

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



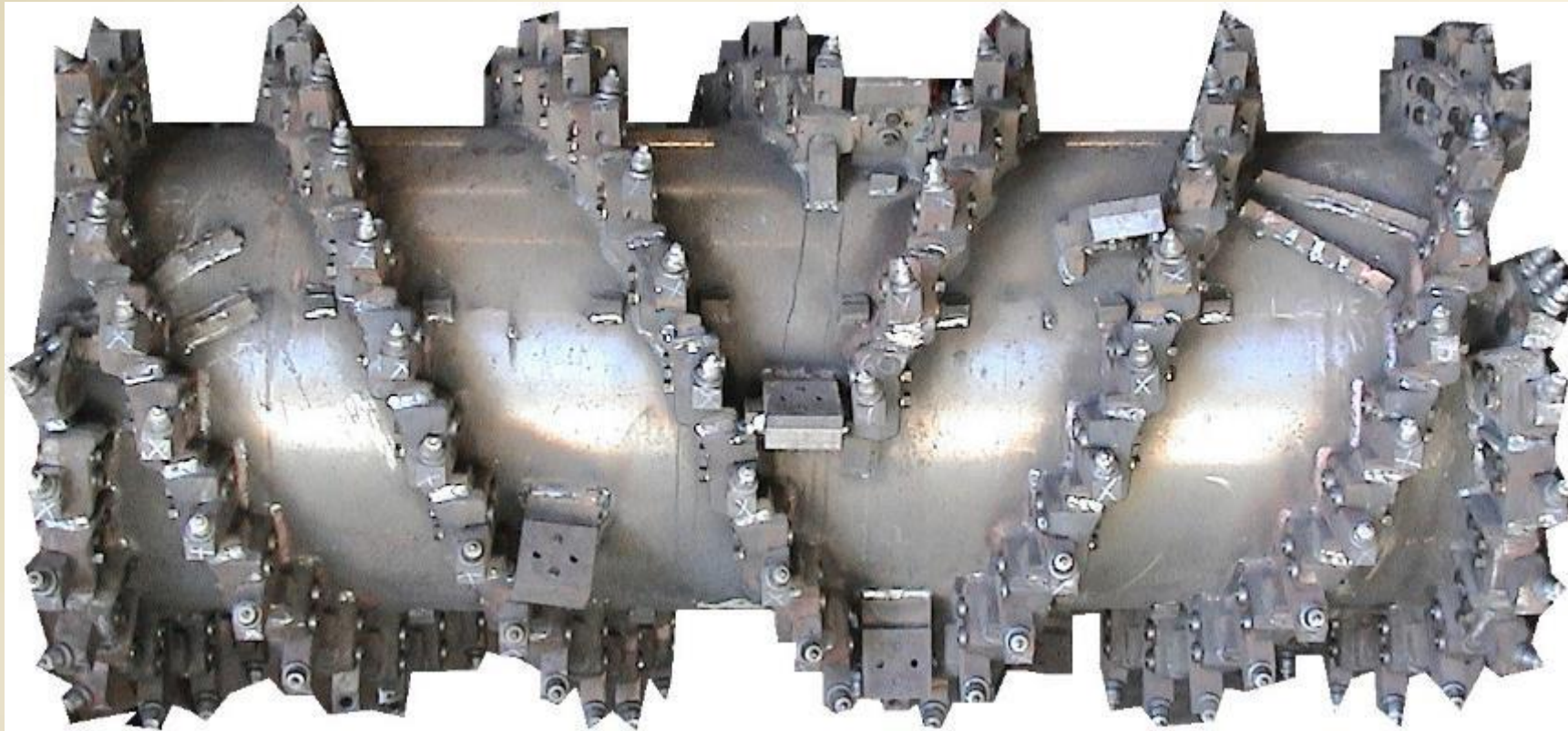
Standard Milling: 5/8" Spacing

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



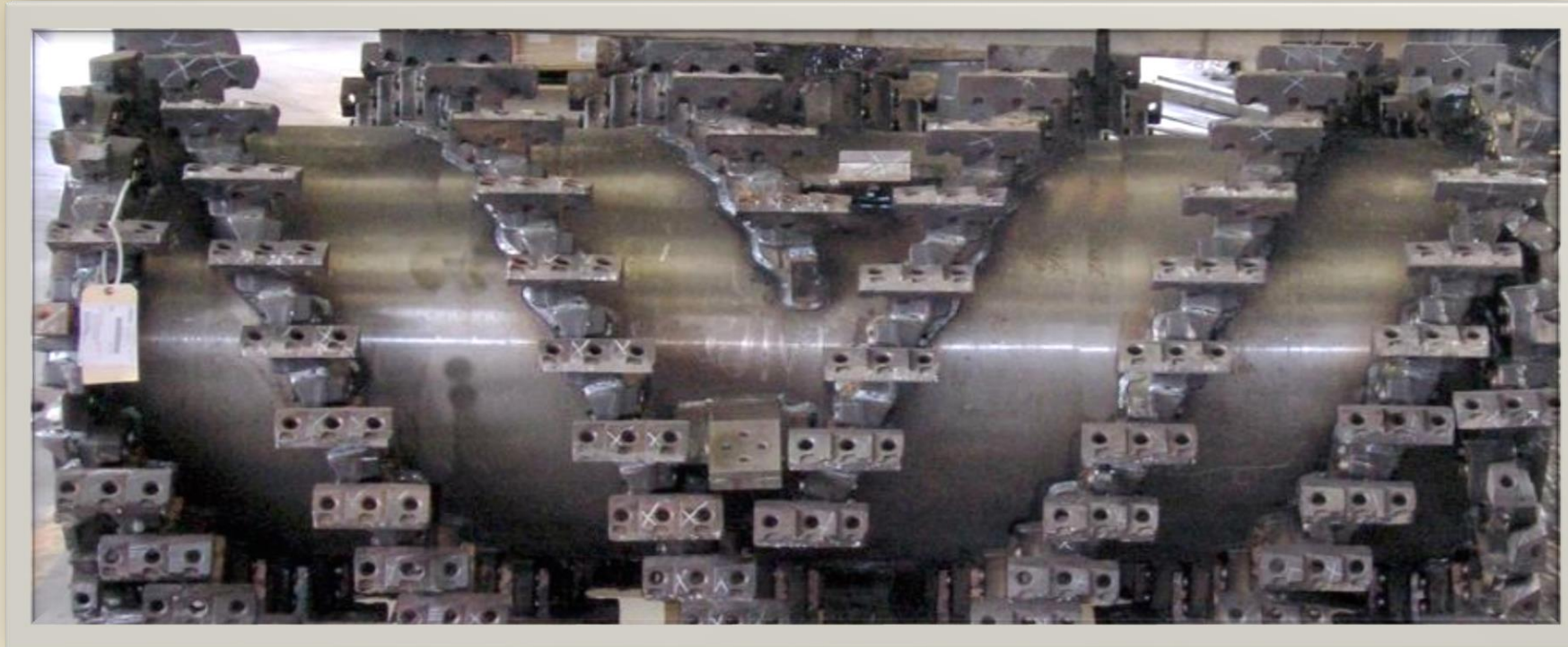
Triple Wrap Lacing at 5/8"
(15mm) Spacing – 150 Bits

Fine Milling Drum



Triple Wrap Lacing at $5/16''$ (8mm)
Spacing - 300 Bits

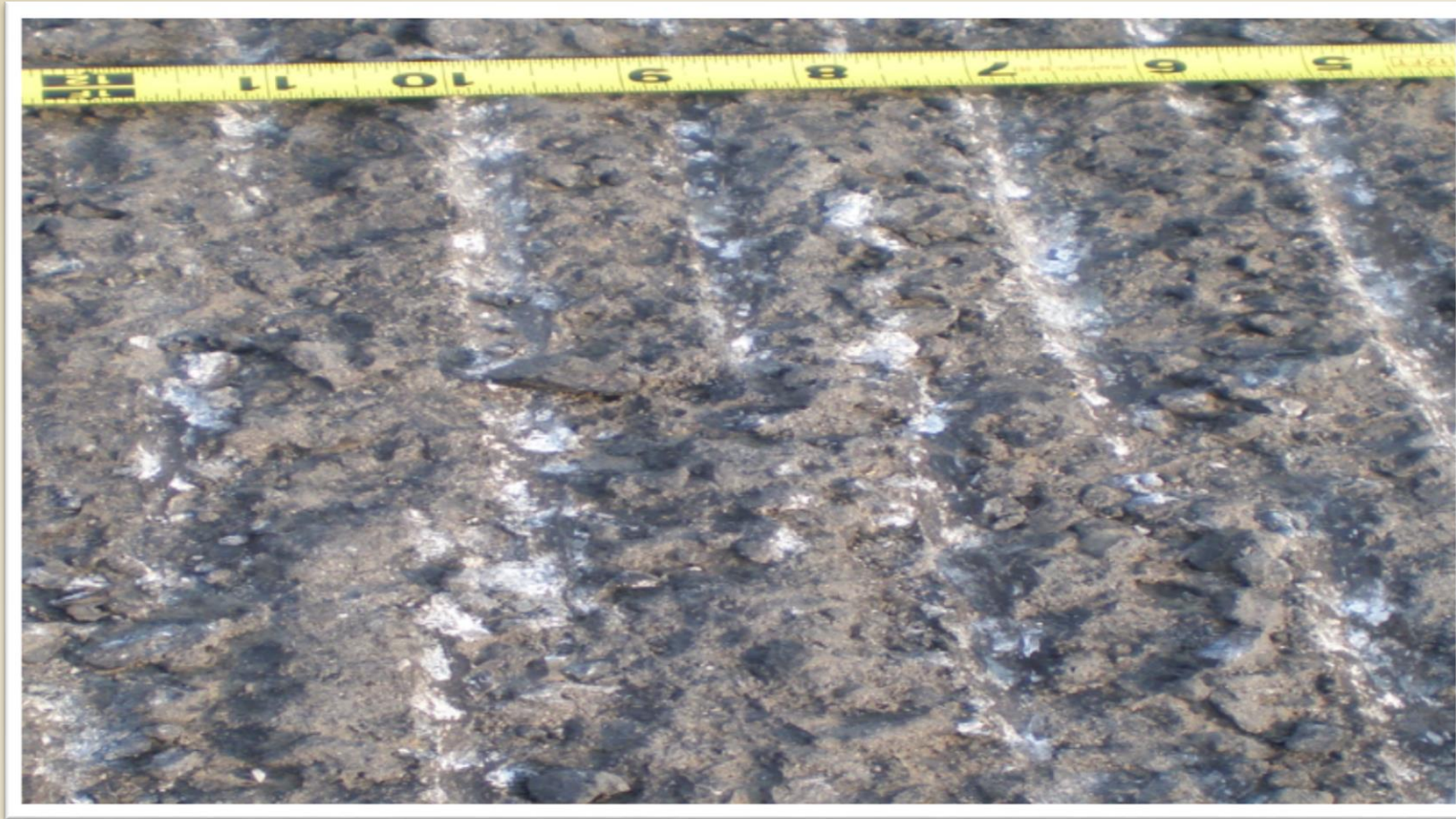
Micro Mill Drum



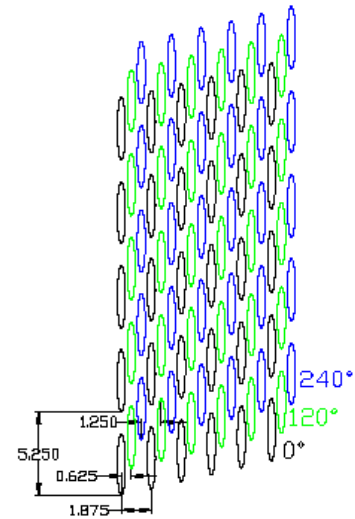
Triple Wrap Lacing at 2/10" (5mm)
Spacing - 450 Bits

2. Forward Cutting Speed

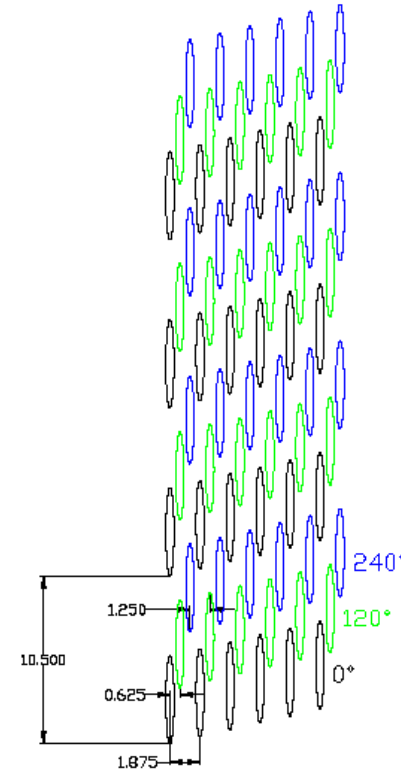
5/8" (15mm) Standard Drum Bit Strikes



Forward Cutting Speed



Triple Wrap
80RPM-35FPM



5/8" Triple Wrap
80RPM-70FPM

Forward Cutting Speed



5/8" Standard Spaced Drum:
Line spacing at 90' min is actually 1 7/8" on the
surface



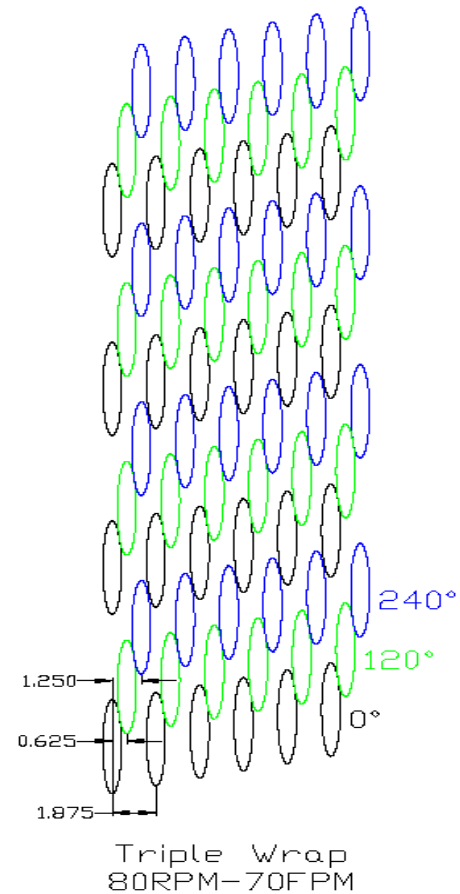
Out Running the Cut or “V’ing Out”



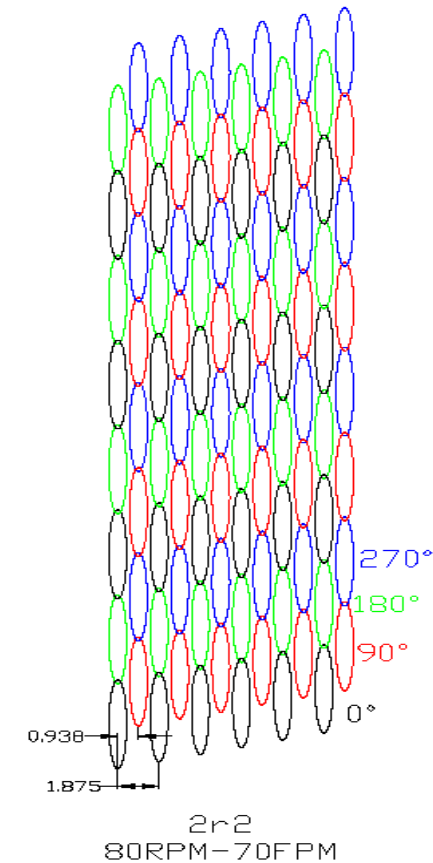
3. Wrap Design

Triple Wrap vs. Quad Wrap

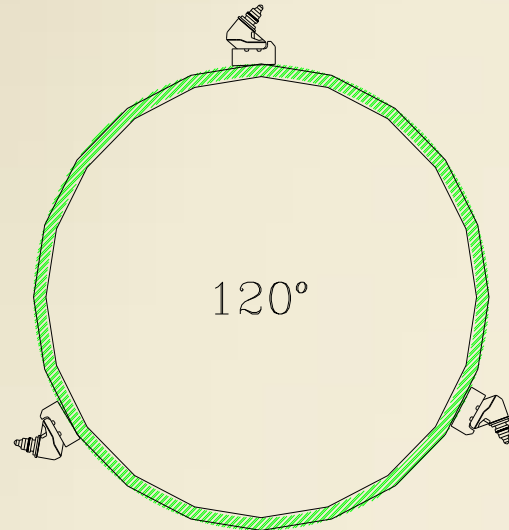
5/8" -15mm Spacing (150 Bits)



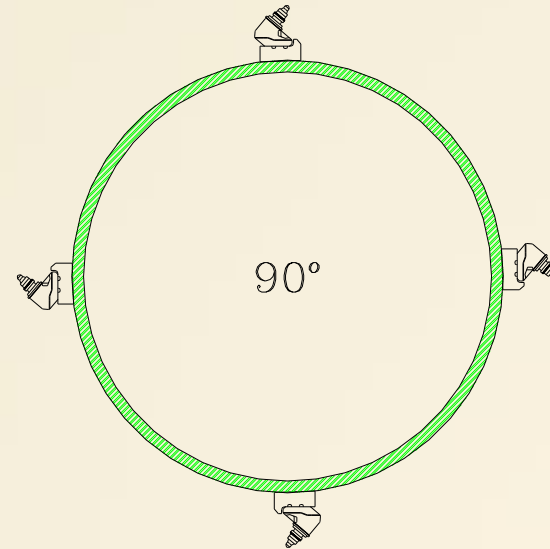
15/16" - 22.5mm spacing (200 Bits)



Triple Wrap vs. Quad Wrap

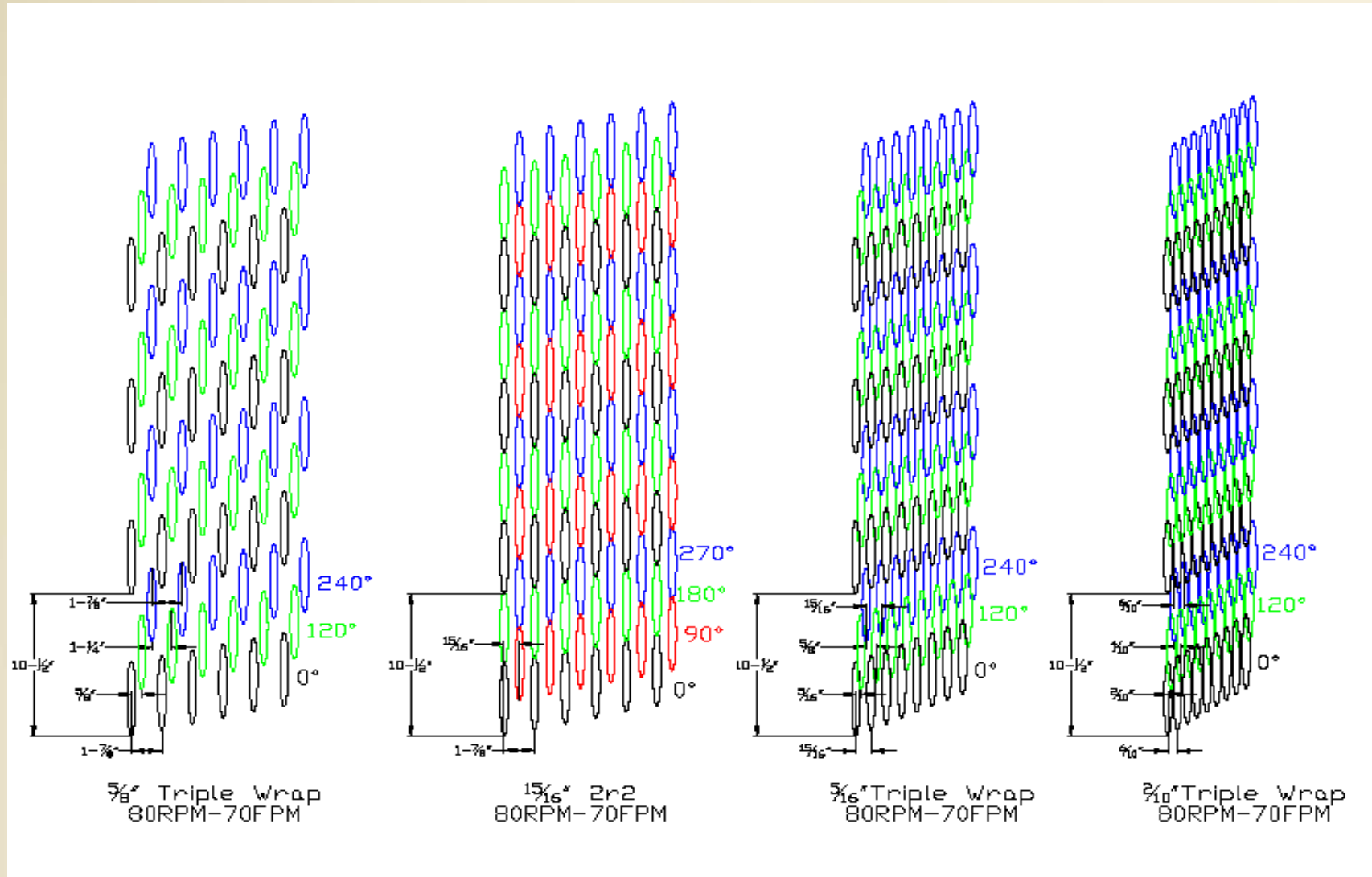


Triple Wrap Lacing:
120, 240, 360



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



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



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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

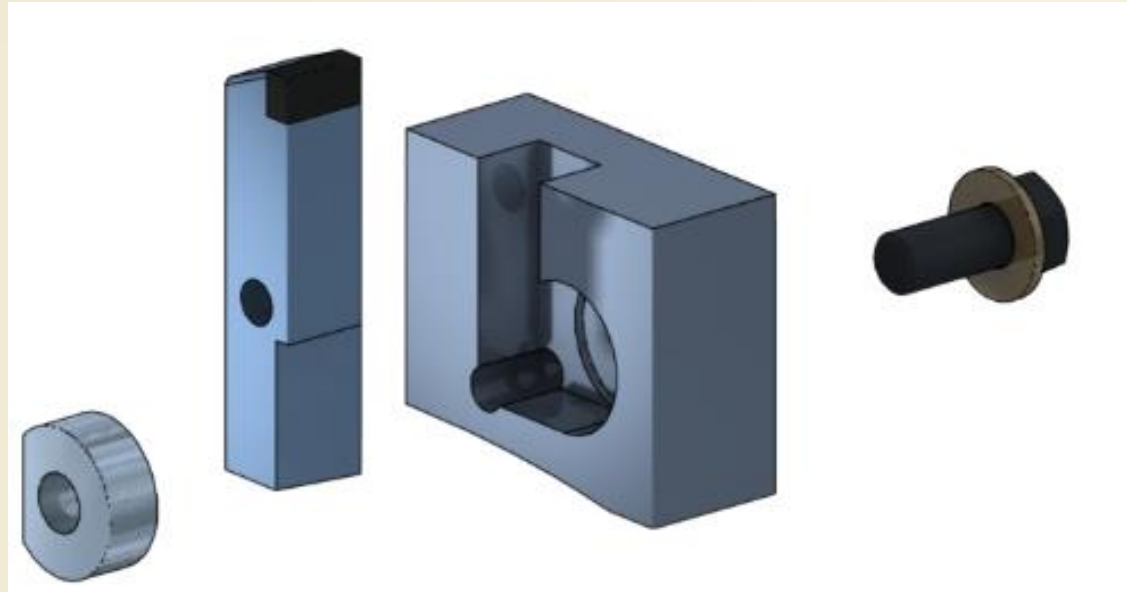
Lessons Learned:

- 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 and Surface
Prep for Seal Coats

Bump Grinding on
Surface Course



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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