Use of Fine Milling (Carbide Grinding) To Stretch Highway Maintenance Budgets

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• Cost effective pavement preservation strategies are more important than ever in today’s tough economic climate.
• One means of extending pavement life at significantly reduced cost compared to traditional mill & fill, is to resurface with thin hot-mix asphalt (HMA) overlays – a case study will be presented.
• Thin HMA overlays require smoother fine milled or carbide ground surfaces so that the peaks and valleys of the milled surface do not reflect through the new thin overlay paved surface.
• Fine milling or carbide grinding utilizing 0.20 inch (5 mm) tooth spacing effectively removes distressed pavement and eliminates the need for multiple layers (scratch and/or leveling) and allows the option of thin-lift resurfacing that is not feasible under regular milling methods.

Highway maintenance budgets are tighter than ever – What should be done?
Why Fine Milling? What Can it Do?

- Restore safe skid resistance to worn, slippery pavement surfaces
- Remove wheel ruts or uneven pavement surfaces
- Roughen pavement surface to improve adhesion of thin wearing course or seal coat applications
- Allow milling crew to operate independently from paving due to surface texture that allows opening to traffic.
- Cost savings related to the reduced amount of material needed.
- Potential to use surface as milled over extended periods.

Fine Milling addresses above conditions at lower cost than traditional mill & fill.
Why Fine Milling? What Can it Do?

- Reduce – Material Removed
- Reduce – New Material Required
- Reduce – Haul Trucks
- Reduce – Time tied to Mill & Fill
- Reduce – Overall Contractor Costs
- Reduce – Overall Cost of Project
- Increase – The mileage of road to be paved

Fine Milling addresses above conditions at lower cost than traditional mill & fill.

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Fine Milling Advantages

- Scarify to a level below the over roll created by traffic.
- Maintain a considerable layer of original wearing surface.
- Restore surface with cover coat or sealer coat of choice.
- Utilize smaller aggregate in cover coat.
- Use super compacted area in high traffic zone as a base to bring road surface back to an “as new” condition.

Fine Milling addresses above conditions at lower cost than traditional mill & fill.
Project Background

- Georgia Department of Transportation (GDOT) project to remove open graded friction coarse (OGFC) and replace it with a thin layer of porous European mix (PEM) on 15.6 miles of I-75
- The OGFC was in service for 10 years and was distressed
- The dense graded surface mix layer under the OGFC still good shape.
- However, normal practice involved milling the underlying surface layer as well due to following concerns:
  - Potential exists for a conventional milled surface to reflect through the thin layer of the Porous European mix
  - Surface water would flow through the porous surface layer and become trapped in the valleys of the milled surface. Conventional milled surface peak to valley height is 5/16 -inch or greater.
- The fine surface texture created by fine milling allowed the thin OG course layer to be placed directly on the ground surface of the dense graded base layer, eliminating the need for a scratch or leveling course.

Reduce the amount of material needing milled and reduce new asphalt required.

Source: National Center for Asphalt Technology – Asphalt Technology News Spring 2010, Volume 22, Number 1, Page 5
Case Study: I-75 in Georgia

Project Controls and Specifications
- Control milling depth within 1/16 inch (1.6mm) accuracy
- Control peak to valley height to 1/8 inch (3.2mm) or less
- Target smoothness of 825 mm / km, not to exceed 900 mm / km

Project Measurement Methods
- National Center for Asphalt Technology (NCAT) assisted in using Circular Track Meter (CTM) and Ultra Light Inertial Profiler (ULIP) to measure surface texture depth
- Laser Road Profiler (LRP) used to measure smoothness.

Controlling the quality of the milled surface texture is critical to success
Case Study: I-75 in Georgia

Project Results:
- Savings of $58,000 per lane mile, or approximately $5.4 million for the project.

Traditional 5/8” Spacing

0.2” (Micro) Spacing

Micro milling enabled significant savings
“Sand Test” or “Glass Bead Test” (Colorado DOT), Maryland (DOT)

- Pre-measured volume (200 ml) of glass beads used for retroreflectivity in lane striping, is poured onto the milled surface from a height not to exceed 4 inches.

- Pile of glass beads is then distributed evenly on the milled surface using a slow circular motion with a plastic disk, until the disk rests on the peaks of the milled surface.

- To pass the test, the glass beads must spread out to cover minimum area of 9.5 inch diameter circle. Anything less means the surface is too rough.

Source: “Better Roads” October 2009 Pgs 16-23

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Milled surface texture is affected by:
- Drum design (bit spacing, wrap angle, bits per line)
- Drum RPM (faster RPM = smoother texture)
- Machine advance speed (faster machine speed = rougher texture)
- Drum Condition (Holders, teeth)
- Track pad condition
- Water system condition (tooth rotation)
## How Ground Speed Affects Texture

### Engagement Length, Angle, and Time Calculations

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20 Feet per Minute Advance Rate
Standard Spaced Drum
60 Feet per Minute Advance Rate Fine Milling 0.20” Drum

- Micro 0.20” (5mm) spacing
100 Feet per Minute Advance Rate Fine milling 0.20” Drum

- Micro 0.20” (5mm) spacing
Fine Milling Road Milling

- Micro 0.20” (5mm) spacing
Thank You