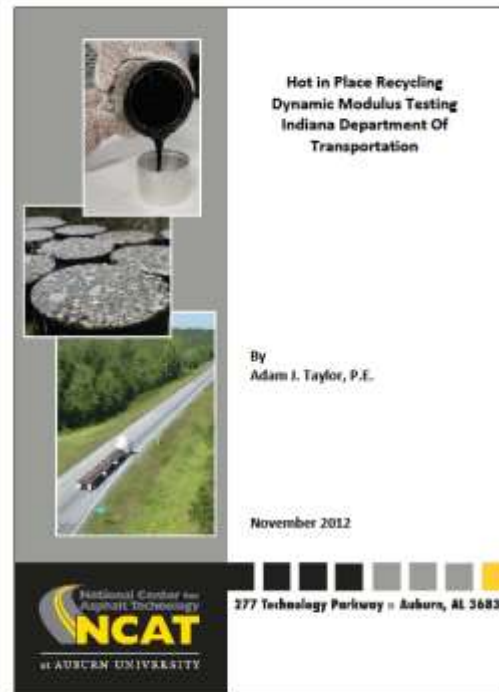


# CTL Hamburg Wheel Study

- Three sets of core samples were tested per AASHTO T324. Sample A is identified as “IRWIN BR CONTROL”, sample B is “IRWIN BR HIR” and sample C is “OLD COVINGTON HIR.”
- Each set tested to the 20,000 pass duration. The maximum rut measured during the test was measured and is summarized in table 1 below:

<u>Sample Number</u>	<u>Maximum Impression</u>	<u>Number of Passes</u>
Irwin Control	-4.73 mm	20,000
Irwin Bridge Overlay	-12.26 mm	20,000
Old Covington	-6.44 mm	20,000

# NCAT Dynamic Modulus Test



# Used by Many DOTs:



New York State  
Department of Transportation







South Coast  
Air Quality Management District  
*Cleaning the air that we breathe...*



Hot  
inPlace  
RECYCLING

Thank You!

Any Questions?

[www.hotinplacerecycling.com](http://www.hotinplacerecycling.com)



# Edge Grind/Scarify























# City of Milwaukee, WI

- Process: Re-HEAT
- Timing: Summer 2012
- Quantity: Approximately 67,000 SYs











SPEED  
LIMIT  
**20**  
WHEN  
CHILDREN  
ARE PRESENT













# Cobb County, Georgia

- Timing: Summer 2006
- Quantity: Approximately 50,000 SYs













# Washington County, Minnesota

- Timing: Summer 2010
- Quantity: Approximately 60,000 SYs















# Waukesha County, Wisconsin

- Process: Heater Scarification
- Timing: 2006 – 2012
- Quantity: 1 million+ SYs





















# City of Manistee, Michigan

- Timing: 2009
- Quantity: 63,000 SYs





















# What is the Conventional Heater Scarification **SURFACE METHOD?**