Micro Milling

Applications and Advantages for Pavement Preservation

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Presentation Overview

1. Difference between standard milling, fine milling and micro milling
2. Factors that dictate surface texture
3. Applications and advantages of micro milling in conjunction with pavement preservation treatments
4. Doublegrove Street Project
Drum Categories:

- Standard Milling- 5/8” (15mm) Spacing
- Fine Milling-3/10” (8mm) Spacing
- Micro Milling-2/10” (5mm) Spacing
Surface Comparison

Micro Milling .3” Repeat .3” Spacing  Standard Milling: 5/8” Spacing
Determining Factors of Surface Texture/Surface Pattern

1. Bit Spacing
2. Forward Cutting Speed
3. Wrap Configuration
4. RPM
5. Diameter of the Drum
6. Drum Maintenance
1. Bit Spacing
Standard Milling Drum

Triple Wrap Lacing at 5/8” (15mm) Spacing – 150 Bits
Fine Milling Drum

Triple Wrap Lacing at 5/16” (8mm)
Spacing - 300 Bits
Micro Mill Drum

Triple Wrap Lacing at 2/10” (5mm) Spacing - 450 Bits
2. Forward Cutting Speed
5/8” (15mm) Standard Drum Bit Strikes
Forward Cutting Speed
Forward Cutting Speed
5/8” Standard Spaced Drum:
Line spacing at 90’ min is actually 1 7/8” on the surface
Out Running the Cut or “V’ing Out”
3. Wrap Design
Triple Wrap vs. Quad Wrap

5/8” - 15mm Spacing (150 Bits)

15/16” - 22.5mm spacing (200 Bits)
Triple Wrap vs. Quad Wrap

Triple Wrap Lacing: 120, 240, 360

Quad Wrap Lacing: 90, 180, 270, 360
Wrap Design and Micro Milling
Tighter Spacing Does NOT= Smoother Surface

12mm-.45” Quad Wrap vs. 8mm-.3” Triple Wrap
Same Forward Cutting Speed and RPM
Increased Bit Count Does NOT = Smoother Surface

8 mm Triple Wrap Fine Drum (300 Bits) Vs. 22.5mm-15/16” Quad Wrap Standard Drum (200 Bits) Both Milled at 85’/Minute
Remaining Factors:

4. RPMs- Equally important as speed but is far less volatile

5. Diameter of the drum-Usually set by machine manufacturer

6. Cutter drum maintenance
Specifications

**Equipment Specs**
DO NOT insure end result

**Performance Specs**
INSURES end result
Allows room for competitiveness and creativity
Performance Based Specs for Micro Milling

• Georgia- Laser Road Profilograph
  – Remove/Replace OGFC
    - Multiple Lifts Required Before Micro Milling
    - Laser Measures the Distance of the Peak/Valley
Performance Based Specs for Fine Milling

- Virginia- Fine Milling Sand Test- ASTM E965: Sand Patch Test
  - Smoothness for Safety Reasons
  - Disconnect of Milling and Paving Operations
Micro Milling Applications

- Ride Corrective Tool Before Preservation Treatments and Overlays
- Surface Preparation Tool Before Preservation Treatment and Overlays
- Surface/Friction Course Removal
- Correctional Work
- Faulted Concrete Correction
- Wheel Rut Removal
- Temporary Driving Surface
- Bridge Deck Repair
- In-field Crushing of Material
Micro Milling Advantages

- Improves Ride on Overlays/Surface Treatments
- Enhances Pavement Life Cycle
- Reduction in Material Cost
- Reduction in Construction Cost
- Safer Driving Surface
- Restores Curb Line
- Reduction in RAP Processing Costs
Micro Milling in Conjunction with Pavement Preservation

1. Improve Ride/Smoothness of Road
2. Provides a Better Bonding Surface
   - Removal of Old Surface
   - Removal of Paint, Oil Slicks
   - Reduction in the Size of Surface Cracks
3. Restores Curb Line
4. Less Material Required (vs. standard milling)
   - Shallower Grooves .1” vs. .5”
   - Improved Spread Rate
5. Public Perception
JOB STORY: Los Angeles County, CA
L.A. County’s JOC (JOB ORDER CONTRACT) Process

• Agency provides an annual price book for each pavement preservation treatment: micro-mill, slurry seal scrub seal, chip seal, patching. The agency provides a price for each treatment and price break for quantities (i.e. smaller quantities higher price larger quantities lower price)

• Contractor bids a factor (i.e. .9) which is applied to all prices in the price book

• Contract is for up to $4.5 million to be used in one year. Can perform multiple contracts but go out to bid only once resulting in less soft costs

• Contract requires a 90% self-performing requirement to ensure experts in the field are performing the work - resulting in better workmanship

• Pavement preservation projects do not require elaborate design plans- resulting in lower soft costs

• Requires a prejob walk with the county and the contractor where the project scope is agreed upon prior to commencing work. Contractor has the opportunity to provide input prior to start of work - resulting in almost no change orders.
JOC- Job Order Contract

**Benefits for County:**

Creates a more collaborative process between the state/county and contractor, generally resulting in a better project

**Benefits for Contractor:**

Creates a more collaborative process between the state/county and contractor, generally resulting in a better project
Job Story- Doublegrove Street Project

Micro Milling Before Cape Seal Surface Treatment

- Residential Neighborhood
- PCI (Pavement Condition Index) 56
- 2.2 MSF
- Extensive alligator and map cracking with localized potholes
- Job cost $1,650,000
- Completed May 2015
Doublegrove Street, L.A. County Options:

1. Thin Lift Overlay/Surface Treatment
   - Too Rough

2. Reconstruction
   - Too Costly
Hybrid Approach

1. **Micro Milling:**
   - Improve ride and restore curb line

2. **Cape Seal Overlay:**
   - Extend pavement’s life and create a new riding surface
Doublegrove Street Project, L.A. County

1. **Asphalt Patching (7 Days):** Patching of failing asphalt

2. **Micro Milling (15 Days):** Less than 3/8” from the edge of the gutter across the road to shave high spots

3. **Scrub Seal (7 Days):** Application of asphalt rejuvenating emulsion (ARE) consisting of latex polymer and a rejuvenating agent and recycled asphalt product (RAP) screenings of 5/16”

4. **RAP Slurry Seal (11 Days):** Type 2- 100% RAP- Polymer Modified Emulsified Asphalt - Reclaimed Asphalt Pavement Aggregate Slurry Seal (PMERAPAS)
Doublegrove Street Project - BEFORE
Failing Asphalt
Milling for Full Depth Patching
Asphalt Patching
Micro Milling Process
Micro Milled Surface
Application of the Rejuvenating Emulsion
Emulsified Surface
Surface After the Spreading of RAP Chips
Application of RAP Slurry Seal
Finished Surface
Doublegrove Street Project, L.A. County

A SUCCESS!

- Improved Ride - 95 PCI
- Reduced Risk of Failure
- Restored Curb Line
- Aesthetically Pleasing
- Savings of $1.4 M!
Doublegrove Street Project, L.A. County

Green Advantages!

- 100% recycled aggregate used
- 84% Greenhouse Gas Emission Reduction
- 79% Energy Consumption Reduction
- 9,400 (CY) Landfill Reduction
Doublegrove Street Project, L.A. County

Lessons Learned:

• Micro Milling is Dusty! Vacuums trucks are needed

• Proper Training Required for Milling Operators- Surface oriented
  NOT production oriented

• Rise in Application Rates: 5-15%
New Technology:
When Conical Doesn’t “Cut” it

Ultra Precise Flat Tooth Bits:

• Shear the Surface
• 100% Surface Coverage
• Smooth and Level Surface Pattern
Bump Grinding and Surface Prep

Bump Grinding on Surface Course

Bump Grinding and Surface Prep for Seal Coats
Summary....

**Provides Options!**
Ride Improvement Tool

**Cost Savings!**
Reduction in Material and Construction Costs

**Better Quality Product!**
Better Bonding of Surface Treatment
Questions?

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