RAIL MILLING – An update

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Presentation Agenda

1. Introduction – a short history of rail management, one of the tail engineers tools in the “tool box”.
2. 2012 WRI Presentation - review of the technology.
3. Case studies.
4. Summary of benefits and some issues.
5. A new development.
6. Q & A.

A Brief history reminder

- History in origins of tramways, noise from rail corrugation
- Commercial heavy haul and intensely operated metro systems identified development of rail defects and management techniques.
- Rail grinding capability and applications developed from 1950's to now well proven range of vehicles, 4 stone road-rail to multi-stone trains.
- However limitations due to operating conditions, rate of metal removal and the environmental drive

Enter – rail milling

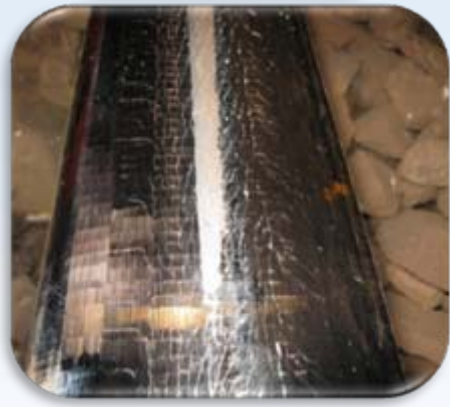
- Recovery of old rail back to a plant to pass through milling plant, rail good for cascading to secondary lines
- But costly
- So take the milling plant to the rail, mid-1990's prototype with application of modern control systems

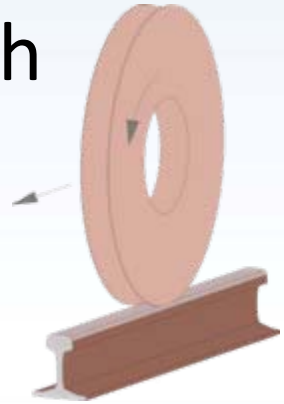
Milling plant today

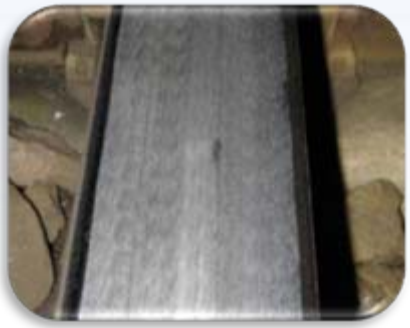
- Range of machines and manufacturers
- Road-rail
- On track

Principal of Rail Milling

- Cutter head with teeth, the profile is in the head
- Can finish with grinding, but much reduced fire risk
- Un-ground finish results in facets, can be a noise issue
- Ground finish





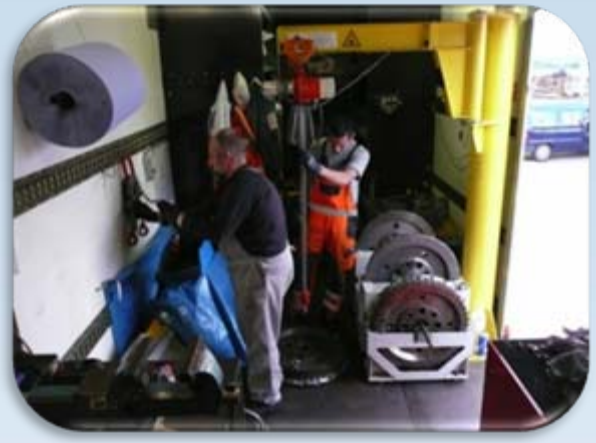


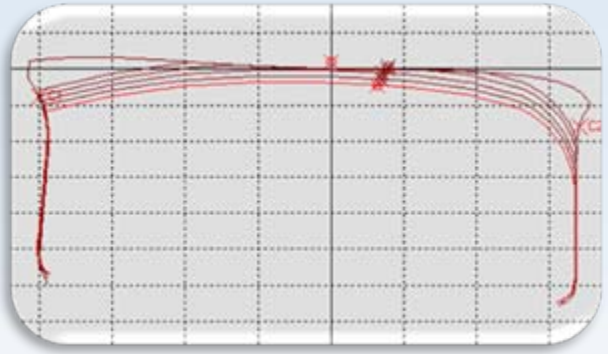
Benefits of process

- High level of debris recovery
- Consistent profile
- Low fire risk
- Low noise
- Low hazard
- Good working environment
- High level metal removal

Some limitations & Issues

- Most technologies cannot vary profile, have to change head or follow up grinding
- Width of rail head with excessive plastic flow
- Higher maintenance support
- Need to “know” the asset condition of the rail being treated
- Perceived cost and comparisons with grinding





Case study 1: Automated Light Rail (DLR)

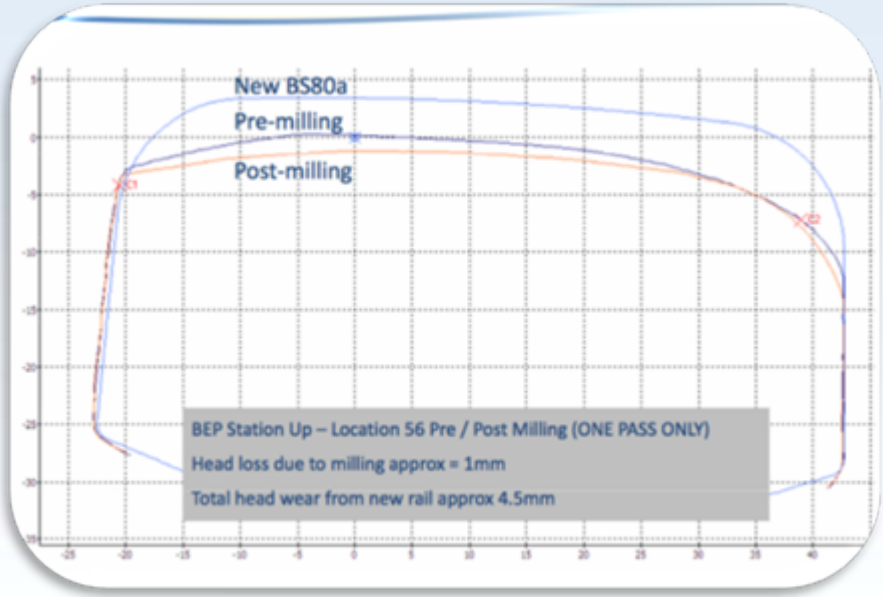
- The problem – hunting of vehicles on tangent track
- Route cause – flatter wheel profile for curving and as rail wore in tangent track resulted in generation of cyclic wear in rail head and excessive hunting with “derailment risk”
- Introduction of bespoke profile with high crown
- New milling wheels with profile in wheel

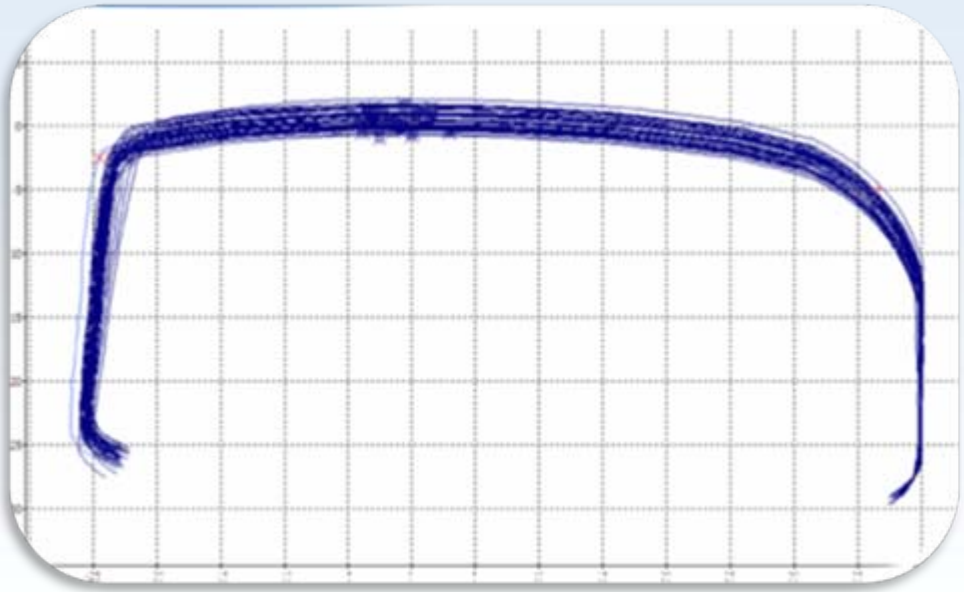
Case study 1: Automated Light Rail (2)

- Problems encountered:
  - Axle counter heads
  - Depth of rail head due to previous grinding that had followed cyclic wear
  - Access for swarf removal
- But – “it did what it said on the tin”

Case study 1: Automated Light Rail (3)

- **Results**
  - Very consistent profile to target
  - Significant ride improvement





Case study 2: Heavy Metro (1)

- The rail problem – corrugation (noise) and extensive rail defects
- Tunnel environment limits or prohibits rail grinding plus dust and fire problems
- Operational access
- Introduction of new generation rolling stock, ac traction drive, increasing rail fatigue damage, development of Squat Type Defects (“STuDs”), not unique!

Case study 2: Heavy Metro (2)

- Good results on good track form but
- Application of rail milling on poorly fixed track resulted in “chattering” of rail head on rail, not suitable
- Need to prepare the rail and fixings – “fettling” of rail joints, signal block joint posts, rail joint gaps, lateral and horizontal rail joint alignment.
- Lubricators need removal
- Gauge face grease needs removal
- Needs pre-work site inspections

Case study 3: “MEDIUM” RAIL (NwR) – 1

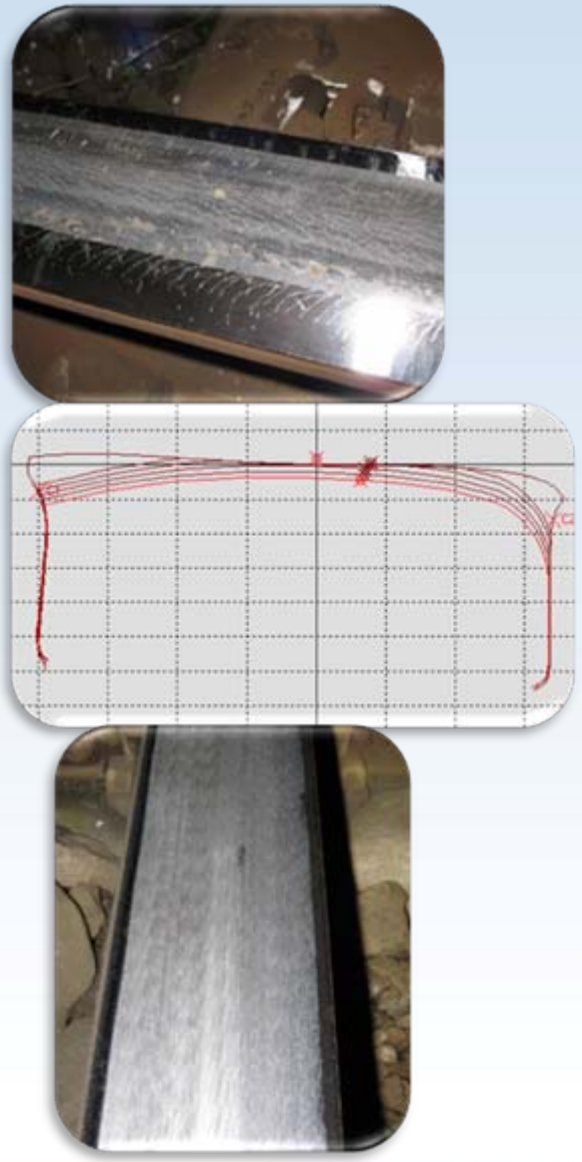
The problem:

- “Crushed” low rail on curve
- Defects in rail shoulder, but not visible
- Area in tunnel, passing trains on adjacent lines
- Options: re-rail/grind/mill

Case study 3: “MEDIUM” RAIL (NwR) – 2

Milling chosen

- 5 passes (subsequent grinding on parallel line 40 passes!)
- Shoulder RCF defects revealed and could be seen to be removed
- Passes progressively restored profile
- Final grind finish



Case study 3: “MEDIUM” RAIL (NwR) – 3

Issues to note

- Width of damaged rail head in excess of teeth of cutting head
- Track condition
- Rail head depth
- Swarf collection

Case study 4: Street Tramway Basel (1)

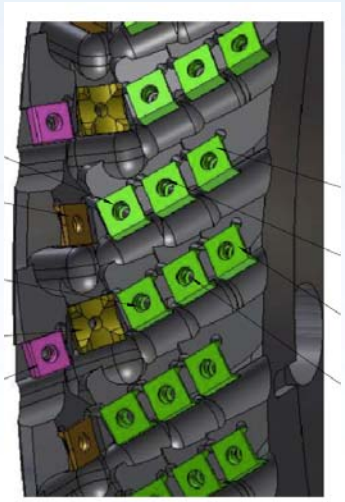
BASLER VERKEHRS-BETRIEBE BASEL ERFAHREN BVB

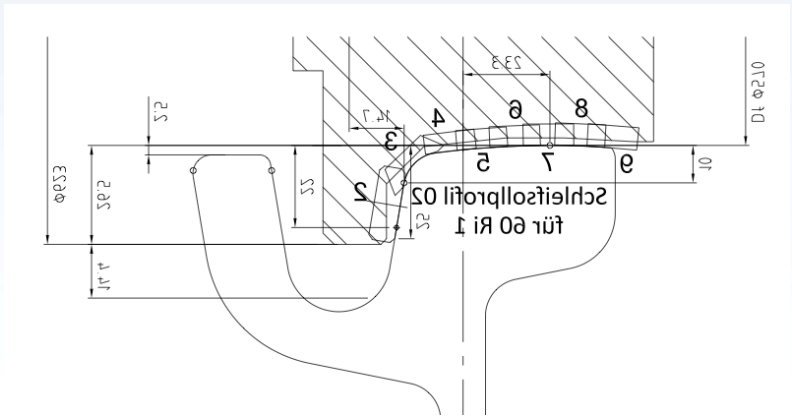
- 1000MM gauge system, street running grooved rail
- Weld deposit on rail head to be renewed
- Lipping on gauge face of grooved rail
- Previous use of rail grinding very slow
- Issues of street working

Case study 4: Street Tramway Basel (2)

BASLER VERKEHRS-BETRIEBE BASEL ERFAHREN BVB

- 1435mm gauge road/rail machine adapted to 1000mm gauge
- Special cutter head profile to reach down to lipping

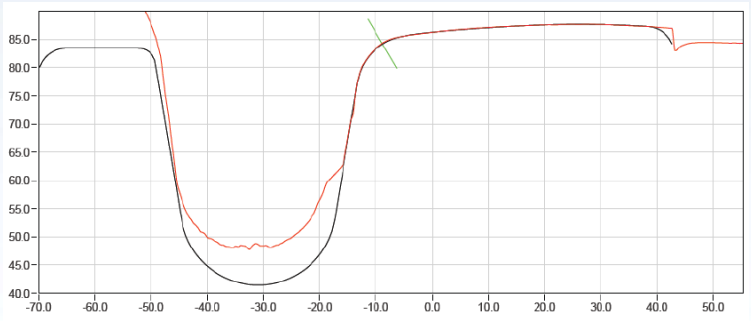




Case study 4: Street Tramway Basel (3)

BASLER VERKEHRS-BETRIEBE BASEL ERFAHREN BVB

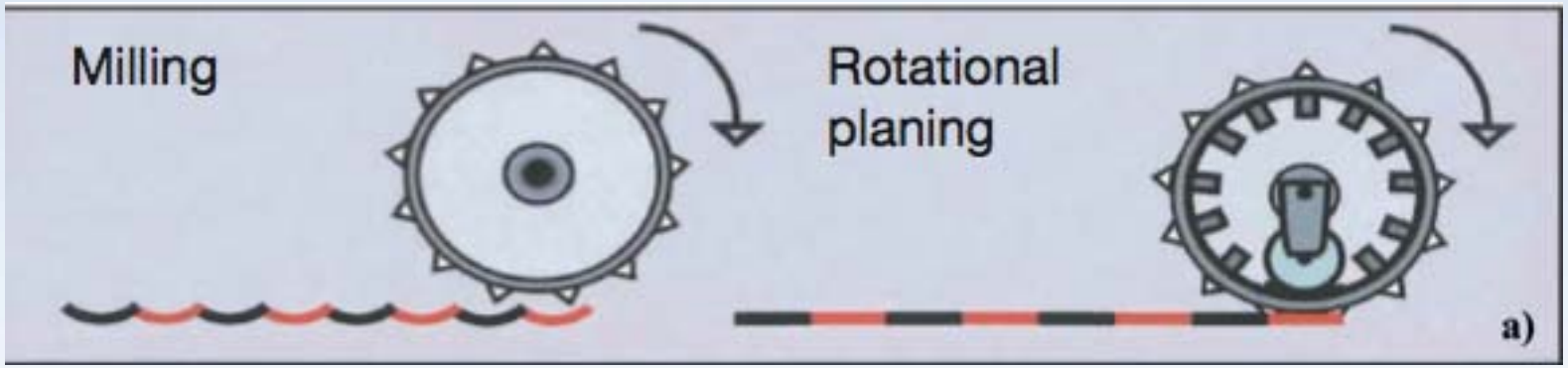
- 10 x increase in productivity
- Ongoing work
- Positive support from operator



New Development - 1

Rotational planing

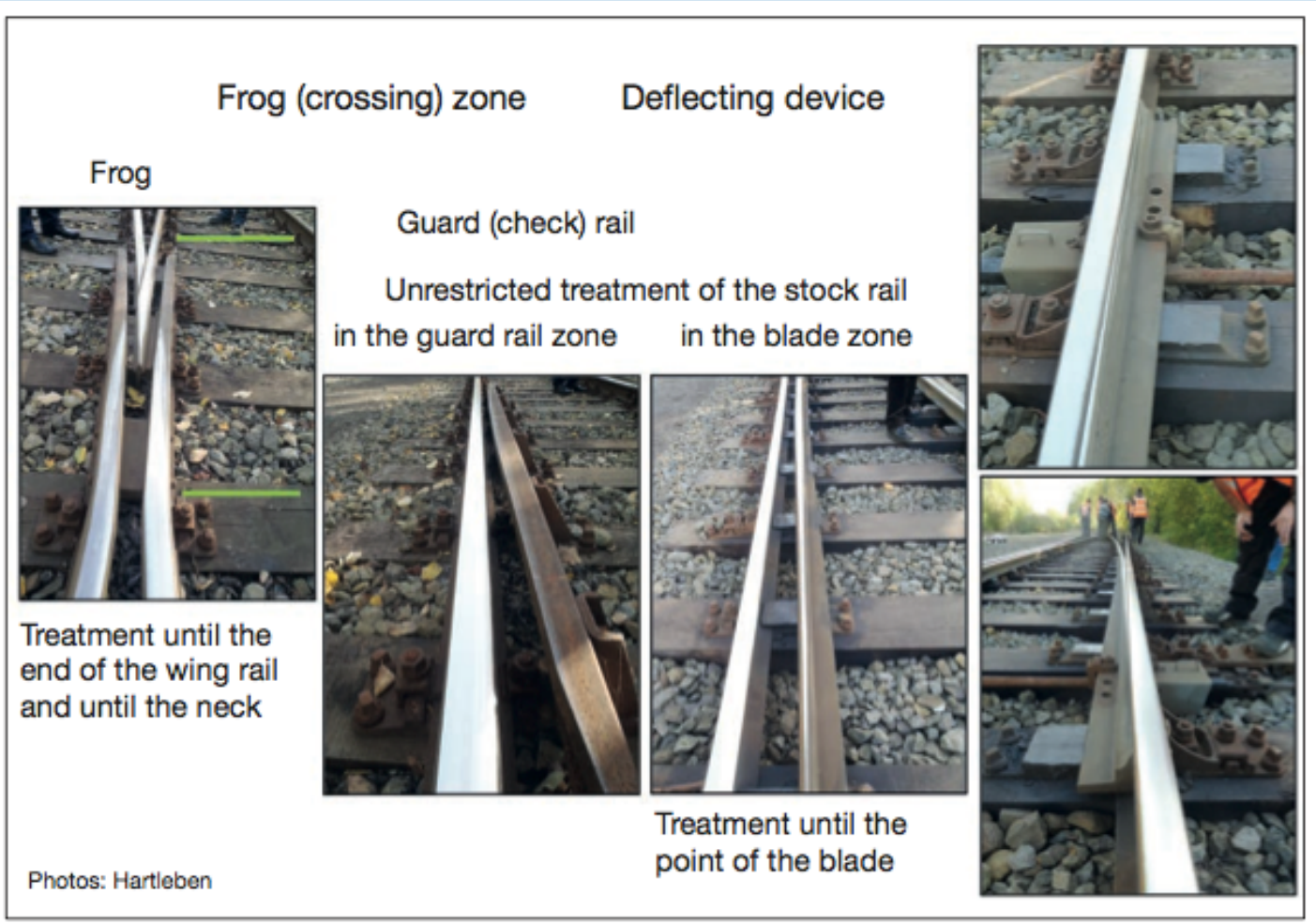
- Cutter teeth drawn along rail



- Does not result in the miller teeth facets so removes need for grinding if an issue
- Variable profile

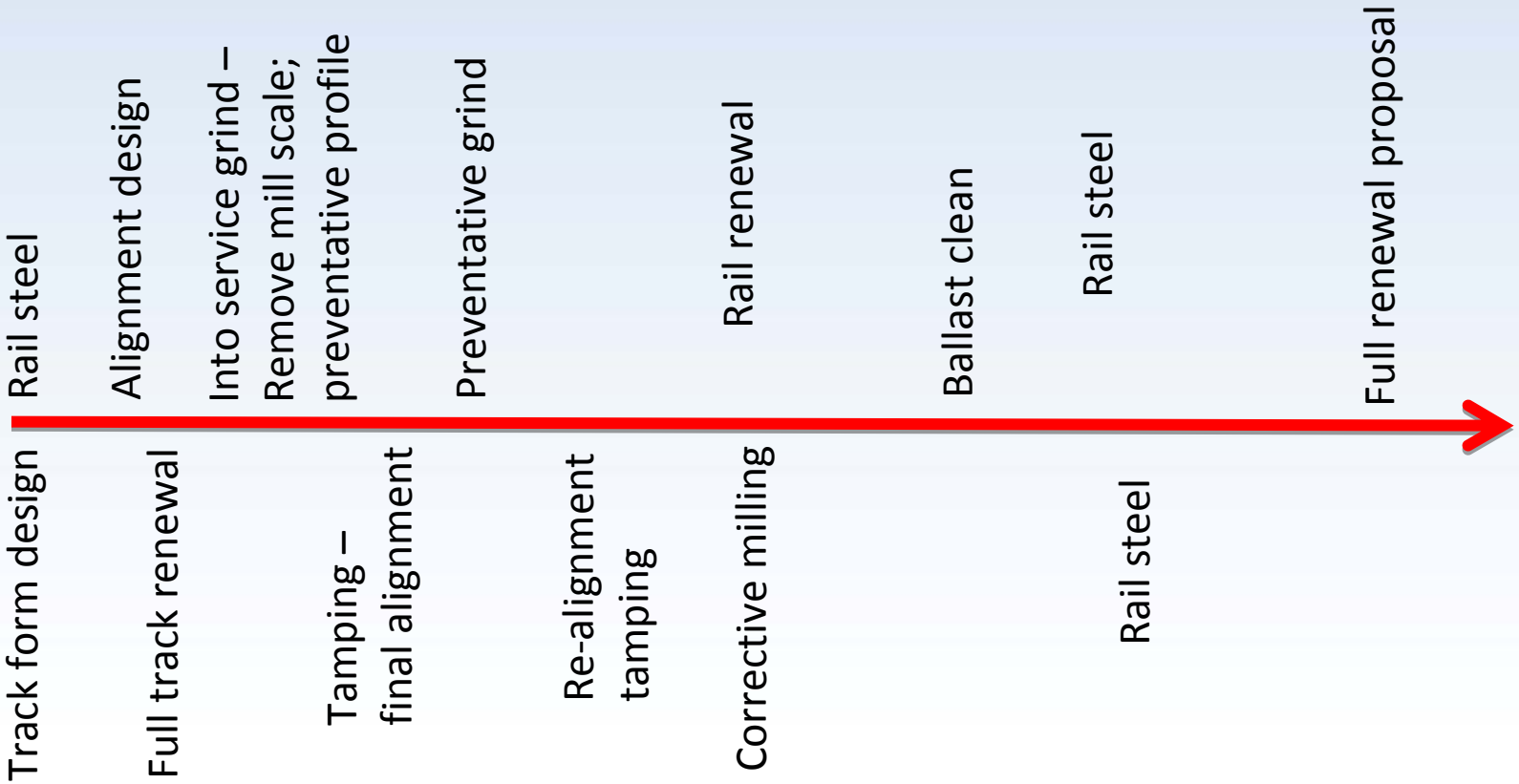
New Development - 2

- **Can be used in switches and crossings**



Some concluding thoughts

Where does milling stand in the Asset Managers "life cycle" tool box, not one solution



Summary

- INCREASING USE OF MILLING
- UNDERSTANDING WHERE IT SITS IN THE "ENGINEERS TOOL BOX" AS A STRATEGIC TOOL
- ADAPTABLE TO ISSUES
- BENEFITS BEING DEMOSTRATED
- DEVELOPMENT OF TECHNOLOGY ONGOING

THANK YOU FOR YOUR ATTENTION

Q & A