



Rail Reprofilng Strategies in America



EXPORAIL, 2025,

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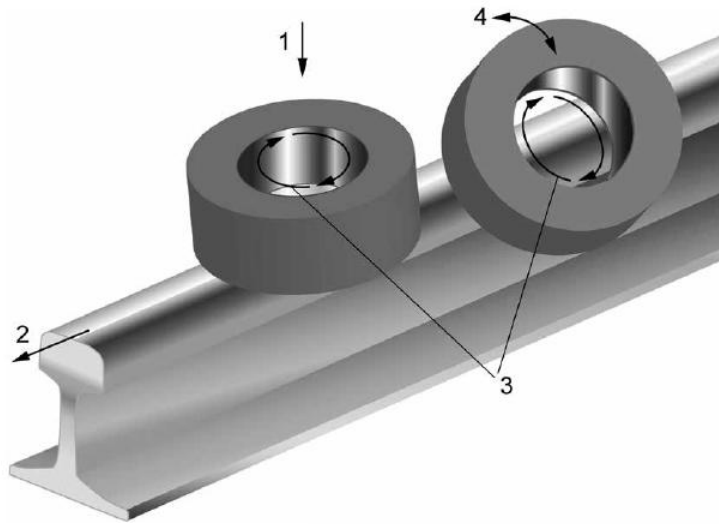
Kozica Elvis

Content:

- Cyclic Preventive Rail Grinding
- Monitoring and Condition-based Rail Reprofilng

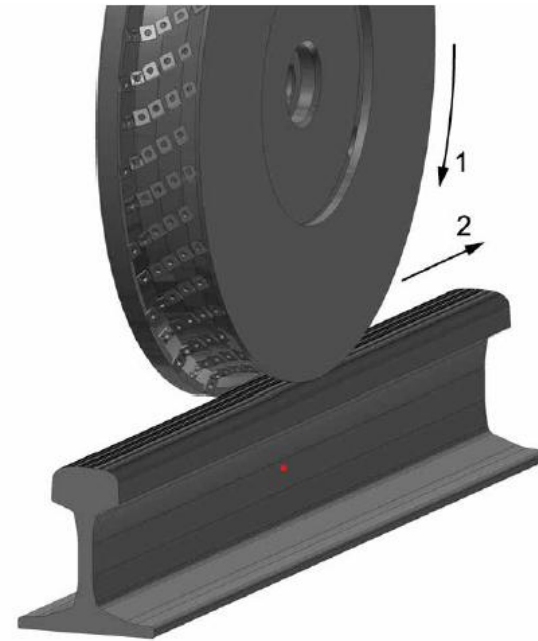


Grinding



Little removal at higher speed

Milling



More removal at lower speed

Rail Surface Damages and Maintenance

Removal of damage
in an early stage

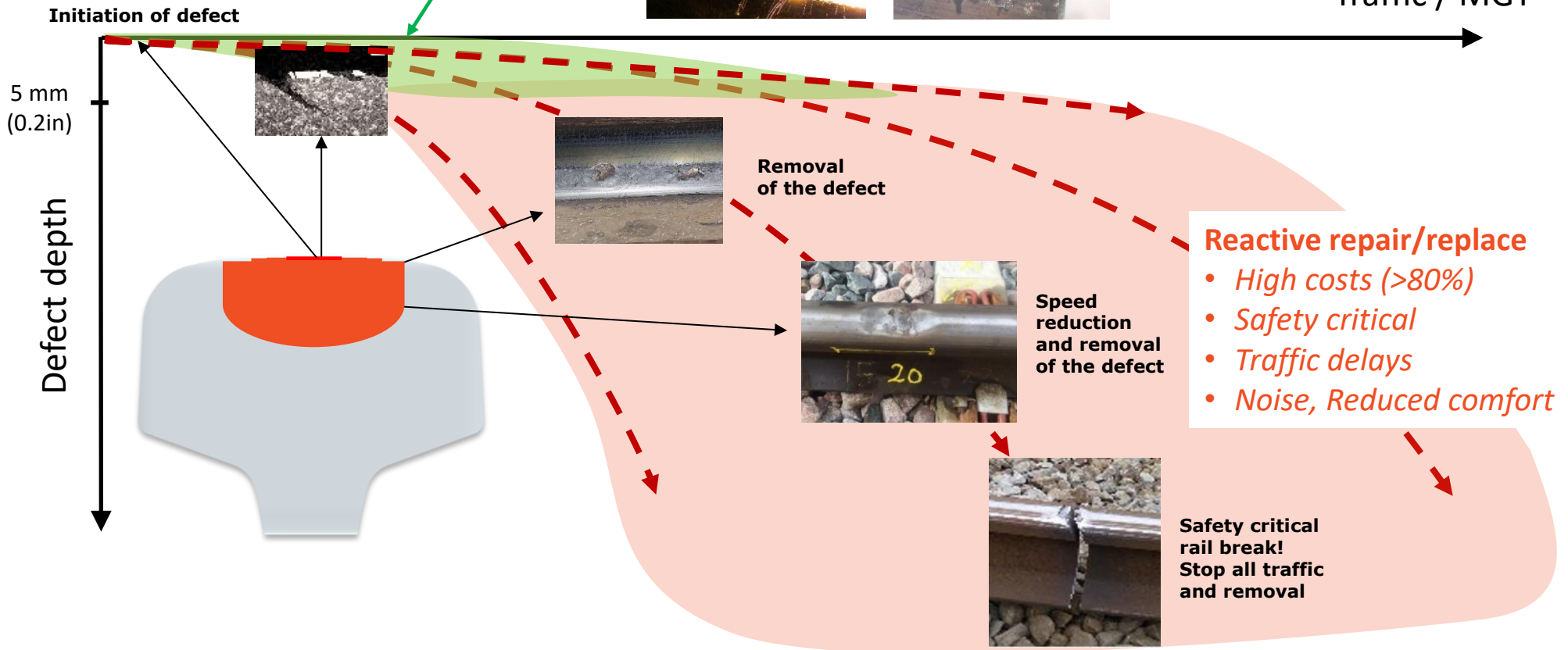
Grinding



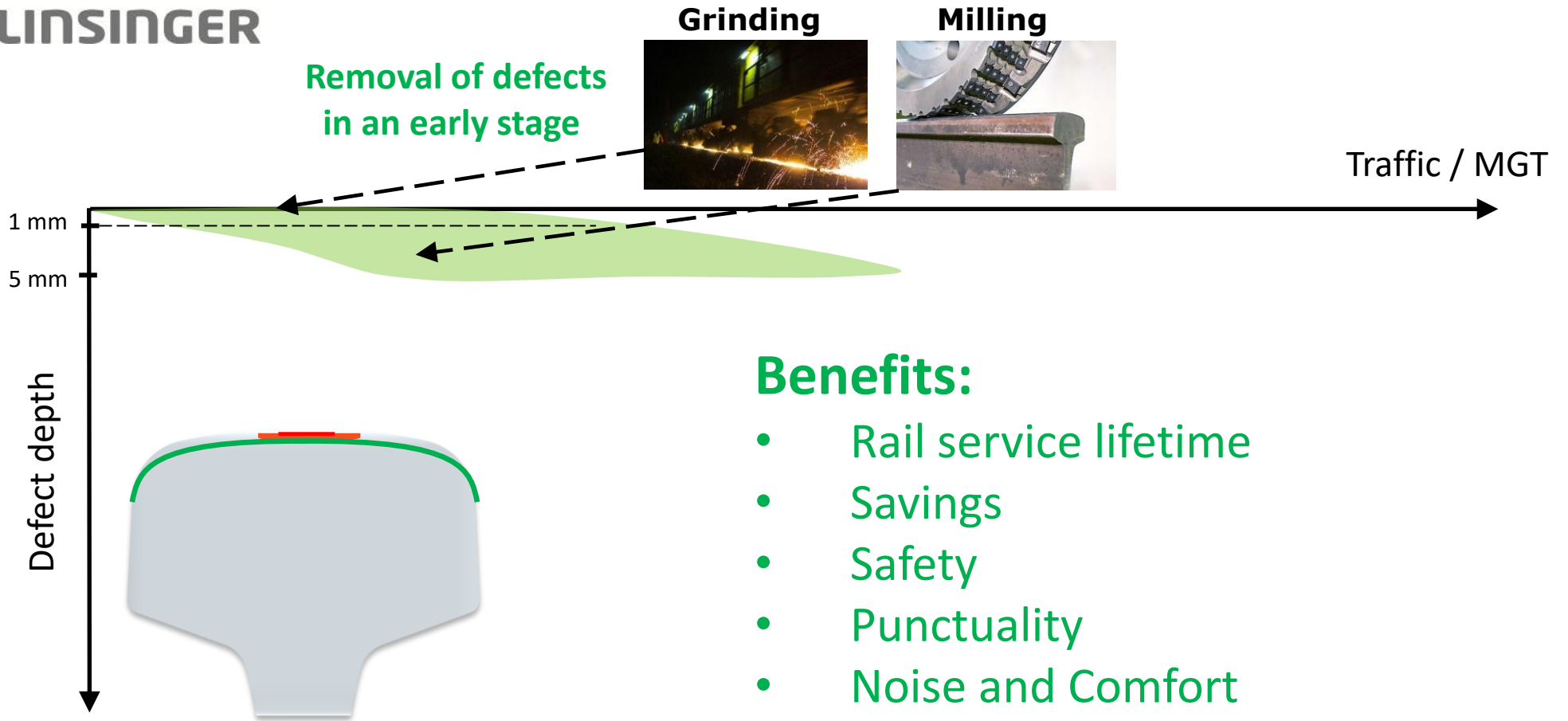
Milling



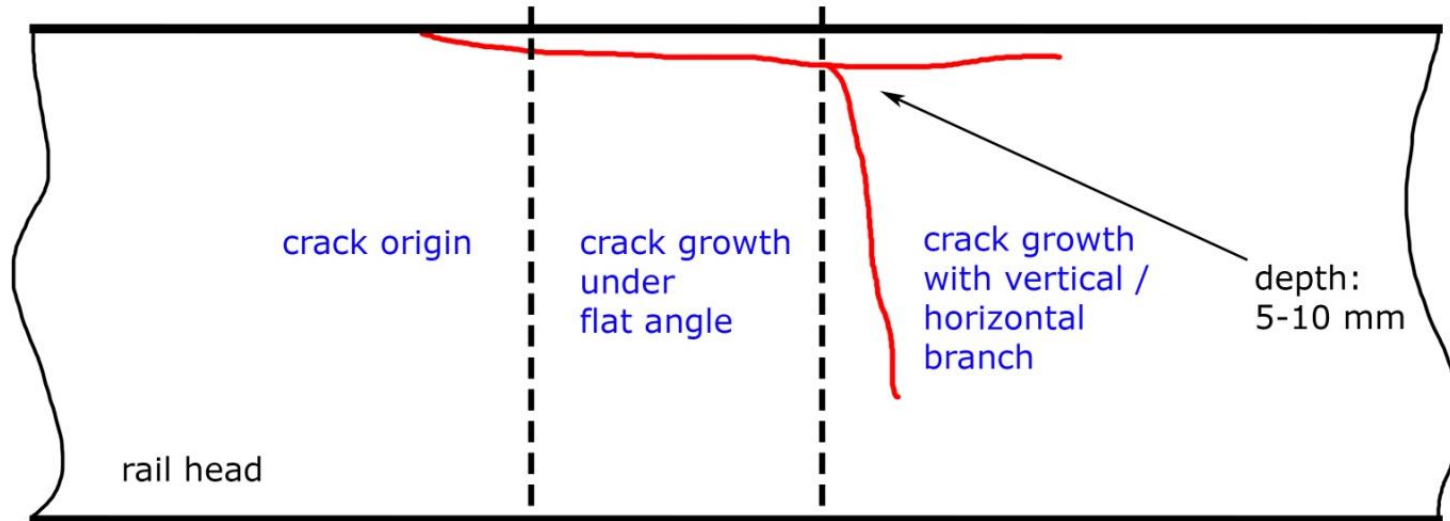
Traffic / MGT



Rail Surface Damages and Maintenance

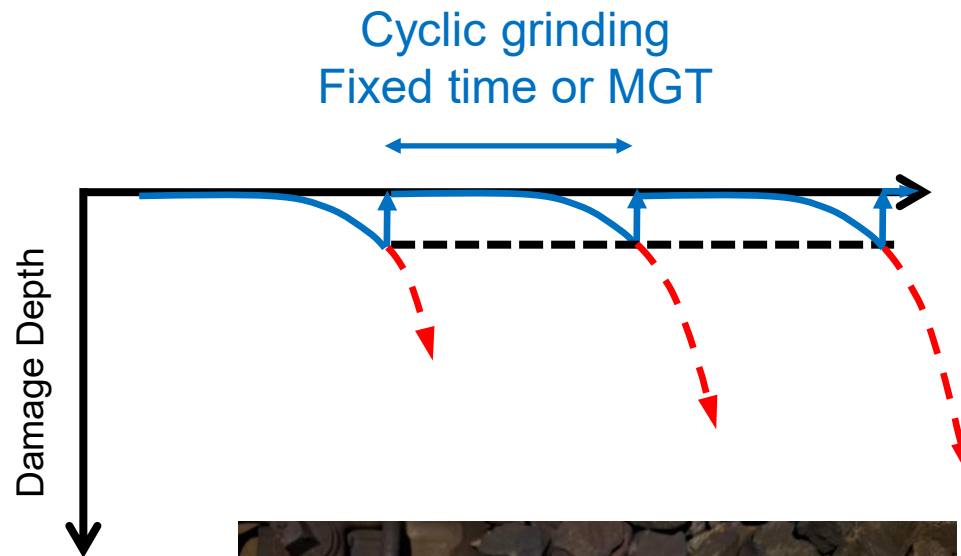


Crack growth study by DB, Germany



crack growth rate (steeltype R260)	after 5-10 MGT	1 to 2 mm / 100 MGT	~ 1mm / 1 MGT	
non destructive testing method for evaluation	VT, ET (St > 0,2 mm)	VT, ET (St ≤ 2,7 mm)	VT, UT	St=damage depth VT=visual testing ET=eddy current UT=ultrasonic testing

Ref. Dr. René Heyder, DB, VTZ 35, 2008



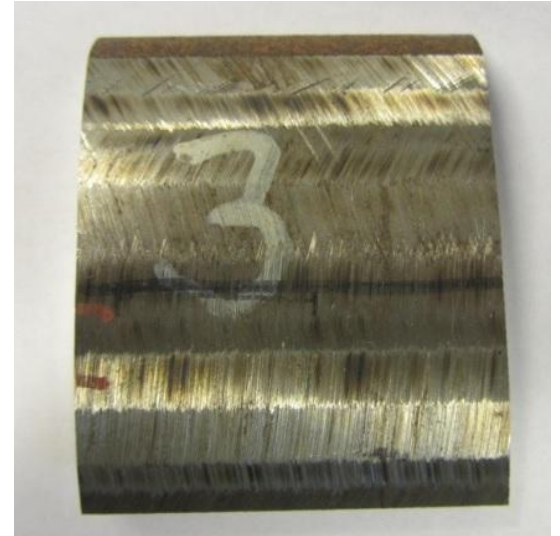
- Magic Wear Rate
- Requires prediction of RCF
- **Huge number of factors influences where and when RCF defects initiates and how they propagate!**

Damages in rails depends on many factors

	Rail	Track	Wheel	Rolling stock	Traffic	Other
Known factors	<ul style="list-style-type: none"> • Initial profile • Steel grade • Initial inclination • Lubrication 	<ul style="list-style-type: none"> • Curve radius • Single/double • Initial inclination • Initial elevation 	<ul style="list-style-type: none"> • Initial profile • Steel grade 	<ul style="list-style-type: none"> • Average axle load 	<ul style="list-style-type: none"> • MGT • Max speed 	
Un-known factors	<ul style="list-style-type: none"> • Worn profile • Longitudinal stresses • WEL • Grind. facets • Steel quality • Maintenance and it's quality • Welds • Insulation joint • Etc. 	<ul style="list-style-type: none"> • Dynamic track gauge and inclinatation • Elasticity • Resonances • Transition curves • Tamping qual. • Vertical tracé • Real elevation • Drainage • Rail pads 	<ul style="list-style-type: none"> • Worn profile • Wheel flats • Maintenance • Sanding • Lubrication • Etc. 	<ul style="list-style-type: none"> • Resonances • Wheel sliding protection • Single/double boogie • Boogie stiffness • Axle-distance • Spring system • Etc. 	<ul style="list-style-type: none"> • Wheel spin or sliding • Actual speed • Acceleration • Braking • Exact speed • Loco-driver • Etc. 	<ul style="list-style-type: none"> • Defect types • Leaf fall • W/R adhesion • Rail temp. • Precipitation • Bridges • Tunnels • Crossings • Etc.

Risks by cyclic grinding:

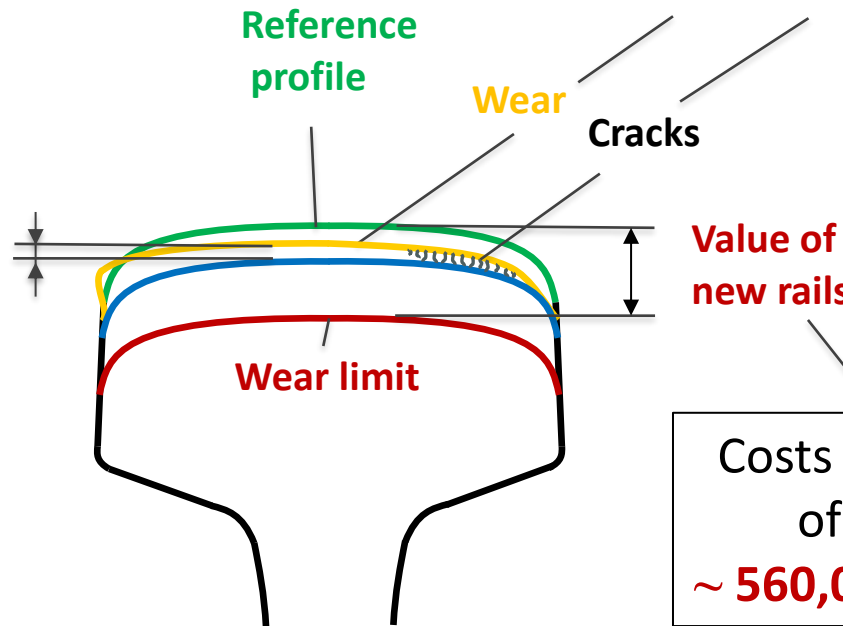
- **Too much reprofiling** in some sections
 - Unnecessary reduction of rail value/lifetime
- **Too little reprofiling** in other sections
 - Costly RCF and low lifetime of rails
- Other risks
 - Fire, WEL, Noise, Facets, Waste, No recycling, etc.



Costs on reprofiling of 1 mm (0.04in) ~ **22,000** \$ per mile

Needed reprofiling

Costs on monitoring of wear and cracks ~ **250** \$ per mile



Costs on exchange of two rails ~ **560,000** \$ per mile

Costs in Rail Maintenance



* Removal of 1 mm (0.04 in)

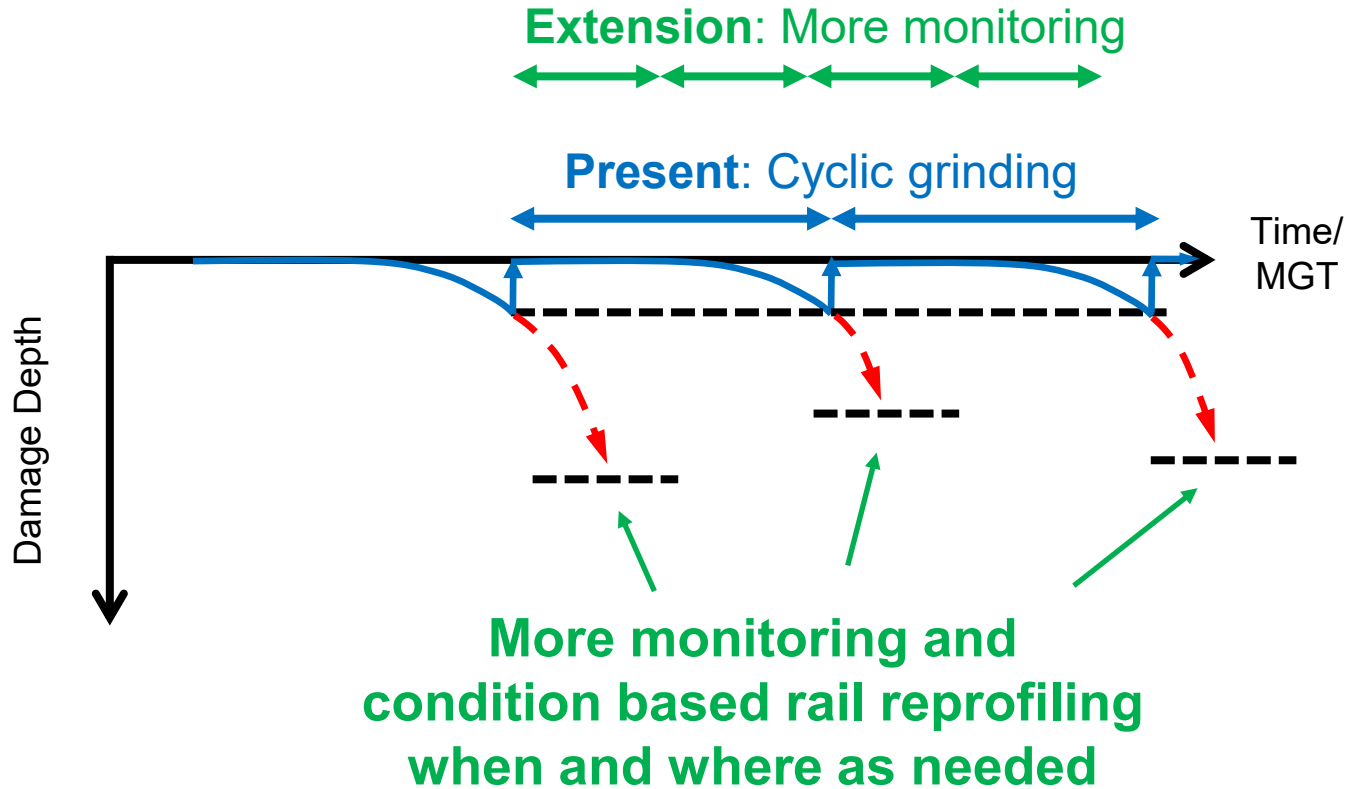
Widely used strategy today:

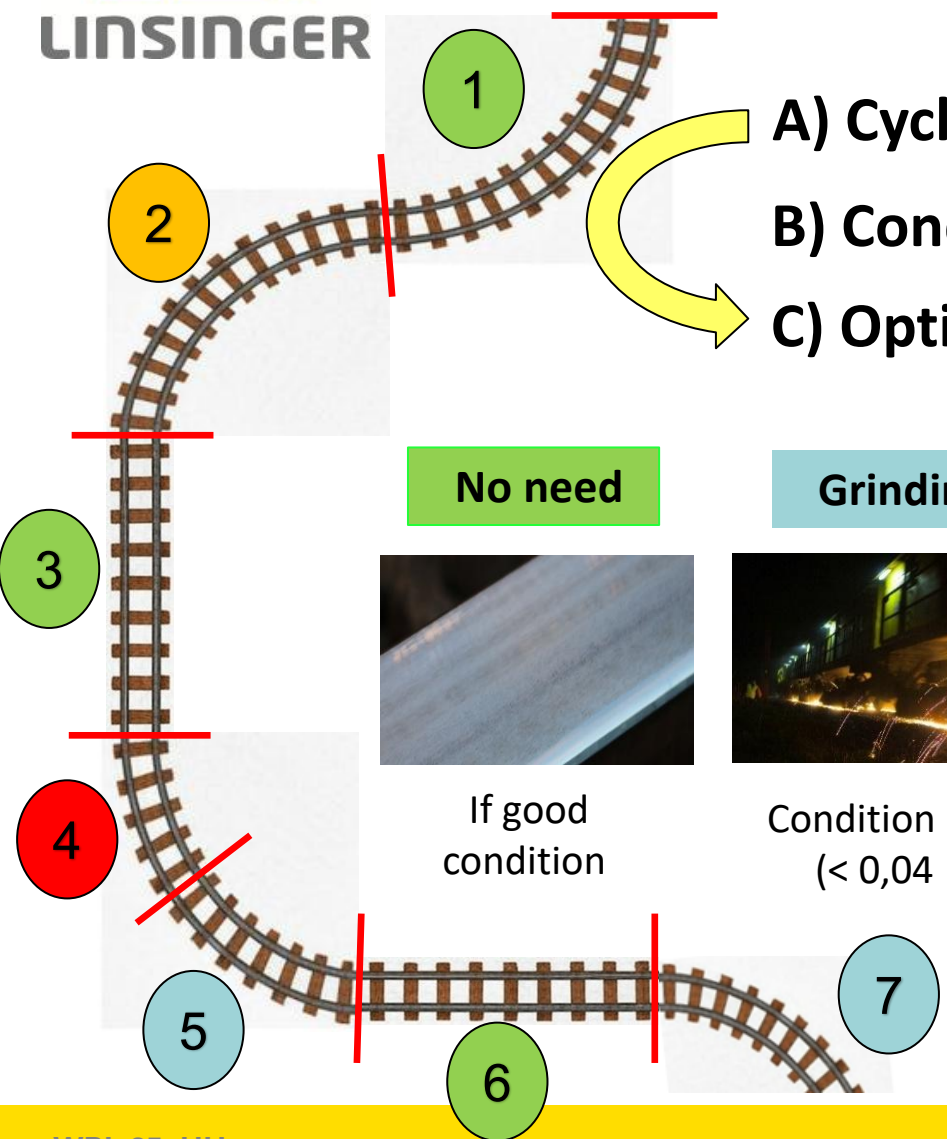
- **Cyclic grinding** with removal of 0,3 mm (0,012in)
 - for every 20-25 MGT in curves
 - for every 60-75 MGT on tangent track
- Visual inspection, profile and Ultrasonic testing.
- No efficient monitoring of smaller RCF cracks.
- **Risk: Too much or too little removal.**

Cyclic grinding



Optimization of the present strategy





- A) Cyclic monitoring of rail condition
- B) Condition based maintenance
- C) Optimization of cyclic reprofiling regime

No need



If good condition

Grinding



Condition based (< 0,04 In)

Milling



Condition based (> 0,04 In)

Re-rail



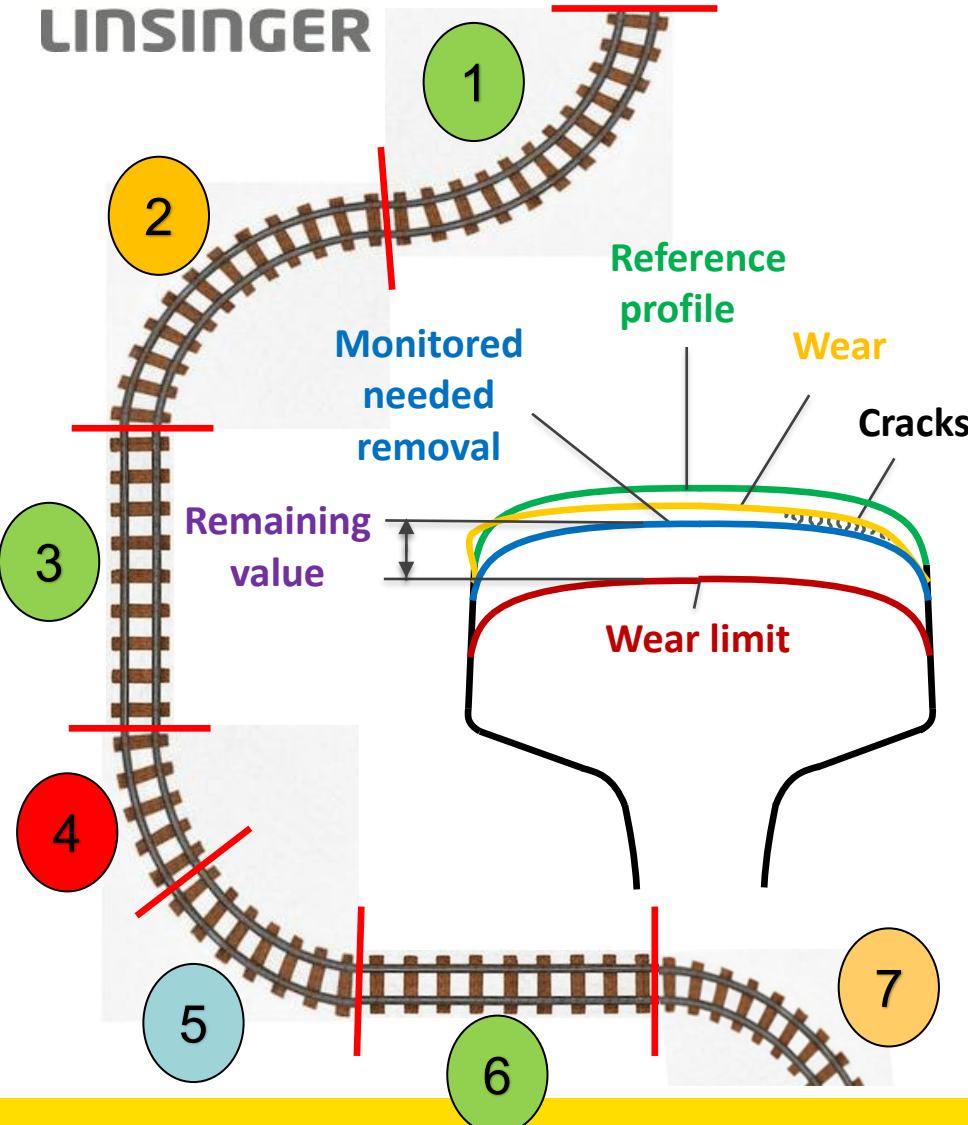
If too little remaining value

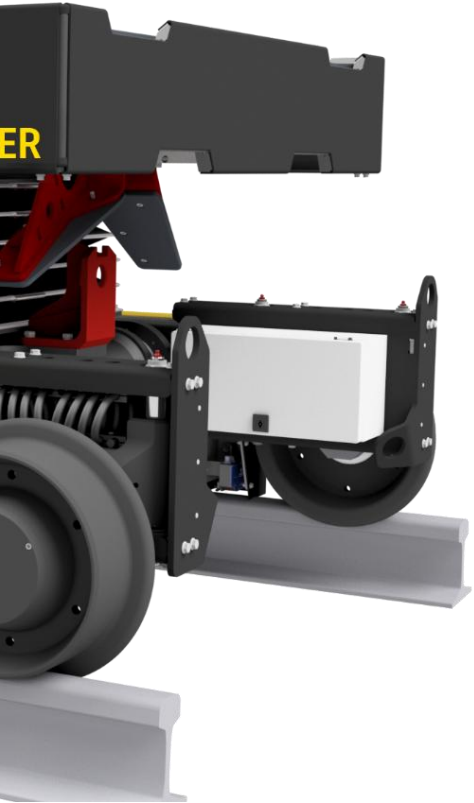
Optimized maintenance

Section	Monitored		Remain- ing value**	Mainte- nance
	Wear	Needed removal*		
1	0.08 in	0.00 in	78%	No need
2	0.12 in	0.18 in	45%	Mill
3	0.04 in	0.00 in	93%	No need
4	0,30 in	0,20 in	9%	Re-rail
5	0.04 in	0.04 in	85%	Grind
6	0.16 in	0.00 in	71%	No need
7	0,12 in	0,18 in	67%	Mill

* Measured need of removal

** Based on a rail wear limit of 0.55 in



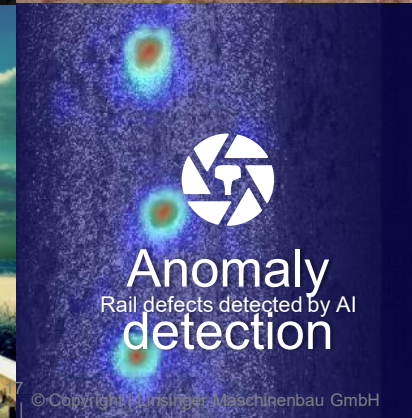
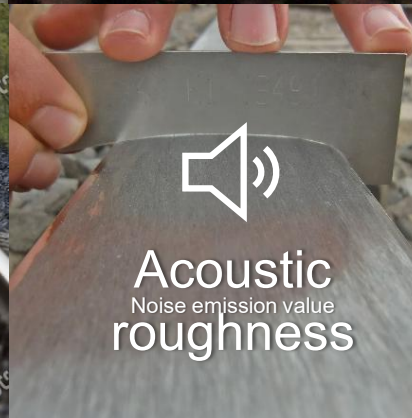


LINalyzer

REVEAL THE UNSEEN



MEASUREMENT RESULTS

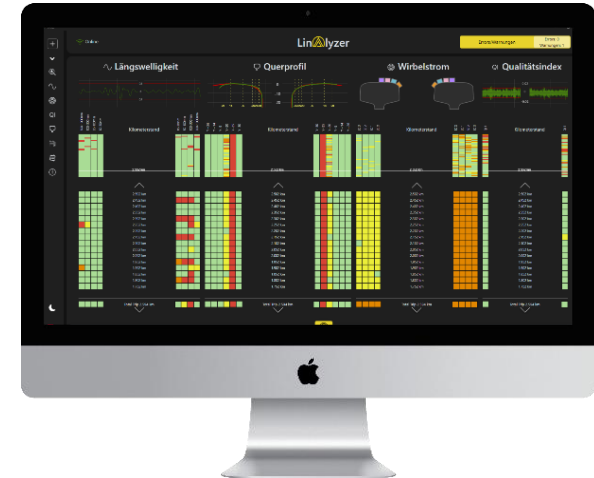


LINalyzer – Maintenance with Vision



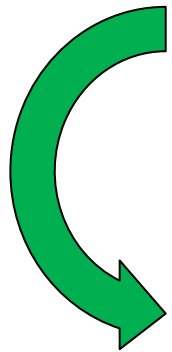
Modular Hardware

- Goes far beyond previous measurement limits
- Can be retrofitted into existing machines
- Standard based evaluation (EN 13231-2, ...)
- Decoupled design
- Minimal space requirement
- GPS-localisation

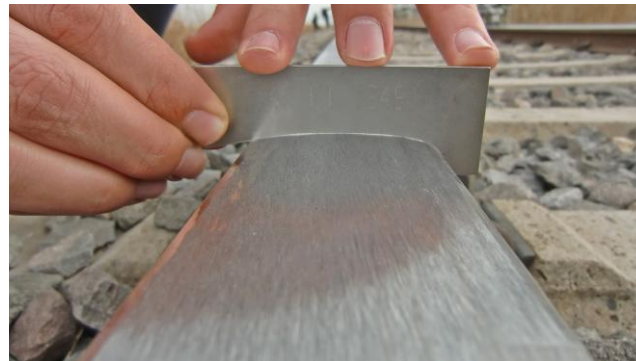


Modular Software

- Interface – clear & user-friendly
- Quick shift reports
- Centralized helpdesk
- Customizable layout
- Each level of detail selectable
- AI supported data evaluation



- ✓ **More Monitoring before and after**
 - ✓ **Condition-based Reprofilng**
- ✓ **Optimize Preventive Cyclic Reprofilng**
- ✓ **Maintenance When, Where and How as needed**



Thank You for Your Attention



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