The Evolution of Hot In-Place Asphalt Recycling in British Columbia

presented to the Transportation Association of Canada

by

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Agenda

• Background
• What’s new
• How it works
• Where it works

Sustainability is not optional
We are the Ecopave Group

• 25 years HIPAR experience
• Over 2000 lane km completed
• Invented the Multi-Stage HIPAR Process
• Winner 2008 Best Paving Project Award
  • *Nominated 2012*
HIPAR: Hot In-Place Asphalt Recycling

- Heats, removes, rejuvenates and re-lays in a single pass
- Reduces cost, traffic disruption and Greenhouse gases
- Conserves non-renewable paving materials
BC HIPAR: past 25 years

• Multiple iterations of methods and machines
• Process of continuous improvement
• Over 9000 lane km completed
## Key innovations

<table>
<thead>
<tr>
<th>Multi-Stage Hot Milling</th>
<th>• 50 mm processing depth</th>
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<tbody>
<tr>
<td>Additive Systems</td>
<td>• Computerized Controls</td>
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<td>• Pugmill Mixers</td>
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<tr>
<td>Emissions Systems</td>
<td>• Captures and incinerates</td>
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<td>25 Years of experience</td>
<td>• Best practice established</td>
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<td>• Consistent outcomes</td>
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BC HIPAR Today

- “Stand-alone” treatment (final product, no overlay needed)
- About 500 lane km are recycled each year
- Major highways and runways

“Stand alone” runway at Kelowna Airport in 2012
First “Stand-Alone” Runway in 2012

• Kelowna International Airport: 3200 m x 61 m
• 50 mm HIPAR with 30% new HMA and recycling agent
• All specifications met, completed on time and on budget
• Client happy, saved over $3 million
New Three-Stage Recycler
Three-Stage Components

- Preheater
- 3 Hot Milling Machines
- Pugmill Remixer
- Conventional Paver
Three Hot Milling Machines

120 C Windrow
Three-Stage Hot Milling Process

1. Heat
2. Mill
3. Heat
4. Mill
5. Heat
6. Mill

Lift windrow over heater
Why Hot Milling?

The aggregates roll out of the heated, softened pavement without being crushed.

Radiant heater

Millers

120 C windrow

DIRECTION OF WORK
Three-Stage Hot Milling reduces the degradation of reclaimed materials

- Lower surface temperature required
- Aggregates removed without crushing
- Changes to aggregate gradation minimized
- Enables high performance, high RAP mix designs
The Pugmill Remixer

- Computerized additive controls & twin shaft pugmill
- Recycling agent and 20 to 30% new HMA
The Three-Stage HIPAR Process

Heat
Mill
Add Rejuvenator
Lift Windrow over Heater
Add new HMA
Blend with Pugmill
Laydown

DIRECTION OF WORK
Recycling Agent

• Recycling Agent: A select group of Maltenes that restores chemical balance of binder.

• Not an emulsion
Adding new HMA

Benefits:

- Improves ride
- Increase air voids
- Modify to more fine or coarse,
- Increase fracture count
Compaction with conventional methods
Smooth, consistent, free from segregation
Emissions are collected and incinerated

Incineration Chamber

Collection Ducts
Percentage of Bonus for Smoothness
Source: BC MoT

Conventional

HIPAR
Percentage of Bonus for Density

Source: BC MoT

<table>
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<tr>
<th>Year</th>
<th>Conventional</th>
<th>HIPAR</th>
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<tr>
<td>2004</td>
<td>80%</td>
<td>80%</td>
</tr>
<tr>
<td>2005</td>
<td>75%</td>
<td>75%</td>
</tr>
<tr>
<td>2006</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>2007</td>
<td>65%</td>
<td>65%</td>
</tr>
<tr>
<td>2008</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>2009</td>
<td>55%</td>
<td>55%</td>
</tr>
<tr>
<td>2010</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>2011</td>
<td>45%</td>
<td>45%</td>
</tr>
<tr>
<td>2012</td>
<td>40%</td>
<td>40%</td>
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Cost comparison per lane km

Source: BC MOT Study

- HIPAR: 45000
- Mill & Fill: 97000

20% RAP
Project Selection Factors

• Structural strength
• Roughness
• AC content not lower than 4.5% or greater than 6%
• AC penetration not lower than 20dmm
• In-situ air voids should not be less than 1%
• Pavement defects
  • Low to moderate density and severity
Thermal Cracking Strategies

Strategy #1 – 50 mm “stand alone treatment”
• Proceed with HIPAR, then crack seal if they reoccur
• Cost effective method to deal with raveling & rutting

Strategy #2 - 50 mm HIPAR with 50 mm overlay

Strategy #3 – Mill 50 mm / HIPAR 50 mm / Fill 50 mm
Project Selection Factors

Moderate surface defects
On the verge of a more rapid decline
BC MOT HIPAR Study

- Cost savings of up to 50% compared to mill & fill
- Experiencing comparable life cycles to new HMA
- Reduces Greenhouse gases by 30% to 40%
- Reduces lane closure time by up to 75%

Source:
BC’S SUCCESS WITH HOT IN PLACE RECYCLING - A 25 YEAR HISTORY
by Daryl Finlayson, Ian Pilkington, P.Eng. of the BC MOT
New Train Under Construction

HEATER MILLER

TWIN SHAFT PUGMILL

REMIXER
Thank you

www.ecopavesystems.com