



Cold Planing/Milling Applications & Proper Technique

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ROADTEC, INC.



Overview

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Factors that affect the finished product

- Environment
- Operating Practices
- Machine Maintenance
- Machine Configuration



Scabbing and Rutting

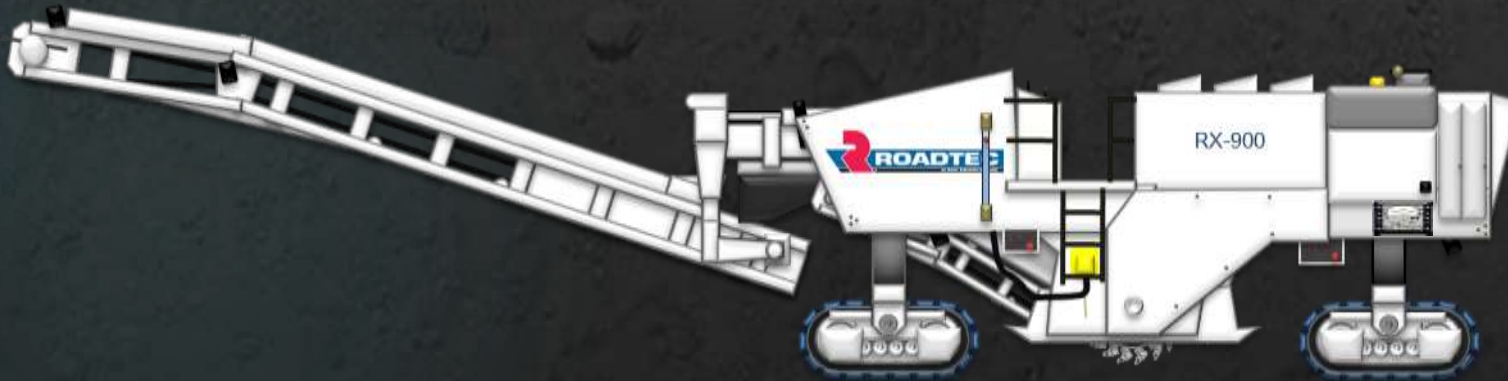
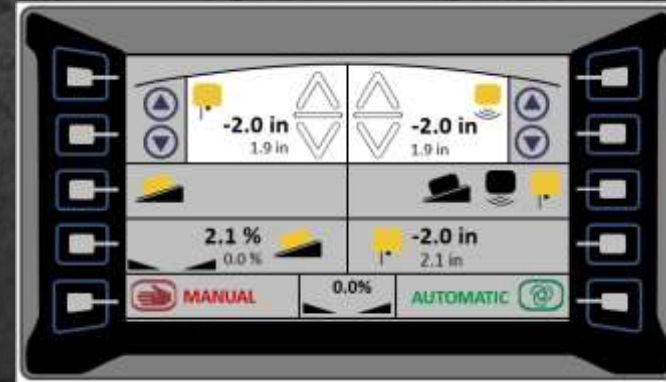
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Grade and Slope Controls

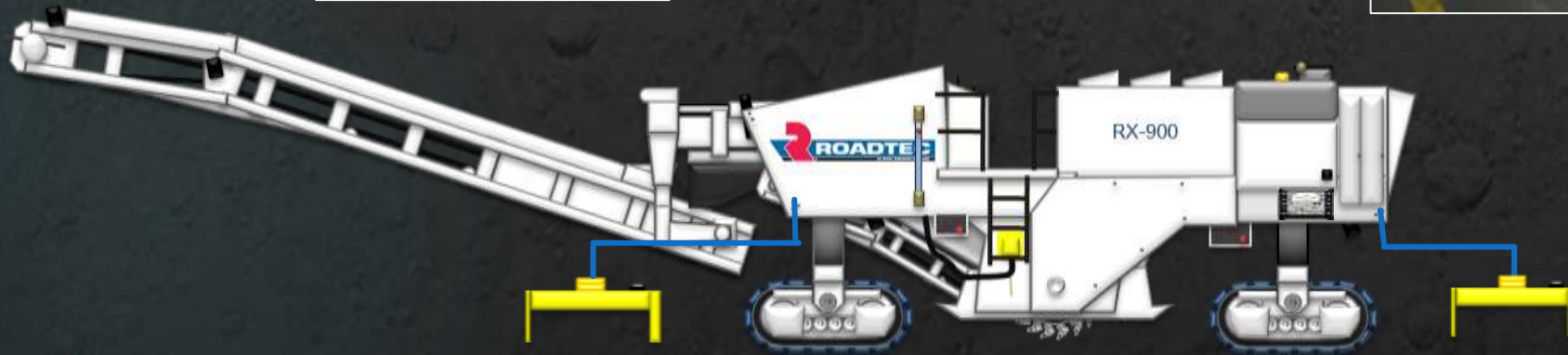
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Averaging Systems

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GPS Control Systems

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Mill to Grade based on Position

Only as accurate as the data





Control Points

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Ground Man

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- Ground Man is responsible for keeping the surface clean and avoiding obstructions
- All utilities have to be marked
- Each pass must match grade properly
- Ensure each cut entry and exit is executed properly





Clean Surface Required

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Grade control sensors (both wire rope and sonic) will react to changes in grade caused by piles of material.

Surfaces must be kept clean in front of the machine, and material piles must be removed every time the machine is picked up



Continuous Milling

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Stops in the milling process cause the teeth to excessively cut the same spot, causing dips in the milled surface.

Difficult for the paving crew to correct these flaws.





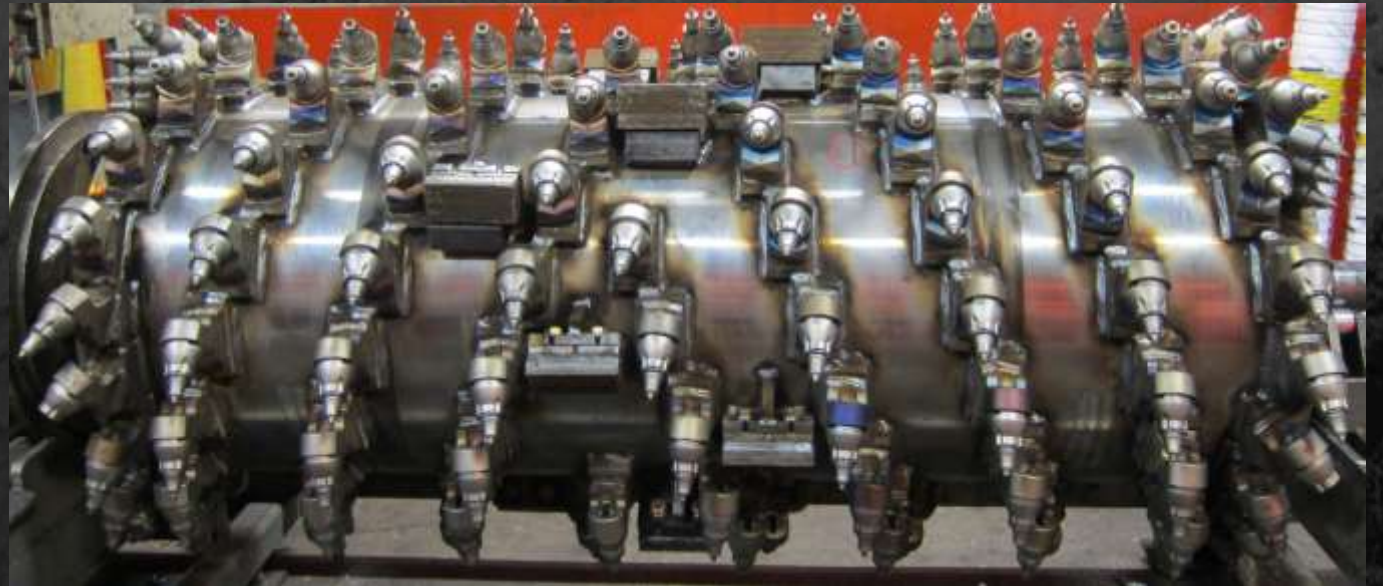
Cutter Drums

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Triple Wrap, Offset flighting.

Tooling is offset so that cutter bits rotate properly

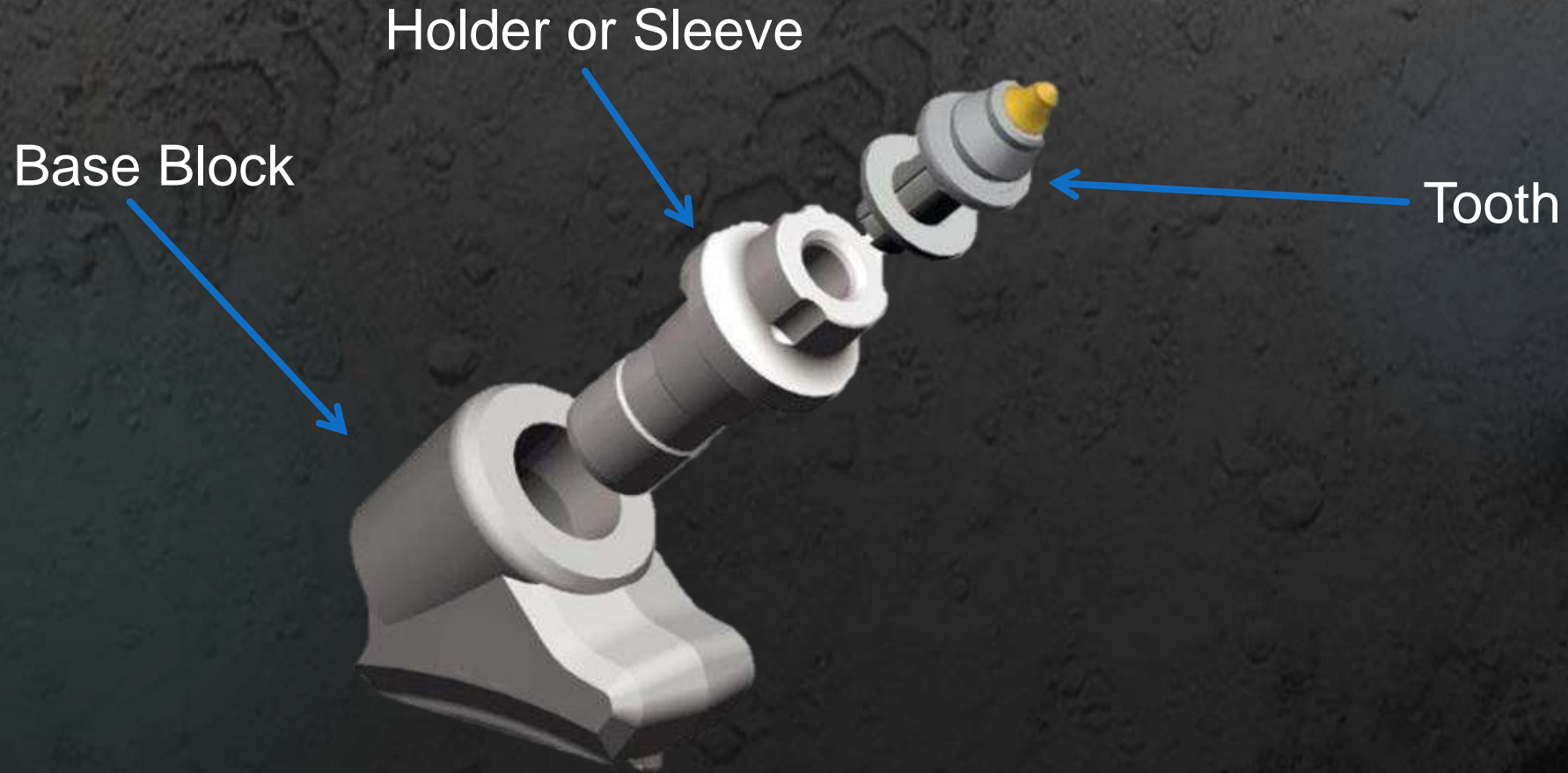
Standard spacing is 5/8"





Drum Tooling Components

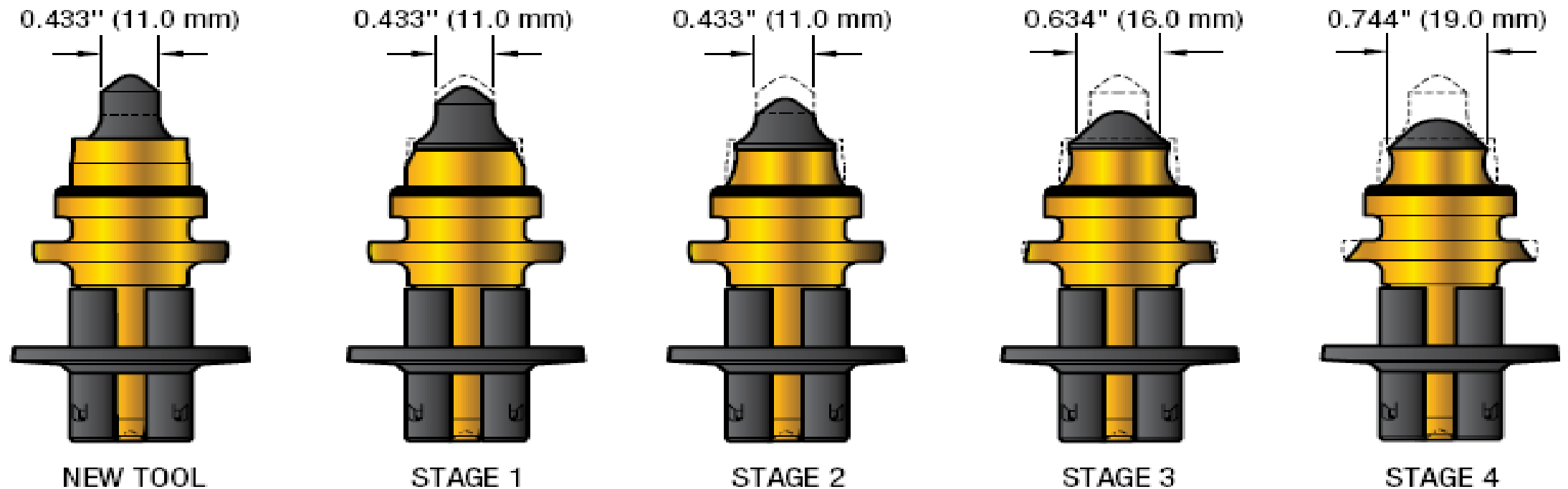
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Cutter Drum Maintenance

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



Cutter Drum Maintenance

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Advanced wear on holders will change how the tooth is seated in the drum.

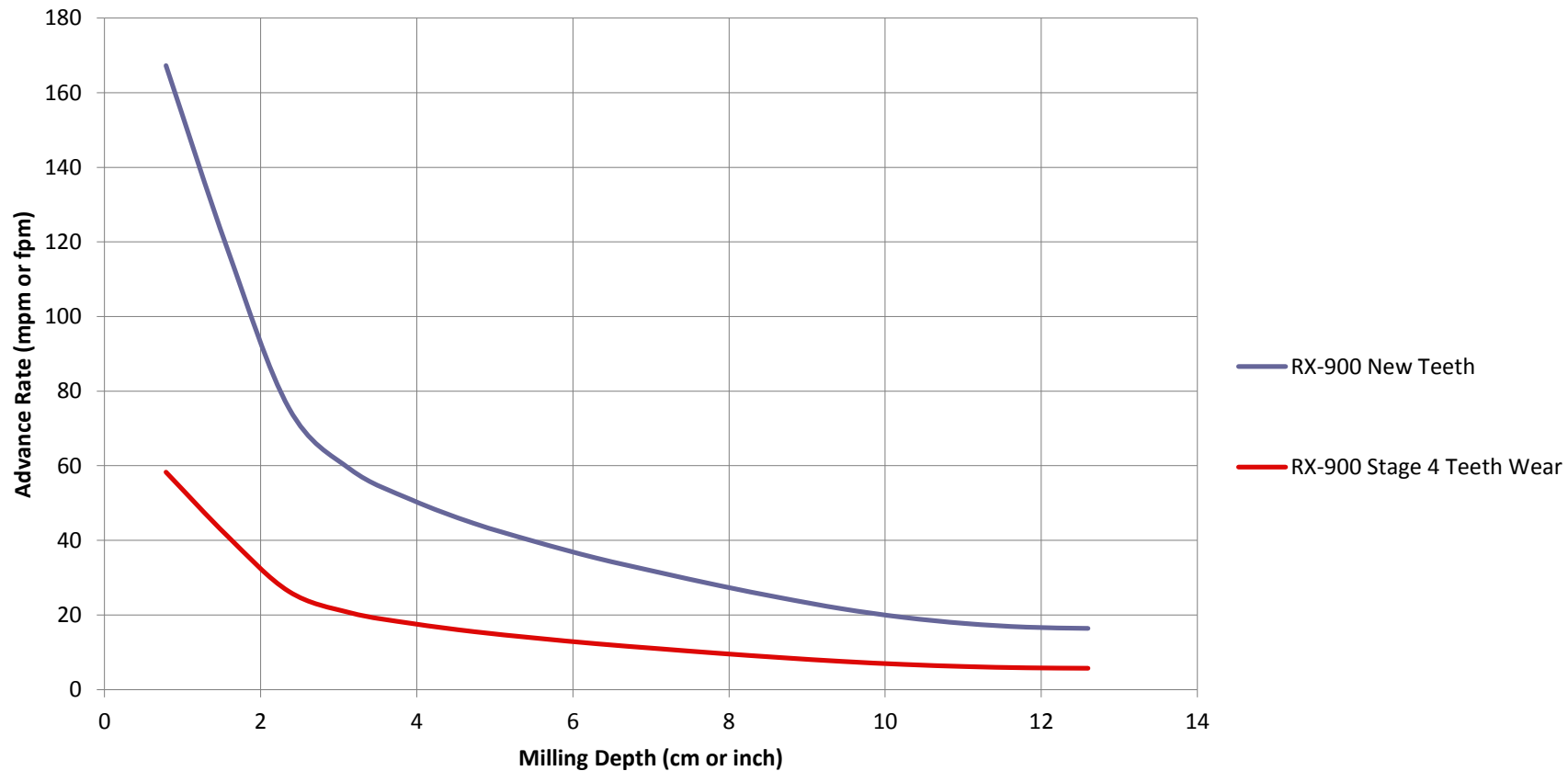
This changes the surface pattern





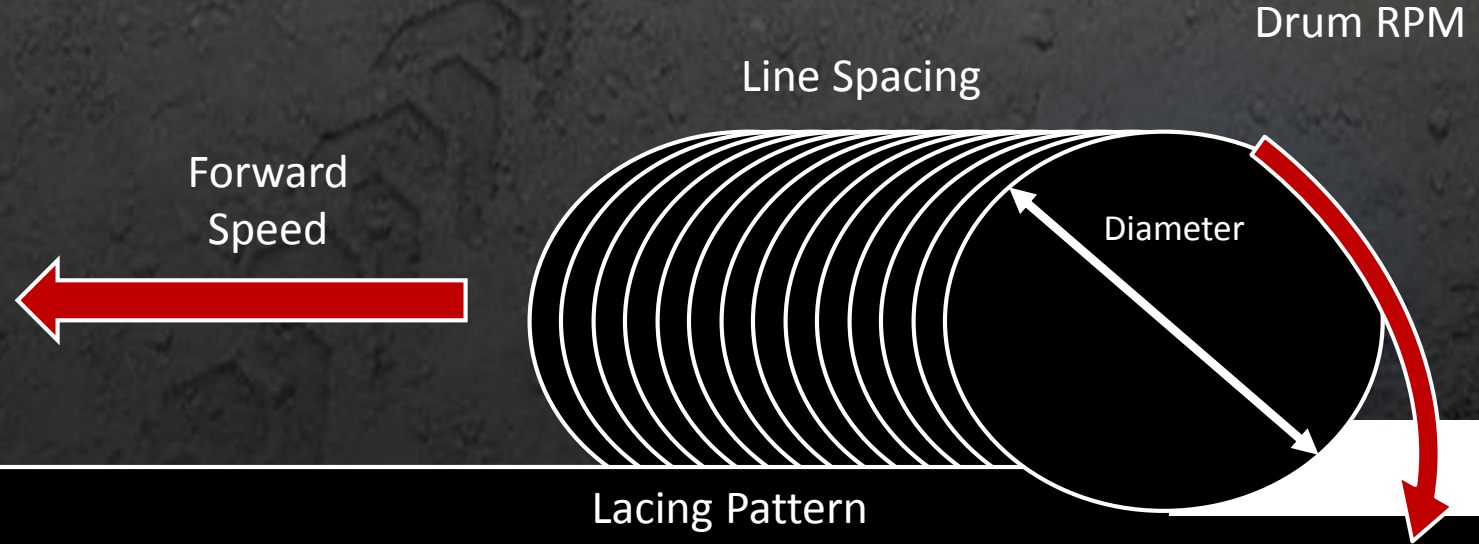
Cutter Drum Maintenance

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The Math of Milling



The 4 Main Factors Affecting Surface Texture

1. Line Spacing
2. Forward Speed
3. Drum RPM
4. Lacing Pattern



Advance Rate & Longitudinal Smoothness

As the machine reaches a certain ground speed, it begins to “out-run” the cut.

This creates the chevron pattern shown here

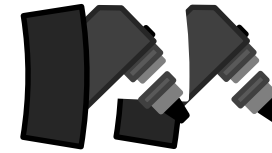
Drum rpm must increase, or machine speed must decrease to maintain a smooth surface





Advance = 30 fpm
Drum Dia = 46"
Drum RPM = 100

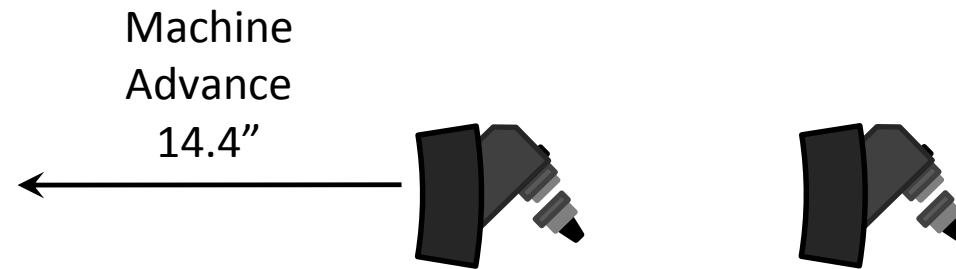
Machine
Advance
3.6"
←



0.071"



Drum Dia = 46"
Drum RPM = 100
Advance=120 fpm



1.16"



Production Tradeoff

30 fpm vs. 120 fpm

2.3 miles in a day vs. 9.1 miles in a day





Double Hit Drums



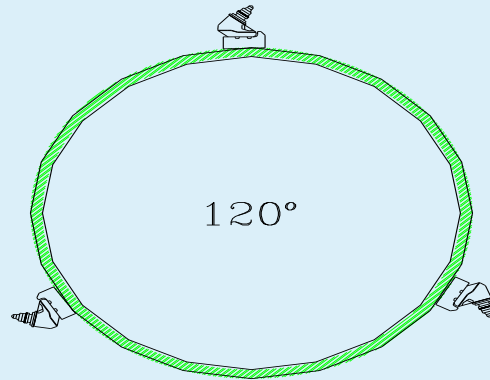
Above
Double hit Quad wrap drum

Standard triple wrap drum
Below

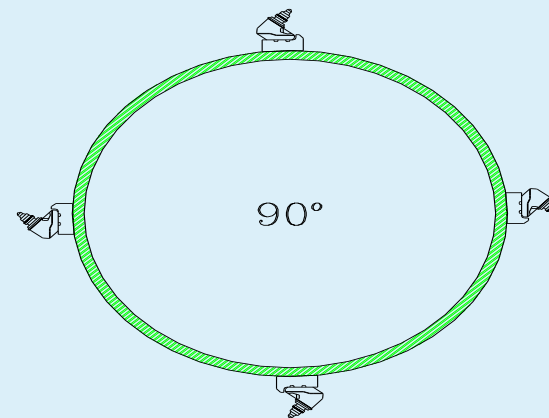




Drum Lacings Scroll Start Comparisons



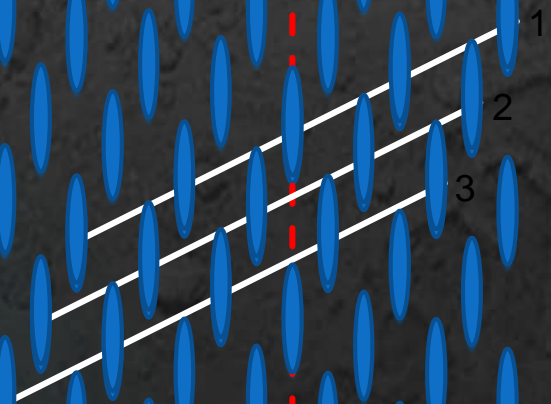
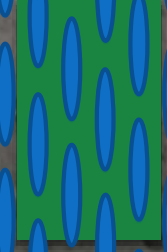
Triple Wrap



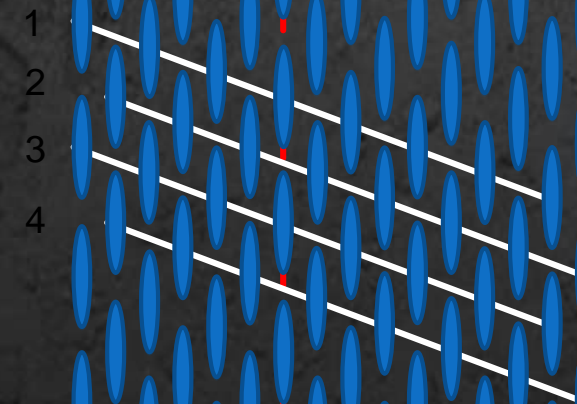
**Double Hit Quad
Wrap**



Pattern Comparisons



**Single Hit
Triple Wrap**



**Double Hit
Quad Wrap**



Pattern Comparison



5/8" Triple Wrap at 100 FPM



7/8" DHQW at 100 FPM



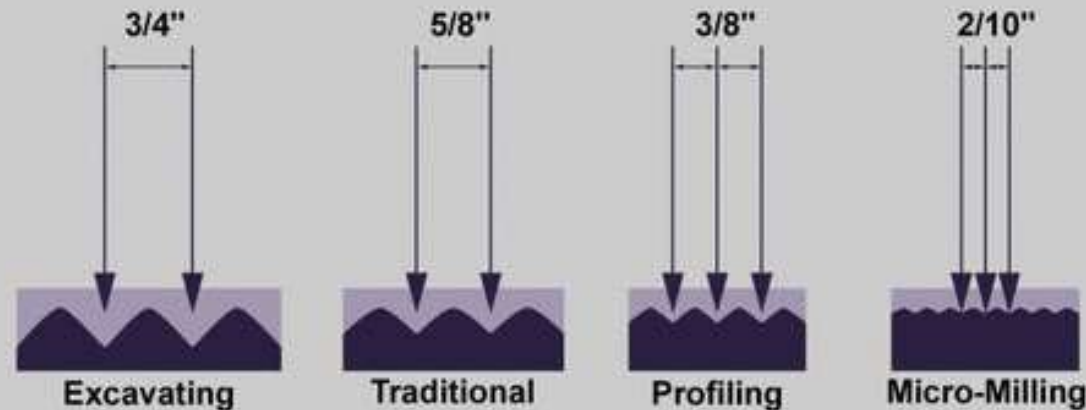
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Line Spacing and Texture

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Each cutter pattern is determined by the number of carbide teeth installed on the mandrel. More teeth produce fine patterns such as Profiling and Micro-Milling, but production rates remain low. Excavating and Traditional patterns allow for higher production rates but produce a coarser surface.

Milling Machine Cutter Drum Patterns

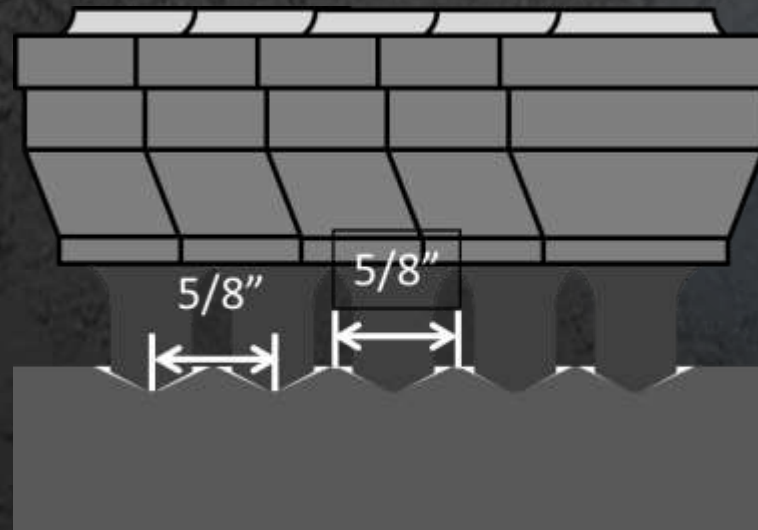


Line Spacing

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Standard drums are configured with 3 scrolls of teeth on each side (Triple Wrap)

In one revolution of the drum, each tooth should strike the surface once in lines spaced $\frac{5}{8}$ " apart





5/8" Spacing at 30 fpm

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Micro-Mill Drums

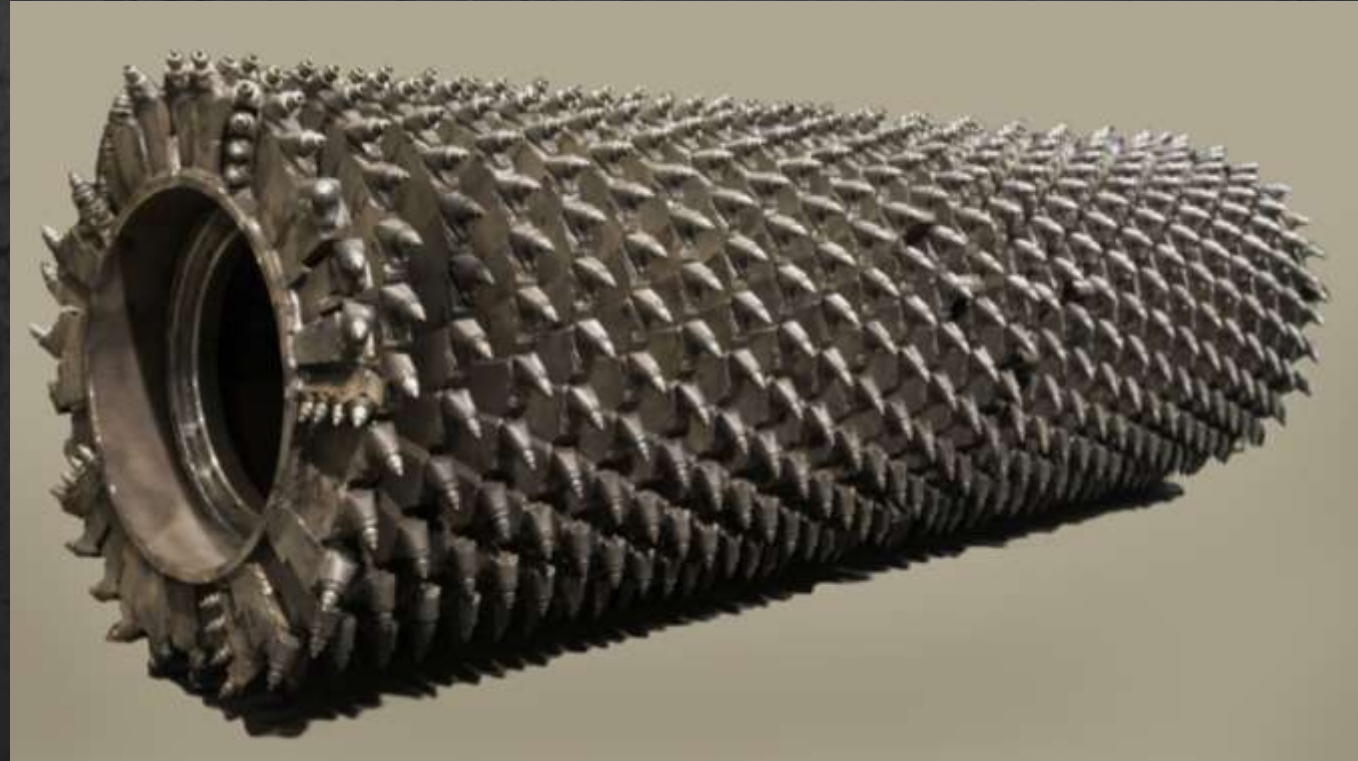
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Laced with 4 scrolls of teeth

0.2" Spacing

Must be built with weld-on tooling

Cut depths < 2"





2/10" Micro-Mill Pattern

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Production & Cost Comparison

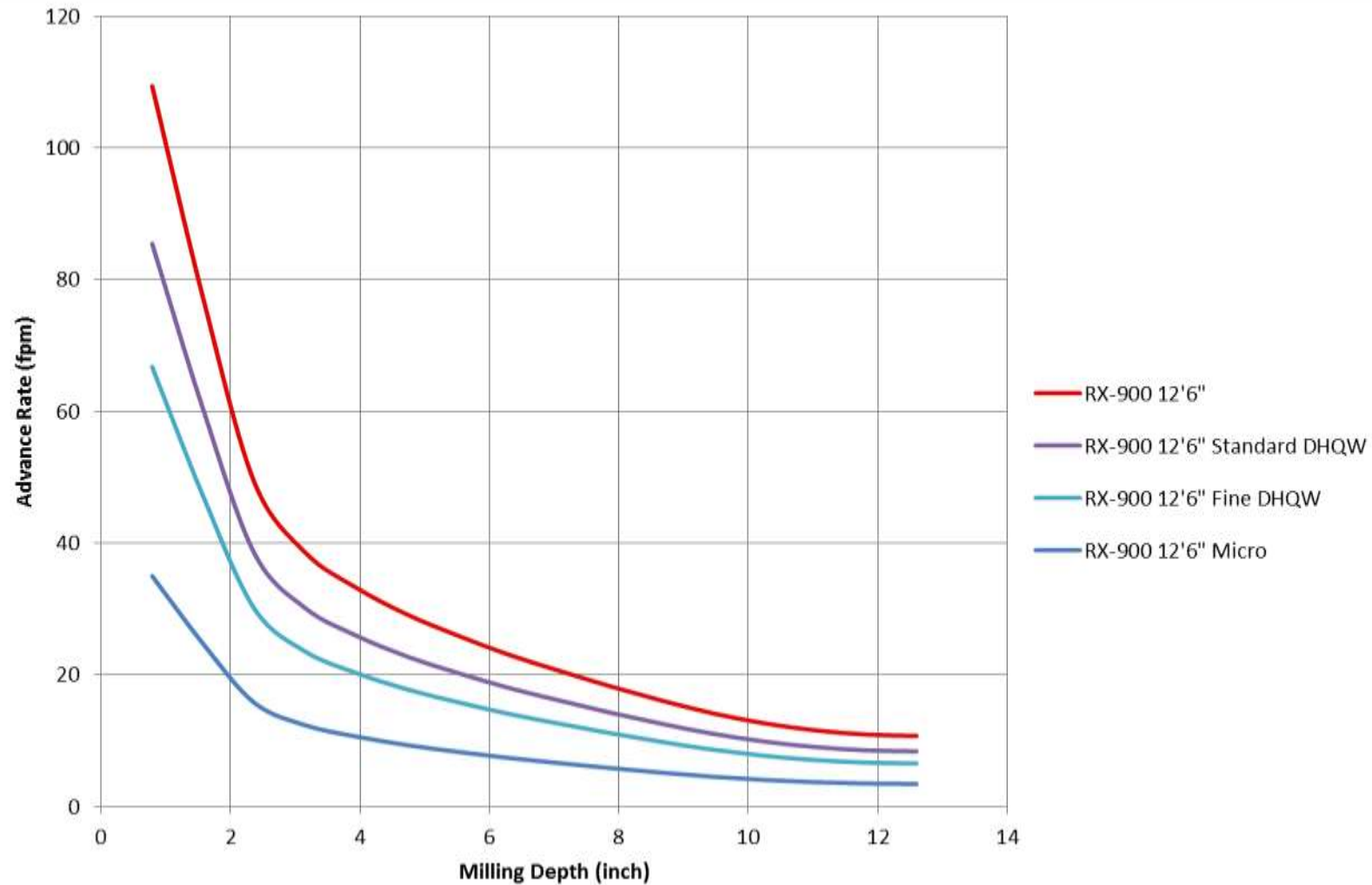
12'6" (3.5 m) Full Lane Drum		
Line Spacing	# of Teeth	Cost of Teeth
5/8" (16 mm)	268	\$1340
3/8" (9 mm)	406	\$2030
0.2" (5 mm)	770	\$3850

Nearly 3 times the teeth
Nearly 5 times the cost
No quick change holders



Production

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Things we need to think about



Prior planning will help you do better work. Look at the job before you cut.
Know what your machine is capable of doing.
Make sure your machine is ready to cut. Keep up with the maintenance.
Am I cutting shoulder and will I have a good reference.
What is expected? smoothness or getting in and get out...
Keep your job clean. Having a clean surface will help you start and make better transitions.