ROADTEC
an Astec Industries Company

MILLING FOR SMOOTHNESS

Eric Baker, Marketing Manager, Roadtec

People and Planning

The first step towards achieving a smooth milling job occurs way before the construction process begins

Everyone involved in the milling process contributes to the overall smoothness of the job, including:

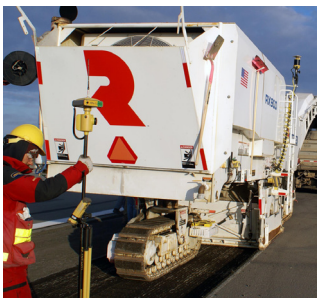
a. Mill operators
b. Ground person
c. Truck drivers
d. Clean up.

2 Types of Smoothness

- Longitudinal Smoothness (Ride)
  - How to achieve
  - Factors on Ride
- Surface Smoothness
  - How to achieve
    - Factors on surface texture
      - Drum maintenance
      - Speed (of what?)
      - Drum pattern
  - Impacts on Production

Averaging System

3D Grade System



Keep It Clean

How can you mill with this.

If you have this to work with you will never achieve grade.

Why?

No really, clean up your mess

Oh that Pile.

Our shovel is on the water truck.

The automatics will take that out…

Clean up your mess

Clean up after you pick up.

What will happen when you set back down.

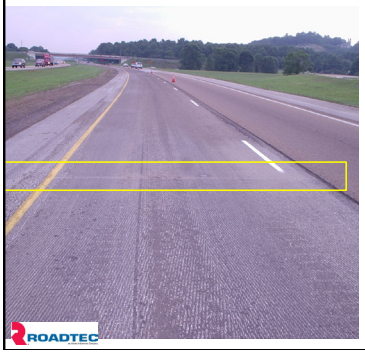
Instead of taking the time to clean this up I Will just guess how thick this is.

This is why you clean up

If you leave work like this you won't last.

Speed

Continuous Milling



There are a lot of forces generated during milling. When you stop so do the forces.
Plus all of the teeth now cut in one spot, no longer spread out.

2 Types of Smoothness

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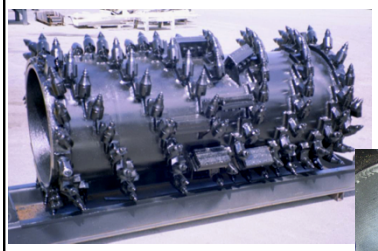
Surface Texture

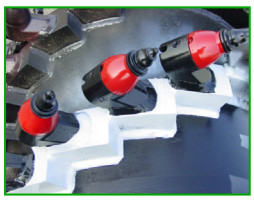
Scabbing

Cutter Drum



Triple Wrap, Off Set Flighting

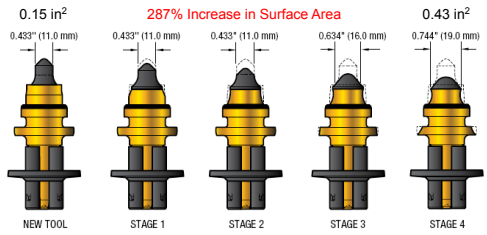
Triple Wrap



Off Set Flighting

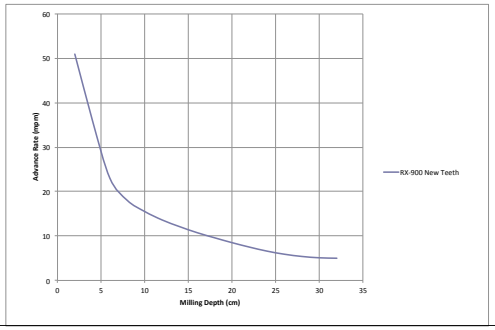
Proper Maintenance

Tool Wear Characteristics



At Stage 3
Tool has lost 0.365 " [9.3 mm]
of gage height

Production Tradeoff



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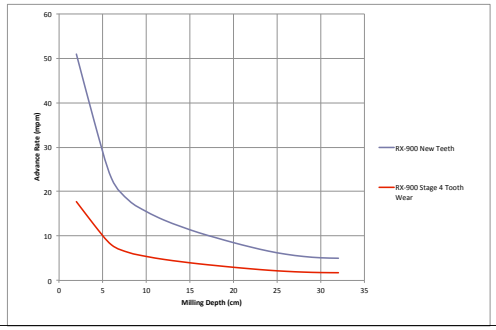
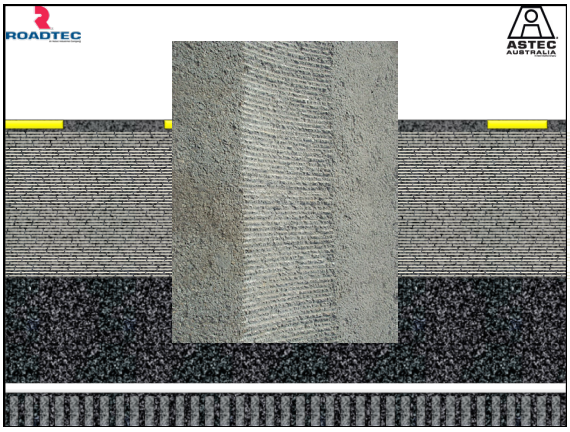
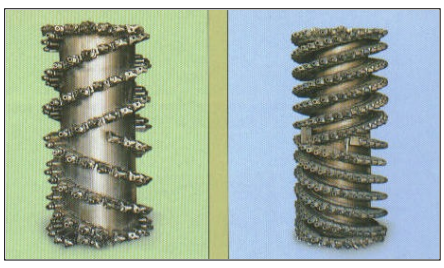


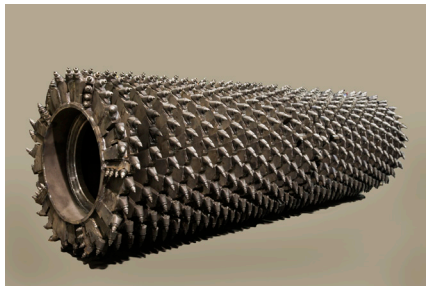


Straight Line Pattern

Standard Drum Profiling Drum



Micro-Milling Pattern



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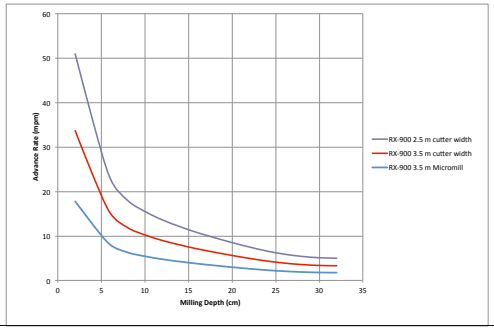
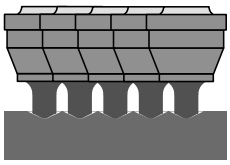


5/8” (16mm) Triple Wrap Lacing Pattern



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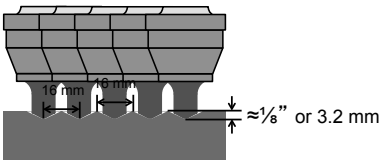


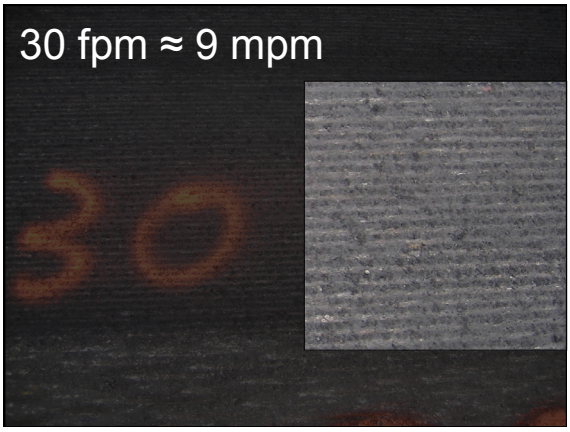
5/8” (16 mm) Triple Wrap at 30 fpm 9 mpm

Speed

Advance Rate = 30 fpm or 9 mpm

Advance Rate = 9 mpm or 30 fpm
Drum Diameter = 115 cm or 46”
Drum Speed = 100 rpm

Machine
Advance
9 cm or 3.6”

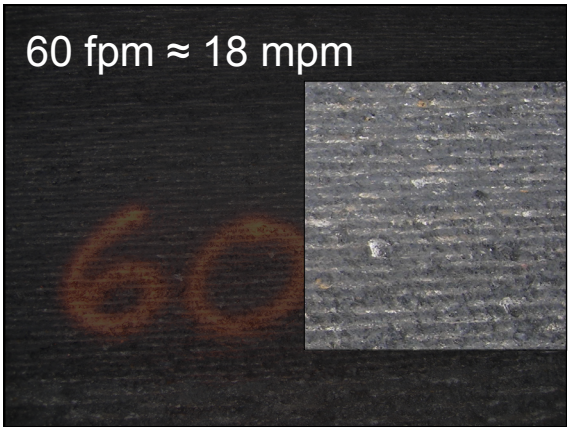


Advance Rate = 60 fpm or 18 mpm

Advance Rate = 18 mpm or 60 fpm
Drum Diameter = 115 cm or 46”
Drum Speed = 100 rpm

Machine Advance
18 cm or 7.2”

0.71 cm or 0.28”

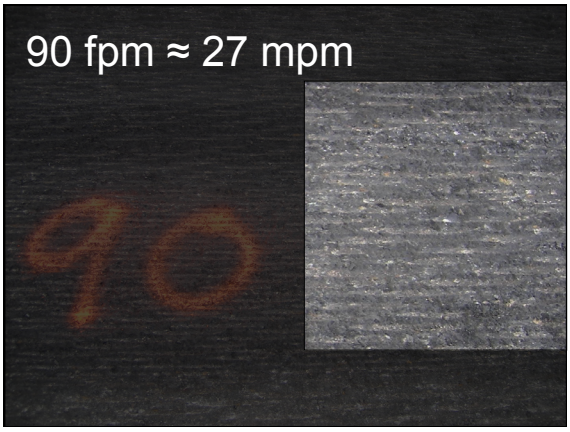


Advance Rate = 90 fpm or 27 mpm

Advance Rate = 27 mpm or 90 fpm
Drum Diameter = 115 cm or 46”
Drum Speed = 100 rpm

Machine Advance
27 cm or 10.8”

1.63 cm or 0.64”



Advance Rate = 120 fpm or 36 mpm

Advance Rate = 36 mpm or 120 fpm
Drum Diameter = 115 cm or 46”
Drum Speed = 100 rpm

Machine Advance
36.6 cm or 14.4”

2.95 cm or 1.16”

120 fpm ≈ 36 mpm

9 mpm vs. 36 mpm

3.7 km in a day vs. 14.6 km in a day

Drum Speed

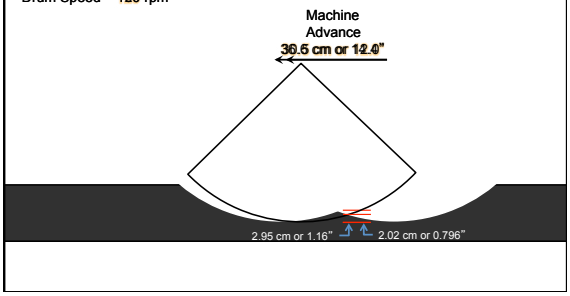
RX-900 Drum Speeds				
Engine Speed	Top Sheave Diameter (in)	Bottom Sheave Diameter (in)	Gear Ratios 20:1	24:1
2100rpm	16	14	120rpm	100rpm
2100rpm	16	15	112rpm	93rpm
2100rpm	14	15	98rpm	82rpm
2100rpm	14	16	92rpm	77rpm

Drum Speed

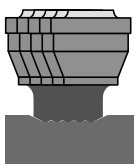
Chevron Peak in cm	Machine Speed			
Drum Rotation Speed	9 mpm	18 mpm	27 mpm	36 mpm
120 rpm	0.12	0.50	1.13	2.02
112 rpm	0.14	0.57	1.30	2.33
100 rpm	0.18	0.72	1.63	2.94
98 rpm	0.19	0.75	1.70	3.06
93 rpm	0.21	0.83	1.89	3.41
92 rpm	0.21	0.85	1.94	3.48
82 rpm	0.27	1.07	2.45	4.42
77 rpm	0.3	1.22	2.78	5.05

Advance Rate = 120 fpm or 36 mpm

Advance Rate = 36 mpm or 120 fpm
Drum Diameter = 115 cm or 46”
Drum Speed = 120 rpm



2/10” (5mm) Triple Wrap Lacing Pattern



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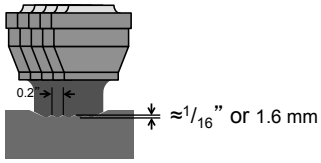
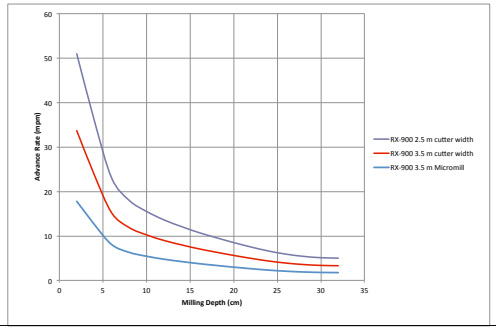


2/10” (5mm) Triple Wrap Lacing Pattern

Amount of Tools

12’ 6” (3.5 m) Full Lane Drum		Cost of Teeth
5/8” (16 mm) spacing	268	$1340
3/8” (9 mm) Spacing	406	$2030
0.2” (5 mm) Spacing	770	$3850

Production Tradeoff



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Drum Diameter = 115 cm or 46”
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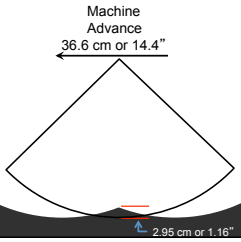
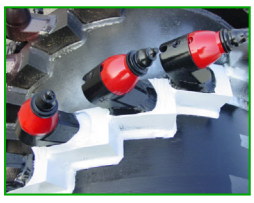


Triple Wrap, Off Set Flighting

Triple Wrap



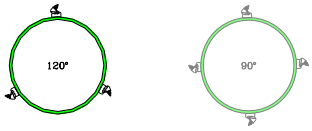
Off Set Flighting

Double Hit Drums

Above
Double hit Quad wrap drum

Standard triple wrap drum
Below

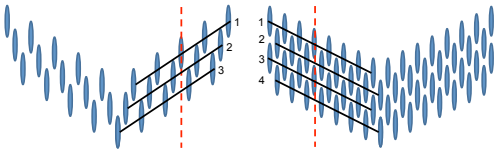
Drum Lacings
Scroll Start Comparisons



Triple Wrap

Double Hit
Quad Wrap

Scroll Start Comparisons



Triple Wrap

1 7/8" (48 mm) spacing per flight
Equals
5/8" (16 mm) spacing

Double Hit
Quad Wrap

1 ¼" (32 mm) spacing per flight
Equals
5/8" (16 mm) spacing

Pattern Comparison

22 mm (7/8") DHQW at 30.5 mpm
(100 fpm)

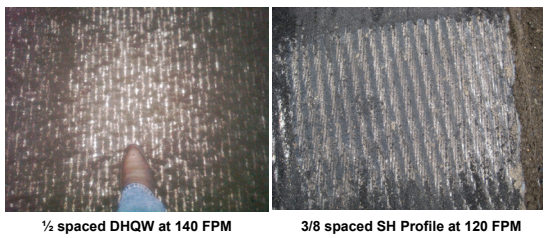
16 mm (5/8") Triple Wrap at 30.5
mpm (100 fpm)

The Point of Breakout

½" (13 mm) spaced DHQW at 43 mpm

Full Lane 8mm (0.3")standard at 14 mpm

Apples to Apples

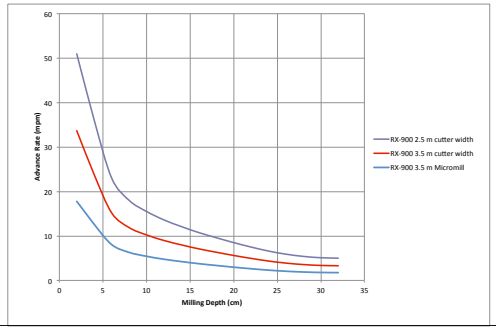


½ spaced DHQW at 140 FPM

3/8 spaced SH Profile at 120 FPM

Micro-mill surface at 20 mpm

Production Tradeoff



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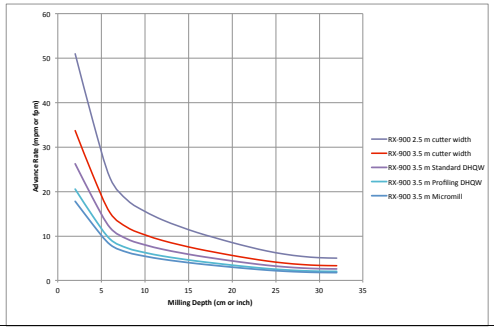

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12’ 6” (3.5 m) (Full Lane Drum		Cost of Drum
5/8” Spacing (16 mm)	268	$1340
Standard Spacing DHQW	343	$1715
Fine Spacing DHQW	440	$2200
0.2” Spacing (5 mm)	770	$3850

Sand Patch Test ASTM E965

Thank you