Rail Milling
a new rail management technology

Paul Baker, Bakerail Services Ltd

Rail Milling

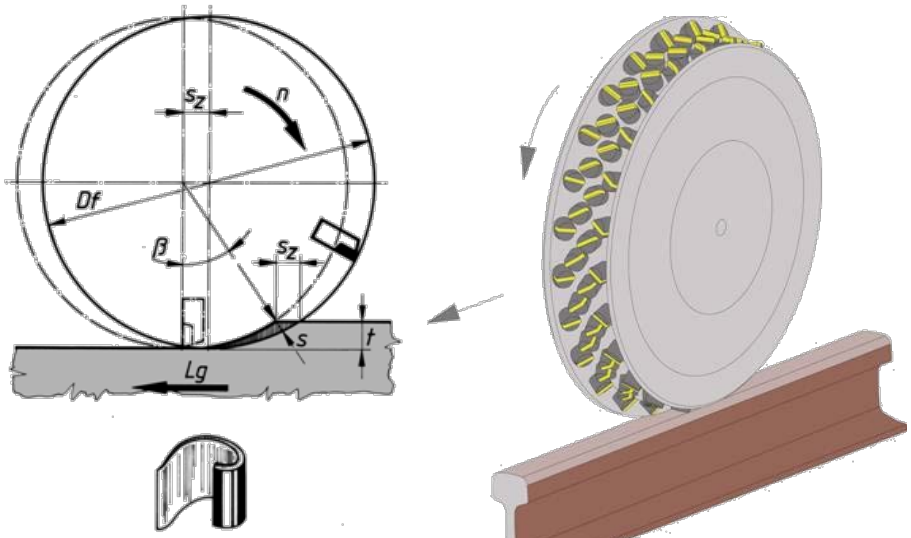
- Background & development
- The technology
- Application
- Environment
- Operation
- Rail milling vs grinding – where do they fit?
- Case studies

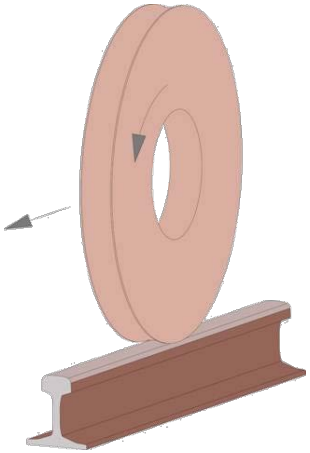
Background & Development

- Operational engineering viewpoint
- Issues of application of rail grinding in LU
- Development of CNC control in metal milling
- Recovery of rail at fixed plant
- Why not take the plant to the rail?
- Prototype rail unit early 1990's
- Now production machines available

The technology - Linsinger machines

- Milling Head – profile in the head





- Finish Grind – tangential

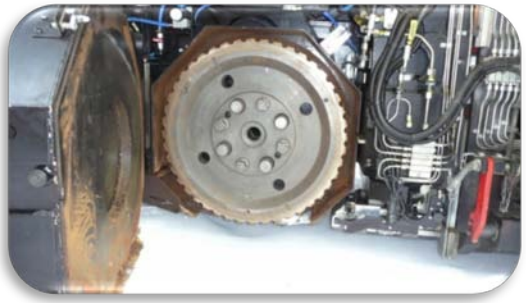
  Wheel – 3-4µmm finish roughness

Application - machines

- 3 types of machine – share common components

Environment

- Enclosed heads



- High level debris recovery

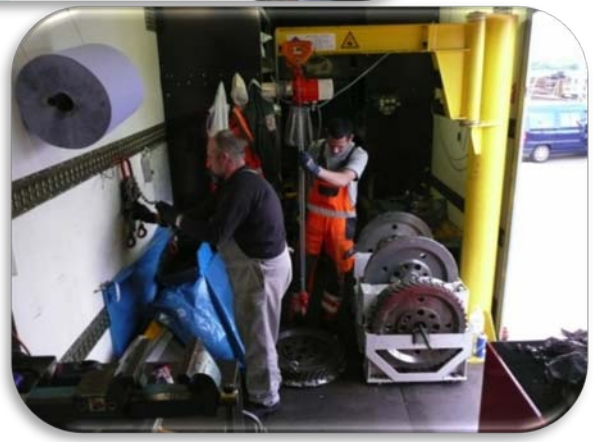
- Operator & Machine environment

Operational safety

- Short spark stream
- Minimal dust
- Low noise - < 82dB
- Low visual impact
- Tunnel capability
- No hazard to adjacent work groups or passing trains

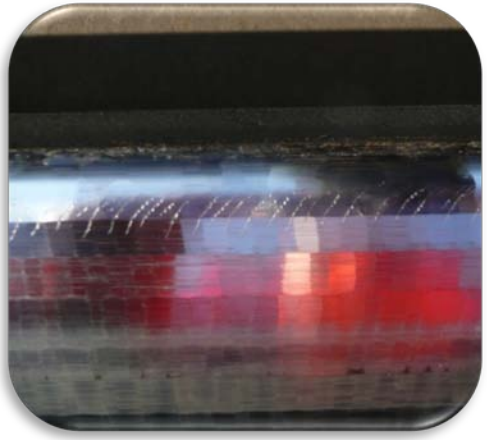
Operational delivery

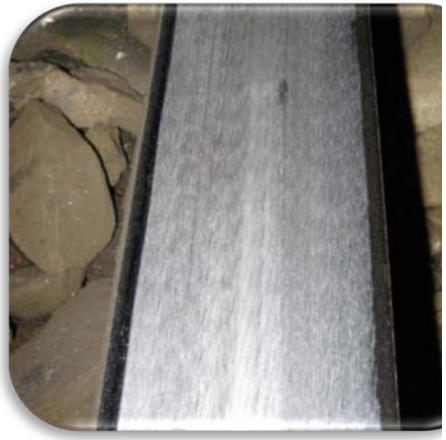
- Rail head cleaning prevents rail damage
- On site changing of head within 15 minutes
- Workshop support facility for tip changing and maintenance

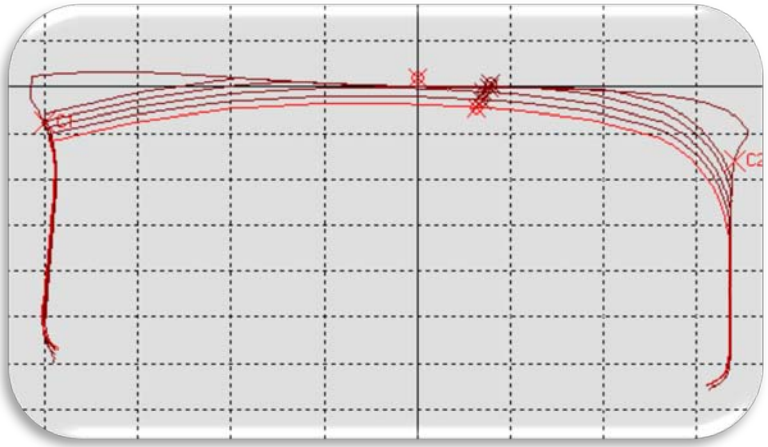


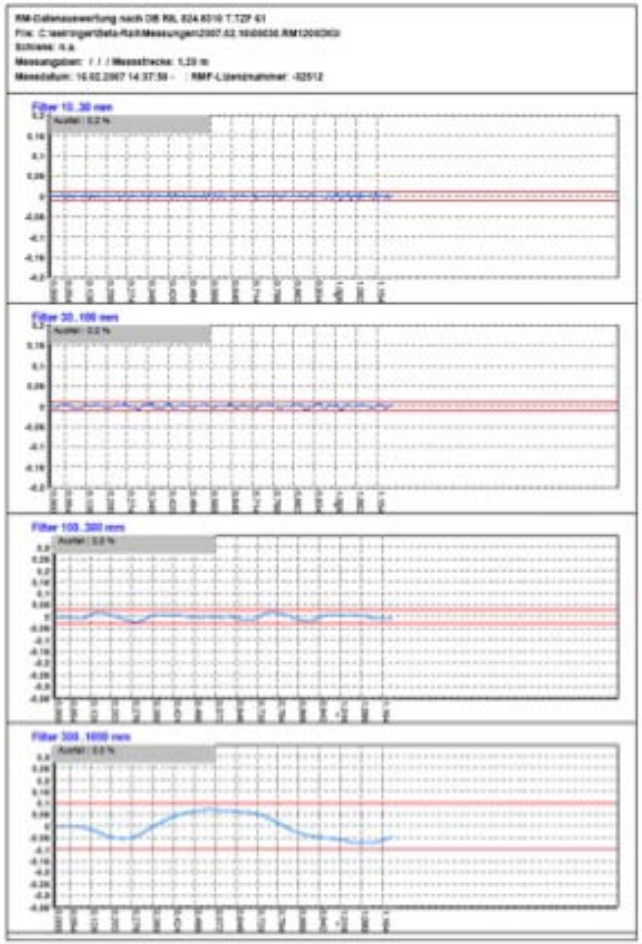
Quality

- Consistent transverse and longitudinal profile









Rail milling vs grinding – options & benefits

- Milling – where high levels of metal removal needed –profile, deep defects
- DB: 0mm – 1.5mm= grind; >1.5mm mill
- Tunnel areas: low emission/low fire risk/starvation
- Milling in high fire risk areas
- Working alongside other workgroups and passing trains
- Machine and residual rail noise: residential

How Rail milling & grinding compares 1

ACTIVITY/HAZARD	RAIL MILLING: RISKS OR OPERATIONAL ISSUES	RAIL GRINDING: RISKS OR OPERATIONAL ISSUES
Fire	Low risk: tangential spark stream	High risk: surrounding area, rubbish, use water cannon in OLE areas
Tunnel Grinding	Ideal: low emissions, dust	Poor: emissions, dust, fire
Swarf/debris collection	Good: 99%+ recovery swarf and dust	Poor: Debris to track and environment
Operator environment	Good: Low dust & vibration	Poor: dust and debris build up
For adjacent work groups	Low risk	High risk: in UK; exclusion zone
For passing trains	Low risk	High risk – spark ingestion into intake systems

How Rail milling & grinding compares 2

ACTIVITY/HAZARD	RAIL MILLING +/-	RAIL GRINDING +/-
Noise from machine operation	Risk low: less than 82dB	High risk: but cannot stand close to machine anyway!
Milling – profile variation	Not possible – profile in the head, benefit of consistency but cannot vary	Can be varied by design, allows asymmetric grinding in single pass, but also unintentionally!
Depth of metal removal	Minimum 0.3mm, ideal 0.5mm plus	Can be minimal, single pass “little and often” for preventative control
Profile quality finish	Very good, finish 3-5µmm	15 – 20µmm
Tool changing	One head each side, 15 mins, ergonomic	Many stones, poor environment

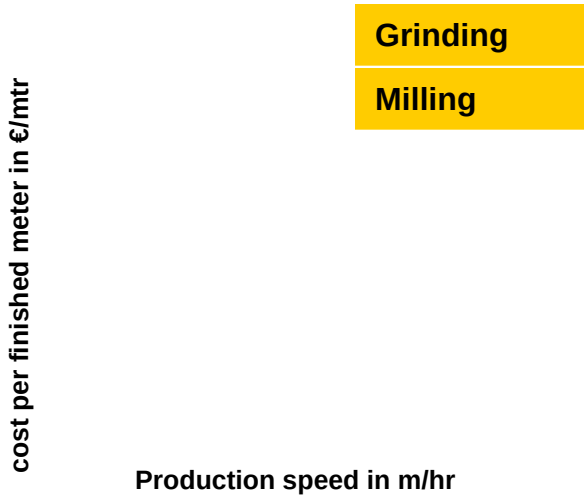
Case studies

- DB Germany - ongoing
- Docklands Light Rail (London) – June 2010
- Network Rail (UK) – October 2010 & November, 2011

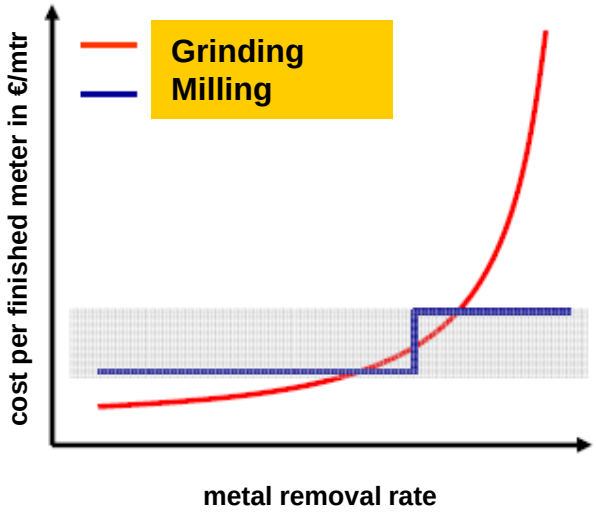
Case study – DB Germany

- Now accepted technology with 10 machines from various suppliers, rail and road units (50% of rail head correction)
- Preferred for metal removal over 1.5mm depth: benefit of cost and finish speed

cost per finished meter compared to finished meter performance

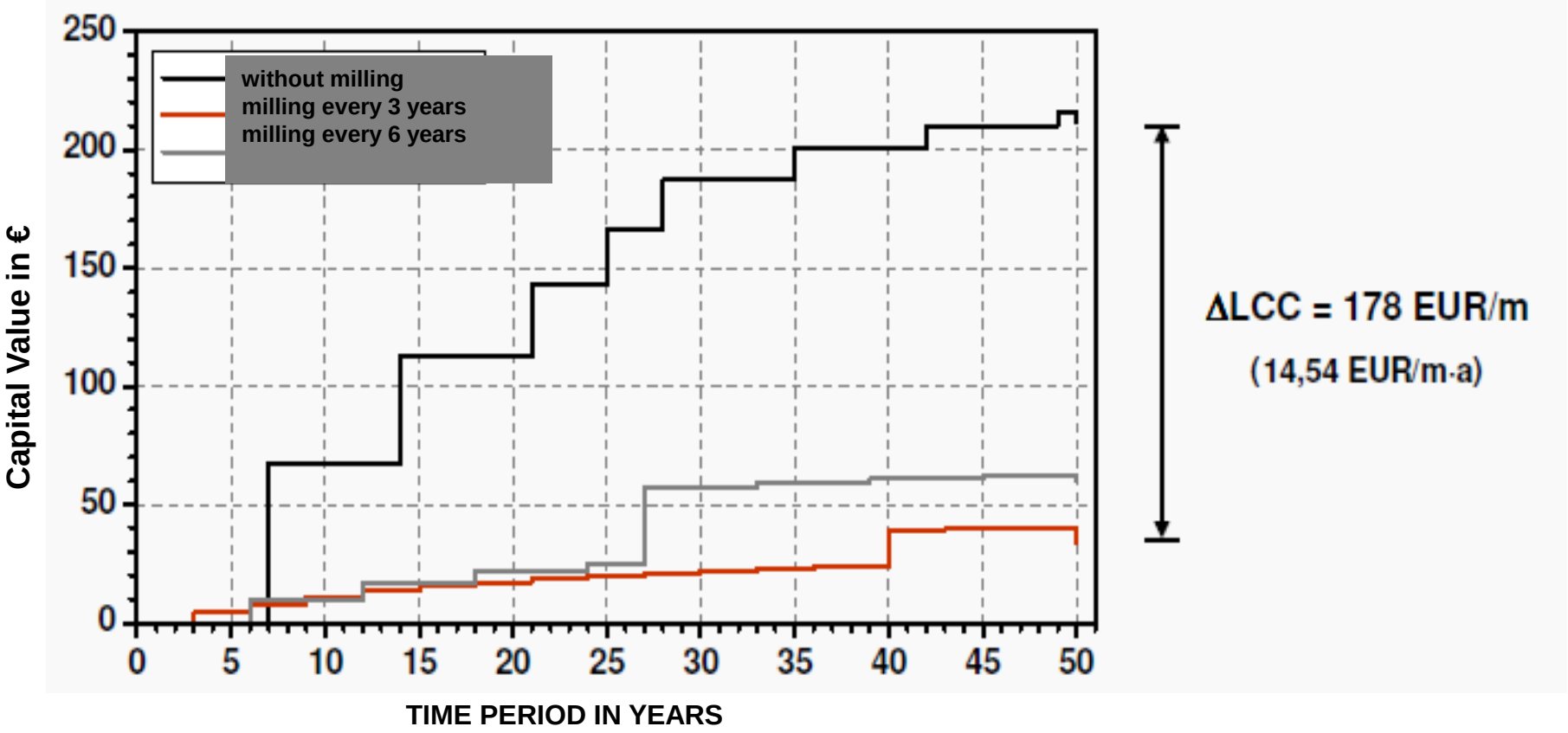


cost per finished meter compared to finished metal removal rate



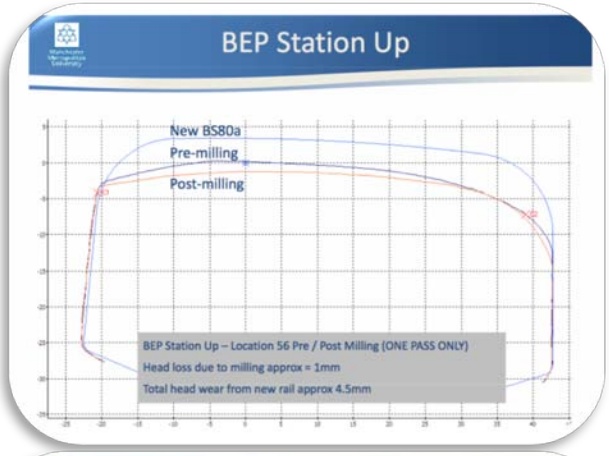
Case studies - DB

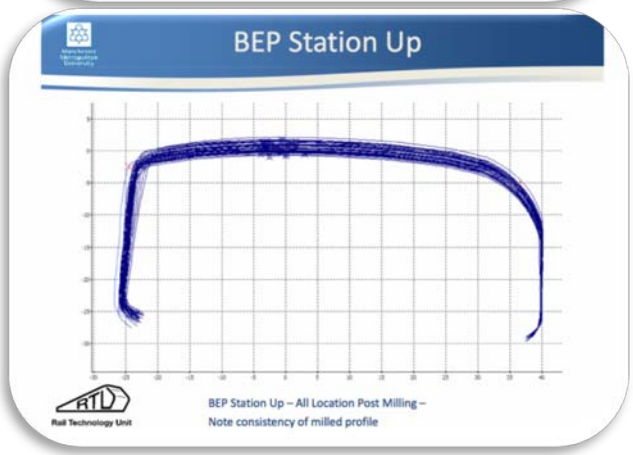
- The Business Case: A Proven Return



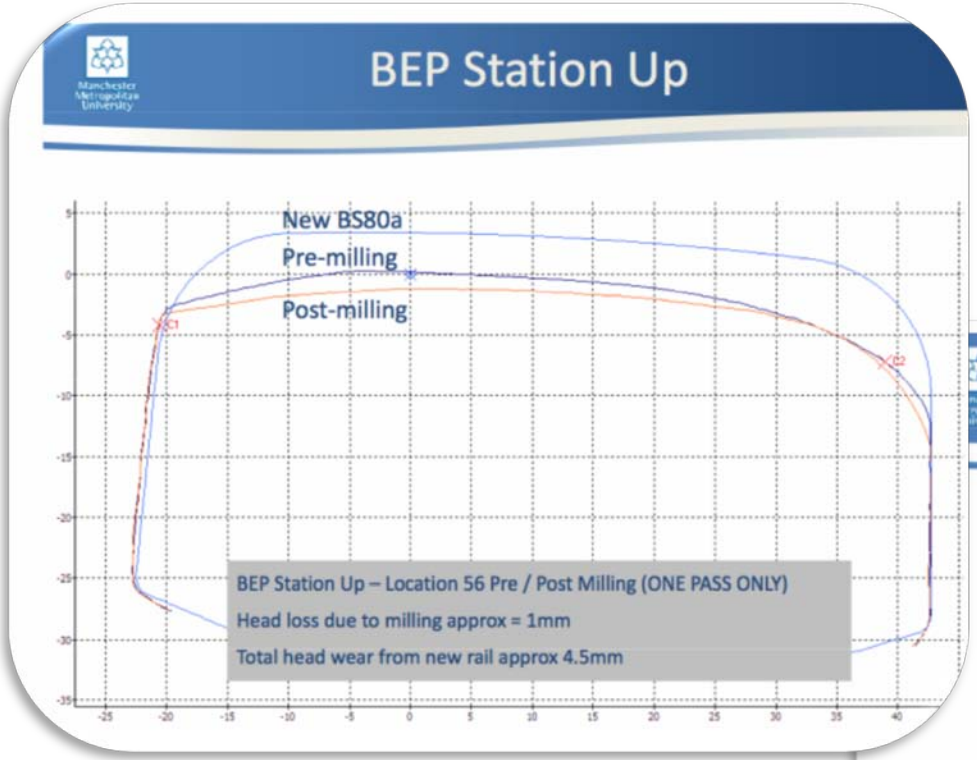
Case study – DLR

- Need to introduce new rail profile

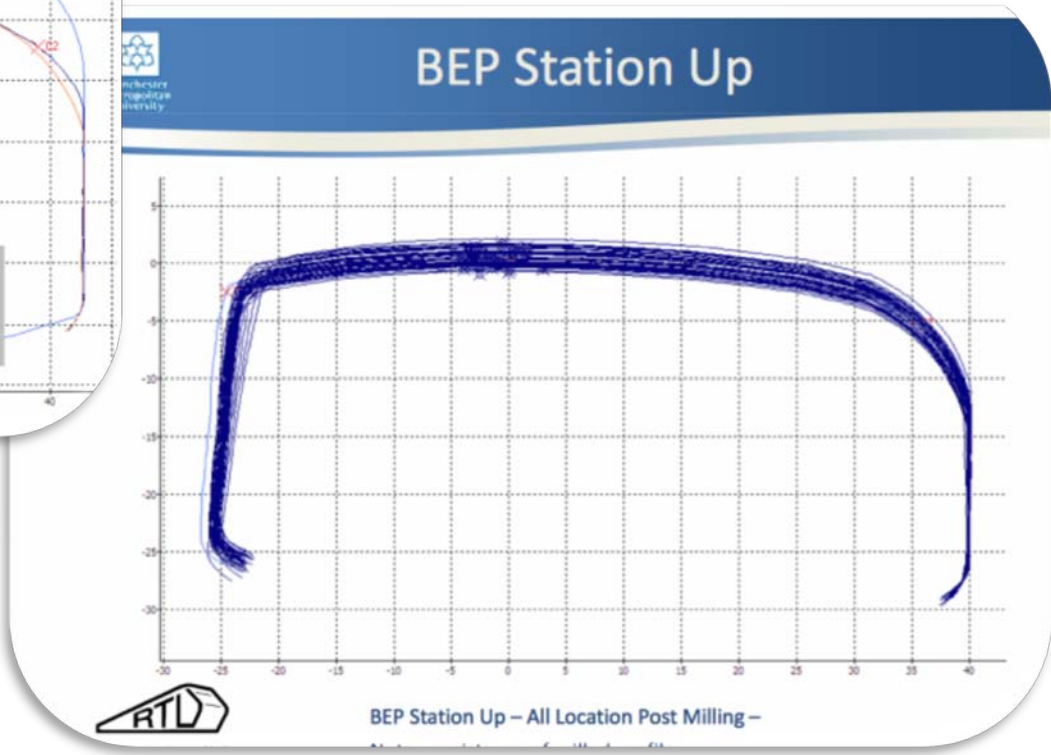




Case study – DLR

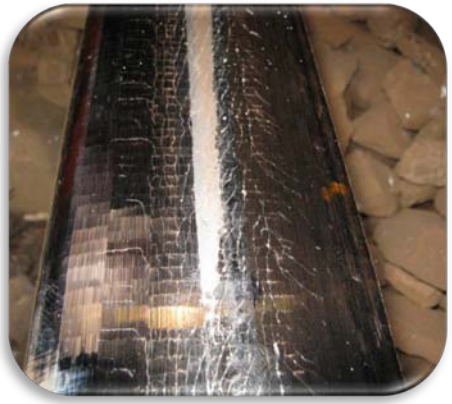


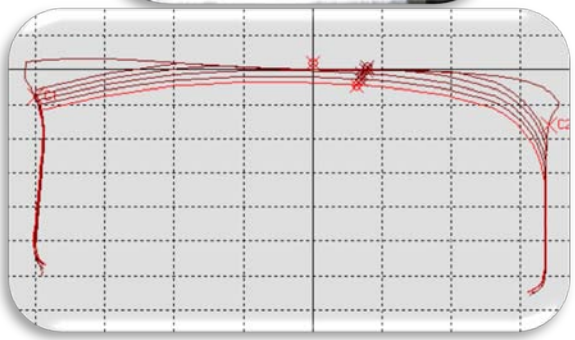
- Achieved target profile
- Consistency of profile delivery



Case studies - Network Rail

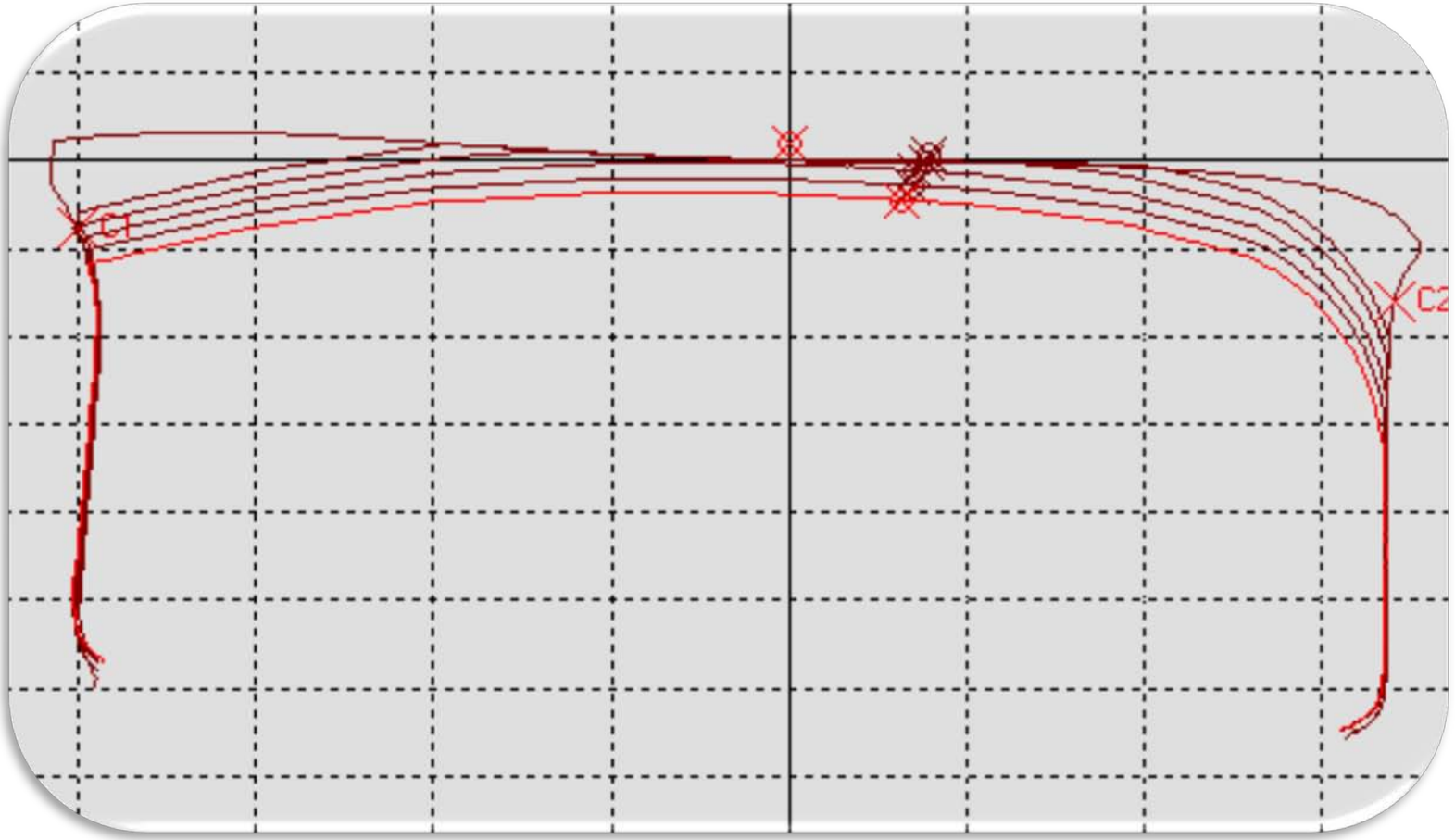
- October, 2010 - First stage of 1530 vehicle and product acceptance.
- Liverpool Street – “crushed” low rail, 5-6mm deep defects, flat rail head profile.
- 5 passes to remove and finish





Case studies - Network Rail

- Progressive recovery of profile and removal of deep defects



Case studies – Experiences

- Very effective at removing deep defects and consistent re-profiling, very effective at restoring low rail with severe rail head damage.
- Cannot directly compare with grinding, the technology “fills the gap” between rail grinding and re-railing.
- There is a balance in cost and speed
- Need to “know the asset” before working it, head profile and to be tackled and rail head depth prior to ensure adequate residual.

Rail milling – future developments

- Gauge change of road-rail machine for working on tram system
- Milling of grooved rail
- Switch and crossing

STRABAG SF02 Road Rail Milling Machine

Video of operation, 2mins 30secs.