Cold In-Place Recycling
First Impressions

Western Canada Pavement Workshop

Jim Gavin, P.Eng.
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Outline

- What is CIR
- Project selection
- Equipment used
- Design and specifications considerations
- Projects completed
- First impressions
- Future
Cold In-Place Recycling

- Recycling of existing asphalt layers done in-place without adding any heat.
  - Milling, sizing, mixing with additives and spreading of the recycled material may be done using either a single unit or a two to three unit train.

- Bituminous stabilization
  - Emulsion or foamed asphalt
  - Other additives such as Portland cement.

- First Alberta Transportation CIR project in 2008.
Project Selection

- Highly distressed and cracked pavements.
  - Minimal to moderate requirement for structural overlay.
- Small benefit in reducing overlay requirements.
  - Helpful in maintaining pavement width on narrow three digit highways.
- Typical treatment depth of 90 – 120 mm.
- Have treated both full pavement width and travel lanes only.
Project Selection

- Highly distressed pavements with much cracking (transverse, longitudinal and/or wheel path).
- Small benefit in preserving pavement widths.
- CIR can reduce overlay by 20 mm.
- Dependant on depth of existing pavement materials.
- CIR 90 – 120 mm treatment of ACP layer only.
- Ideally leave 50 mm of existing ACP.
- Typically 1.25% emulsion and 0.5% to 1.5% cement.
The Equipment

- Multi Unit Trains
  - Two Unit Trains
    - Milling, sizing and mixing in one unit.
    - Windrow pick-up and separate paving unit.
  - Three Unit Trains
    - Separate cold milling machine
    - Sizing and mixing in one unit
    - Windrow pick-up and separate paving unit.

- Single unit equipment
Two Unit Train
Three Unit Train
Three Unit Train
Single Unit Train
Design & QC/QA Testing

- Design follows Wirtgen Cold Recycling Manual
  - Briquettes - 75 blow Marshall @ room temperature.
  - Indirect tensile strengths (ITS)
    - Dry strength of 250 kPa
    - Retained strength ratio of 50%
  - All designs to date have used emulsions with 0.5% to 1.5% Portland cement.

- QC testing to include ITS testing of field mix.

- Acceptance requirements
  - Compaction $\geq$ 96% of field Marshall densities.
  - Moisture content $\leq$ 2%.
Specifications

- **Operational Constraints**
  - No CIR work below 10°C (5°C for foamed CIR)
  - Emulsion CIR to cure minimum 10 days prior to overlay.
  - All CIR to be overlaid within 30 days.

- **Contractor responsible to manage excess CIR material.**
  - Have included bid item on one project for pre-milling of patches.
# CIR Projects To-Date

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<th>Project</th>
<th>Lane.km</th>
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<td>2010</td>
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Observations

- Scheduling issues between CIR and paving
  - Projects where CIR was not overlaid within 30 days.
  - Also projects where paving contractor was waiting for CIR curing/moisture requirements.

- CIR mat seems to be more susceptible to traffic/moisture damage (raveling) if rain event is within 24 hours of placement.

- CIR mat can be reprocessed to improve smoothness and/or mat deterioration.

- CIR mat can be re-rolled to increase low compaction.
Observations

- All projects used emulsion stabilization.
- Curing does seem to need 10 to 14 days.
  - Competent slab specimens with moisture contents near 2%.
- Surplus material can be an issue.
  - Heavily patched or distorted pavements.
  - CIR of travel lanes only.
Observations

- Surface appearance and smoothness of CIR mat highly variable.
  - Examples of smooth tight mats and cases of rough segregated mats.
  - Related to equipment type, workmanship, condition of existing pavement ....
In-Place Recycling

Continue to use:

- Full Depth Reclamation
  - Mechanical, i.e. pulverization only – limited usage.
  - Bituminous stabilization – option for foamed or emulsion.

- Cold In-Place Recycling
  - Bituminous stabilization – option for foamed or emulsion.

Consider to provide option FDR vs. CIR on suitable projects.
That's All Folks