

Joint Grinding Operations – Application of a Gradual Preventive Strategy to Specialty Grinding Operations

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Introduction

Who I am:

- Product Manager at Loram Maintenance of Way
- Responsible for managing Loram's portfolio of rail products
- At Loram for over 9 years
- B.S. in Mechanical Engineering from the University of North Dakota
- M.S. in Technology Management from the University of St. Thomas

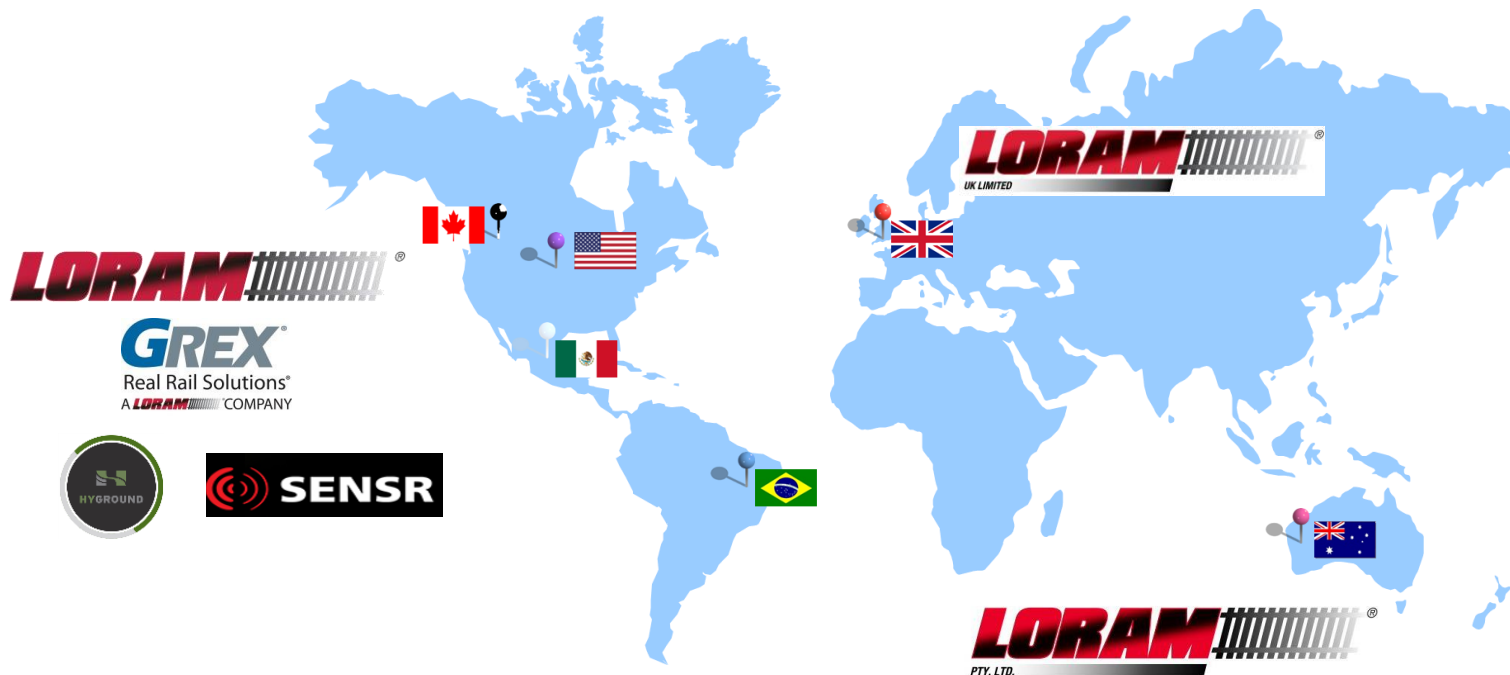
Who Loram is:

Since 1954, Loram Maintenance of Way, Inc. has been providing the most advanced, most productive and most innovative railroad maintenance services and equipment with exceptionally high standards of quality and performance.

The Loram family of companies offers a wide array of products for the railway market.



















Loram Companies

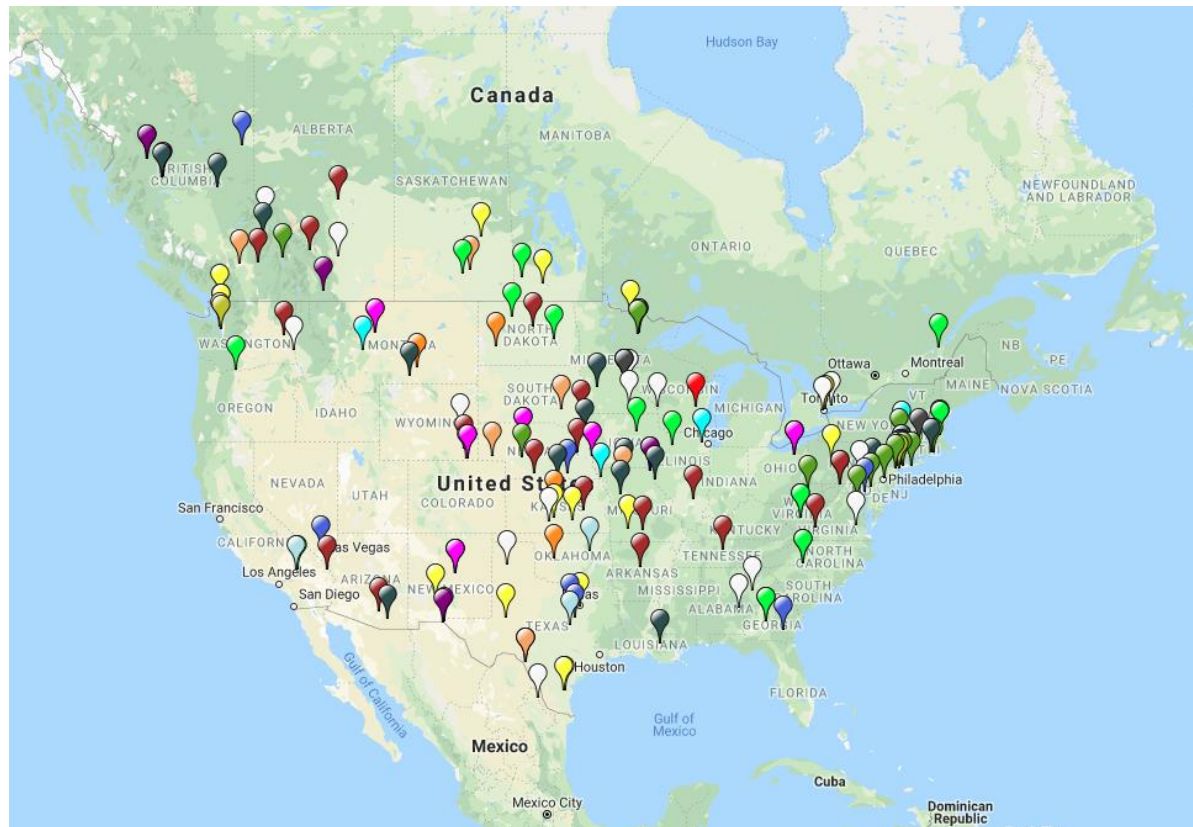


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Loram Fleet Services

-  - RG Machines
-  - RGS Machines
-  - LRG Machines
-  - J, LM, RW, RGT
-  - RV Machines
-  - SBC Machines
-  - TLU, UC Machines
-  - DC Machines
-  - OR, RIV Trucks
-  - LRT Machines
-  - GREX: DT
-  - GREX: DTFC
-  - GREX: P
-  - GREX: SLOT
-  - GREX: SPS
-  - HyGround



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Loram Machines in Brazil

In-service or In-production Machines:

- (3) Production Rail Grinders
- (4) Specialty Rail Grinders
- (3) Rail Inspection Vehicles
- (3) Rail Vacuum Rail Bound Machines
- (1) Shoulder Ballast Cleaner
- (2) Wagon Vacuum Machines



Presentation Outline

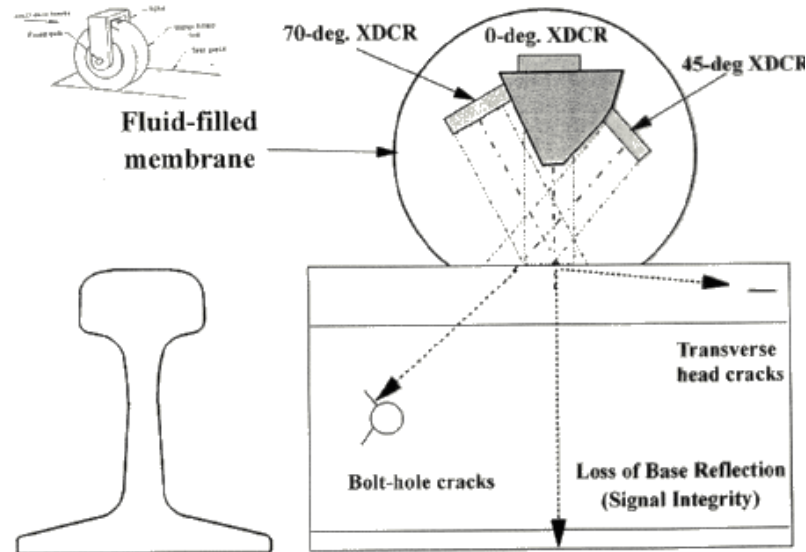
- Testing and Defects
- Rail Grinding and Machines
- Traditional Grinding Program
- Treating SSC and Non Test Locations
- Progression of Strategies of Grinding
- Joint Grinding Program



Ultrasonic Testing and Codes

- NT: Non-testable area
- SSC (Shelling, Spalling, or Corrugation)
Rail Defect: rail surface condition rough enough to interfere with ultrasonic testing for internal rail defects
- SDZ is just a SSC in the dead zone of a switch

Wheel Probe Used in Railroad Rail Inspection



Defects

- SSC (Shelling, Spalling, or Corrugation) examples
- Severe Checking can also lead to an SSC being marked



Corrugation



Shelling

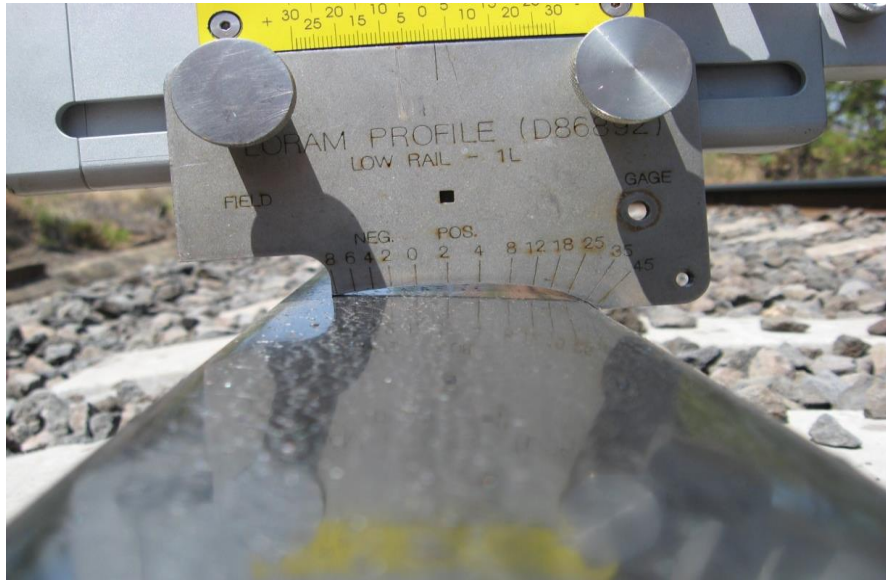


Spalling



Rail Grinding

- Regular preventive rail grinding has become the industry best practice to extend rail life.



Mainline Production Grinders (PRG)

- Between 152.4 to 213.4 meter [500 and 700 feet] in length
- Range between 60 and 120 stones
- High levels of metal removal in a single pass
- Holds 94,650 to 283,900 liter [25,000 to 75,000 US gallons]



Specialty Rail Grinders (SRG)

- 41.2 meter [135 feet] in length
- 24 stone machines (10" and 6" grinding stones)
- Flexible modules to grind through obstacles
- Holds 71,500 liters [4,500 US gallons] water



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Traditional Grinding Program Configurations

Production Grinder Configuration (PRG)

Rail Inspection Vehicle

(1) Operator



(1) to (4) weeks ahead

Production Rail Grinder

(1) Foreman + (0.5) Local Pilot + (5+) crew



Machine Length is 500 to 700 ft [152.4 to 213.4 m]

0.25 to 1.0 mile
[.4 to 1.6 km]

Water Truck #1

(1) Operator



0.25 to 1.0 mile
[.4 to 1.6 km]

Water Truck #2

(1) Operator



Specialty Rail Grinder

(1) Foreman + (0.5) Local Pilot +
(3+) Crew + (1) Ground Man



Machine Length is 135 feet [41.2 m]

0.25 to 1.0 mile
[.4 to 1.6 km]

Water Truck #1

(1) Operator



Specialty Grinder Configuration (SRG)



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Challenge with Traditional Grinding Program

- Most grinding programs focus on mainline track
- Specialty assets take second place
- Turnouts, crossings, and switch component replacement costs can be greater than mainline rail
- Limited resources to grind complete network

Progression of Grinding Strategies

- Corrective grinding approach - Grind to ideal state before moving on
- Challenges
 - Resource availability
 - Required excess track time at each location
 - Limited network coverage due to time spent at a grind



Treating SSC and Non Test Locations

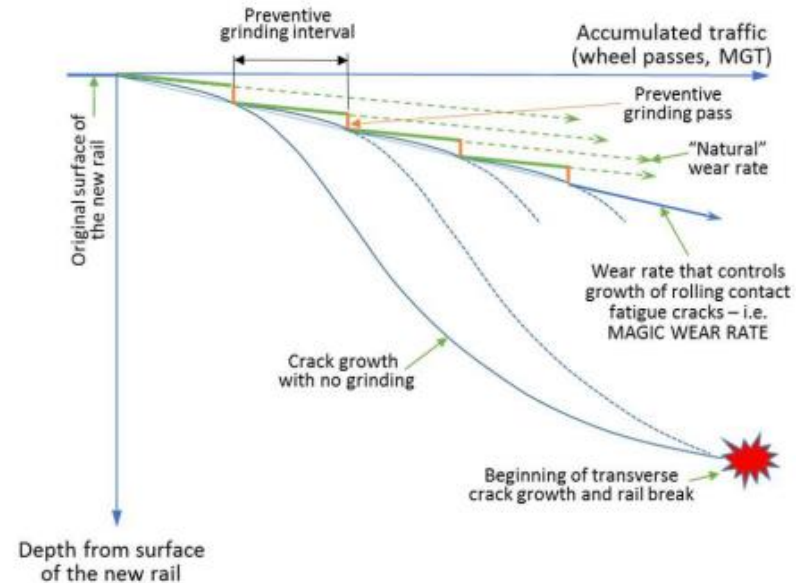
- Average SSC length is 15.2 meter [50 feet]
- Rail is treated uniformly within a track grinding segment for efficiency
- Best when treated with a specialty rail grinder



Change in the Production Grinder Strategy

Preventive gradual grinding

- Grind to restore running band (profile radius)
- Remove enough Rolling Contact Fatigue (RCF) to control growth before next cycle
- Less time spent at each location



Joint Grinding Program Configuration

Rail Inspection Vehicle

(1) Operator



(1) to (4)
weeks ahead

Eliminates (1) water truck / operator by joining the teams

Production Rail Grinder

(1) Foreman + (0.5) Local Pilot + (5+) Crew



Machine Length is 500 to 700 ft [152.4 to 213.4 m]

0.25 to 1.0 mile
[.4 to 1.6 km]

Water Truck #1

(1) Operator



3.0 to 7.0 mile
[4.8 to 11.2 km]

Specialty Rail Grinder

(1) Foreman + (3+) Crew



Machine Length is 135 feet [41.2 m]

0.25 to 1.0 mile
[.4 to 1.6 km]

Water Truck #1

(1) Operator

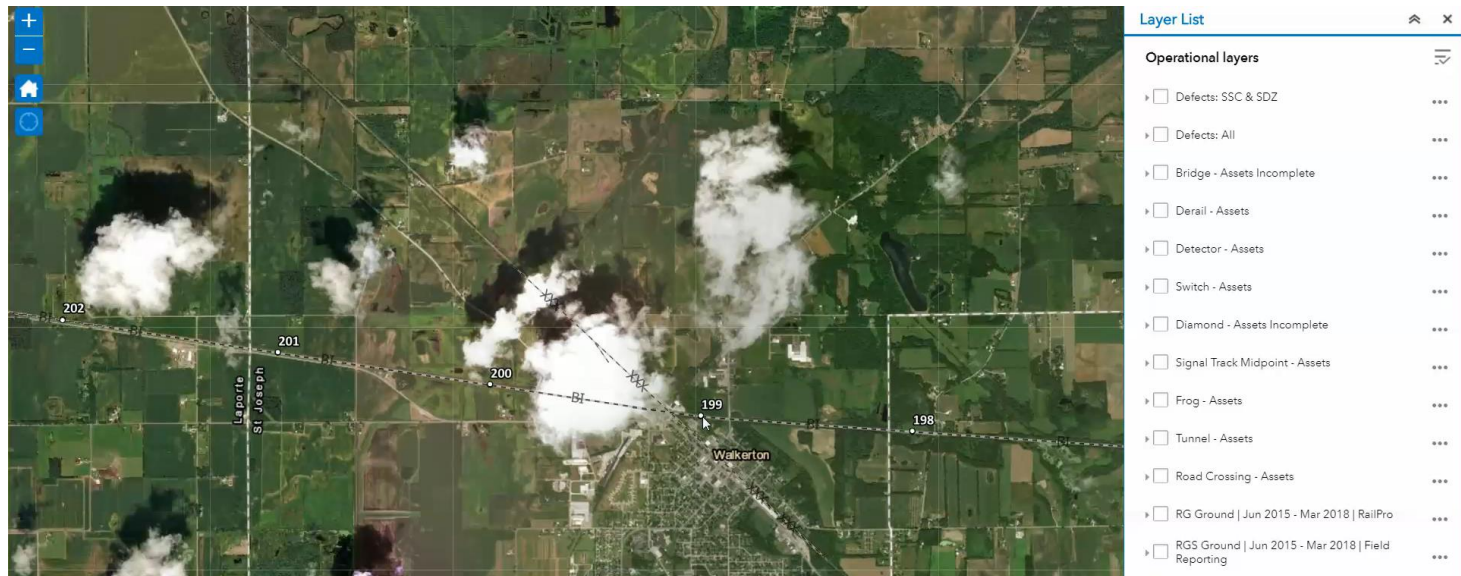


Operational Changes to Move to a Joint Grinding Program

- Apply the preventive gradual grinding strategy to the SRG and operate as a joint grinding team with the PRG
- Key is for the SRG to keep pace with the PRG
- Work off of a prioritization list for specialty assets
- Maintain a skipped asset list for next cycle



Skipped Asset Tracking

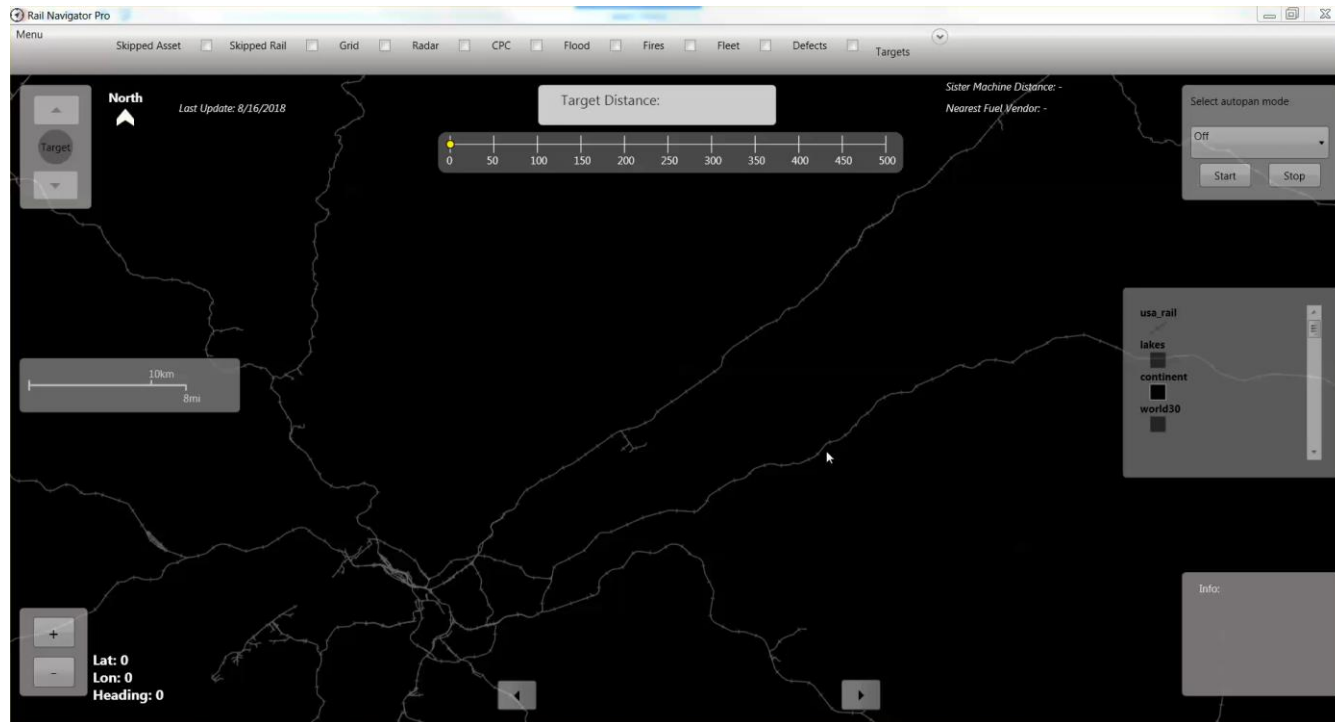


Specialty Rail Grinder Prioritization List

Priority	Assets
1	Location unable to test ultrasonically due to surface condition interference (rail defect code: SSC, where length is $\leq 250'$)
2	Skipped assets from previous cycle
3	Switches, straight side
4	Level crossings, curved track
5	Level crossings, tangent track
6	Switches, turnout side and crossovers
7	AEI detectors, defect detectors, wayside lubricators
8	Small surface defects (engine burns, crushed head, etc.)
9	Surface conditions not achieved by production grinder or needing addition work by grind plan (less than 85% of a track segment)
10	Profile conditions not achieved by production grinder or needing addition work by grind plan (less than 85% of a track segment)



Specialty Asset Prioritization



Benefits – SCC reductions

- SSC rail defects reduction due to joint grinding program.
- When the joint grinding program was introduced with one of our customers, the total combined lengths of SSC rail defects were able to be reduced year after year.

Year	Reduction in SSC Rail Defects
Year 1	59%
Year 2	44%
Year 3	5%



Benefits – Labor and track time

- Fewer Railroad resources
- Reduces track time by working (2) machines in same window
- Increased system coverage of specialty assets being ground
- Allows each grinder to concentrate on locations where their size and capabilities are the most effective at addressing



Benefits – Quality & Correct Machine Sizing

- Able to match grind marks for a continuous rail profile and avoid grinding gaps
- Ability to perform additional work on shorter segments for surface conditions or surface defects
 - $SSC > 76.2$ meter [250 feet], then ground by PRG
 - $SSC \leq 76.2$ meter [250 feet], then ground by SRG



Benefits – Operational Safety

- Even with (1) less water truck, the consist has greater fire suppression capabilities than working as individual work groups
- Remove the man from the ground for SRG operation



Benefits – Shared Resources

- Cross-training of manpower
- SRG able to fill up water from PRG during train delay
- Improvement in staff/machine logistics



Benefits – Connect Equipment

- Self Recovery if mechanical issues
- Single railroad conductor/pilot travel under train profile



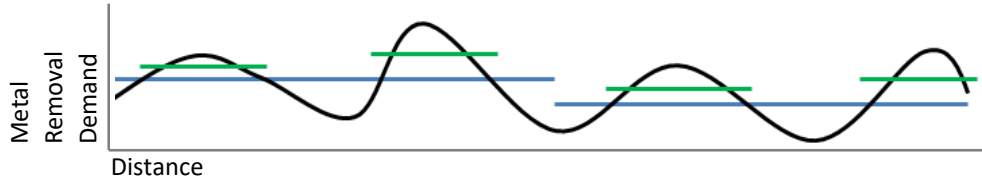
Joint Grinding Operation is not without its Challenges

- Good documentation on what assets were skipped during the shift (due to working from the prioritization list to so the SRG can keep up with the PRG) and need to be considered on the next cycle
- Detailed grind planning needed to consider the entire asset
- Turnouts potentially left untreated



Complementary Grind Plans

- Cycle 1



- Cycle 2 when Cycle 1 without Specialty Grinder



- Cycle 2 when Cycle 1 with Specialty Grinder



LEGEND

- Profile or Surface Deviation
- Production Grinder
- Specialty Grinder

- RESULTS: More closely match demand = rail life extension by minimizing grinding wear and surface initiated defects



Conclusion

Utilizing a joined grinding program versus a traditional grinding program will result in:

- Improved treatment of non-test / SSC locations
- Increased network coverage
- Efficient use of the production grinder and the speciality grinder
- Efficient use of railroad resources



Thank you for listening! Questions?

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