EDDY CURRENT & RAIL MILLING NEW TOOLS IN THE RAIL MANAGEMENT ENGINEER'S BOX

Sorin L Castravete – Senior Asset Engineer (Support) [Track]

Route London North East, Network Rail, United Kingdom

Network Rail

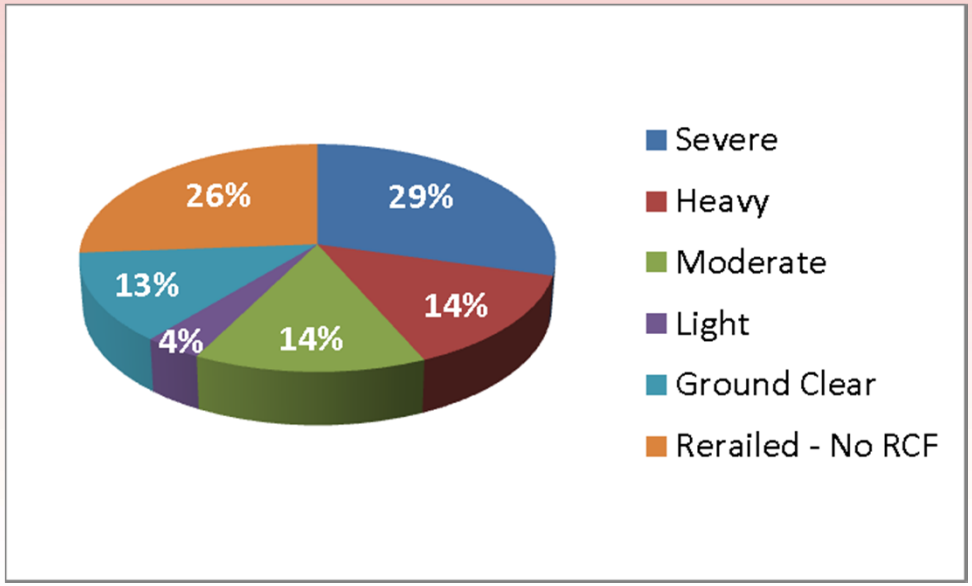
- Network Rail owns, operates and develops Britain's railway
- 20,000 miles of track, 40,000 bridges, tunnels and viaducts
- Thousands of signals, level crossings and stations.
- We don't own or run passenger or freight trains – this is the remit of train operating companies and freight operating companies.
- Devolved day-to-day responsibility for railway businesses to 8 strategic geographical routes

Route London North East

- Our route is the second largest in Britain
- We carry 20% of the daily rail travelling public in Britain
- Our freight operating companies distribute 25% of British freight and 70% of British coal.
- 3238 Single Track Miles
- 3023 S&C Units
- Maximum Speed 125mph

RCF in Route London North East

- **Rail Defects Management System (RDMS)**
  - **1387 Plain Line RCF Sites**
  - **225 miles RCF (7%)**
  - **781 S&C Sites (13%)**

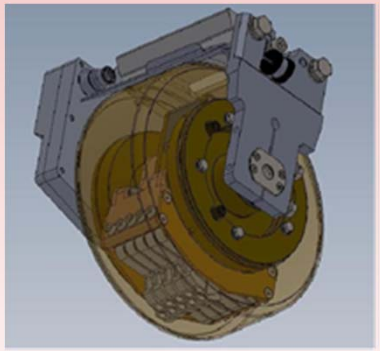


Current Management of RCF in UK

- Visual Inspections
- Ultrasonic Test Unit (UTU) Train
- Pedestrian Ultrasonic Testing

- Preventative Grinding – PL
- Corrective Grinding – PL & S&C
- Rerailing
- Track-Ex
  - Premium Grade Rails
  - Wheel / Rail Friction Management

New Developments in the Management of RCF in UK



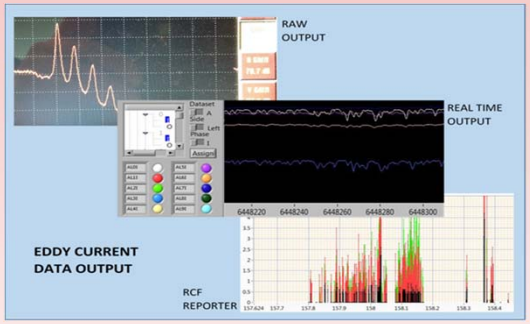
Rail Milling

- Circular milling head with tungsten carbide tipped cutter teeth

Eddy Current Testing (ECT)

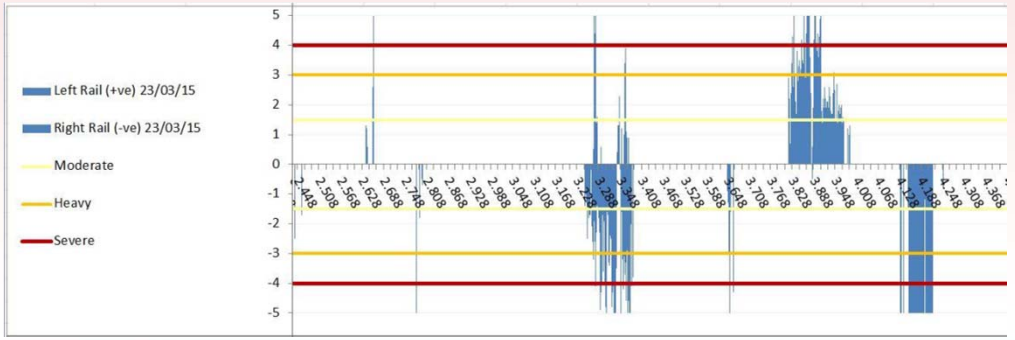
- Allows accurate measurement of sub-surface cracks and internal material anomalies

Eddy Current Data



- The Sperry Ultrasonic Test Unit (UTU) collects Eddy Current (EC) RCF data in 1-yard intervals
- The output is processed, positioned and sent from Sperry Rail to Network Rail for action.

- Corporate Solution - RDMS
- Interim Solution - EC data plot using MS Excel



Rail Milling Vehicles

- Rail Milling RRV – Strabag SF02 W-FS Truck (Linsinger Built)

- Rail Milling Trains
  - Schweerbau HSM
  - Linsinger SF06-FFS

- Mobile Rail Milling Machine (Prototype) – LASA Voestalpine

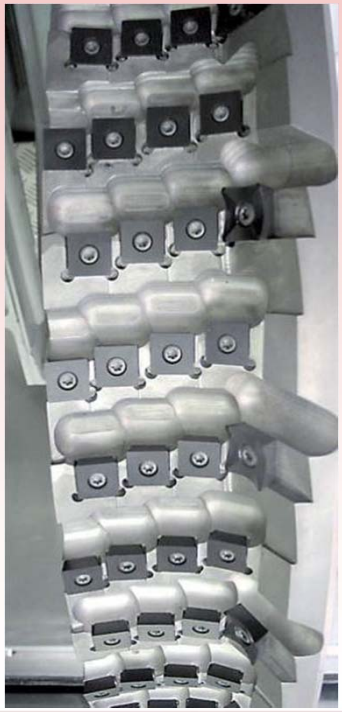
Strabag SF02 W-FS Truck RRV

99709 919090-9			
Manufacturer Linsinger GmbH 00 43 7613 8840		Owner STRABAG Rail GmbH 00 49 30 670 690 692	
Maximum travelling speed	20 mph	Maximum on/off track gradient	Level Track
Maximum working speed	2 mph	Maximum on/off track cant	Level Track
Maximum travelling speed through S & C	5 mph	May be used under LIVE overhead lines	NO
Maximum travelling speed through raised checkrails	5 mph	May travel on LIVE 3 or 4 rail lines	NO
Maximum working cant	150 mm	May be used on isolated & bonded 3/4 rail lines	[redacted]
Maximum working gradient	01:25	May be used adjacent to running line	NO
Minimum travelling radius	38 m	Maximum tail swing gauge exceedance	N/A
Minimum working radius	50 m	Minimum height of tail swing above rail level	N/A
Maximum non service braked towed load	N/A	RCI does NOT have a tandem lift mode. NOT PERMITTED OUTSIDE A POSSESSION WORKSITE	
Maximum service braked towed load	N/A		

Strabag SF02 W-FS Truck RRV

PERFORMANCE DATA

- **Processing speed 6–15 m/min**
- **Metal removal rate (surface) 0.3–0.9mm**
- **Metal removal rate (gauge corner) up to max. 5mm**
- **Surface roughness 3–5 µm**
- **UK Rail profile 56E1 (1:20)**



Strabag SF02 W-FS Truck RRV

SITE SURVEYS

- **Rail to be milled**
  - **Mileage**
  - **Type and age of rail, joints, defects**
  - **Width of rail head**
  - **Remaining rail head depth**
  - **Sidewear**
- **Requested profile and tolerance**

Strabag SF02 W-FS Truck RRV

SITE SURVEYS

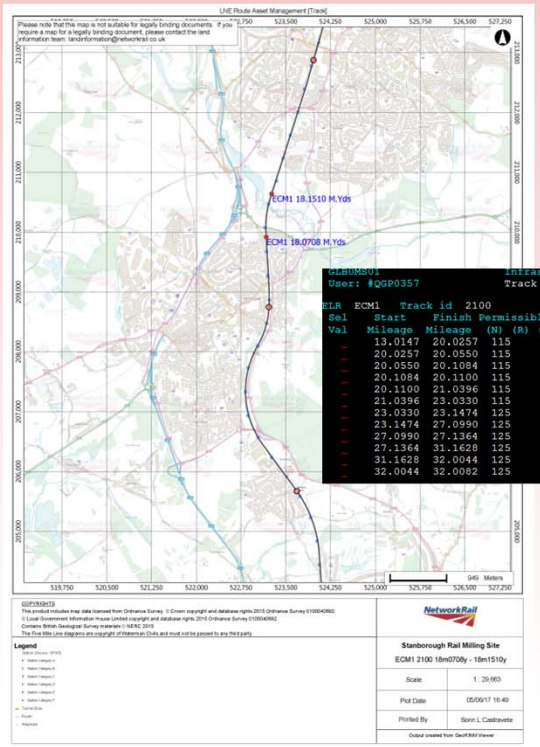
- **Track geometry, e.g. max. track gradient, max. cant, min. curve radius**
- **Track structures, e.g. stations, level crossings, bridges**
- **Track furniture or obstacles infringing the gauge for safe travel, operation or on/off tracking of the machine, e.g. lubrication systems, wheel treadles**

Strabag SF02 W-FS Truck RRV

SITE SURVEYS

- **Planned safety or possession arrangements, e.g. ALO, OLE**
- **Access to and from work site or stabling or parking location for the support vehicles**
- **RRAP for on/off tracking incl. access roads and obstacles**
- **Place for skips for swarf unloading**
- **Planned timeline, time for milling works or daily maintenance**
- **Site specific requirements**

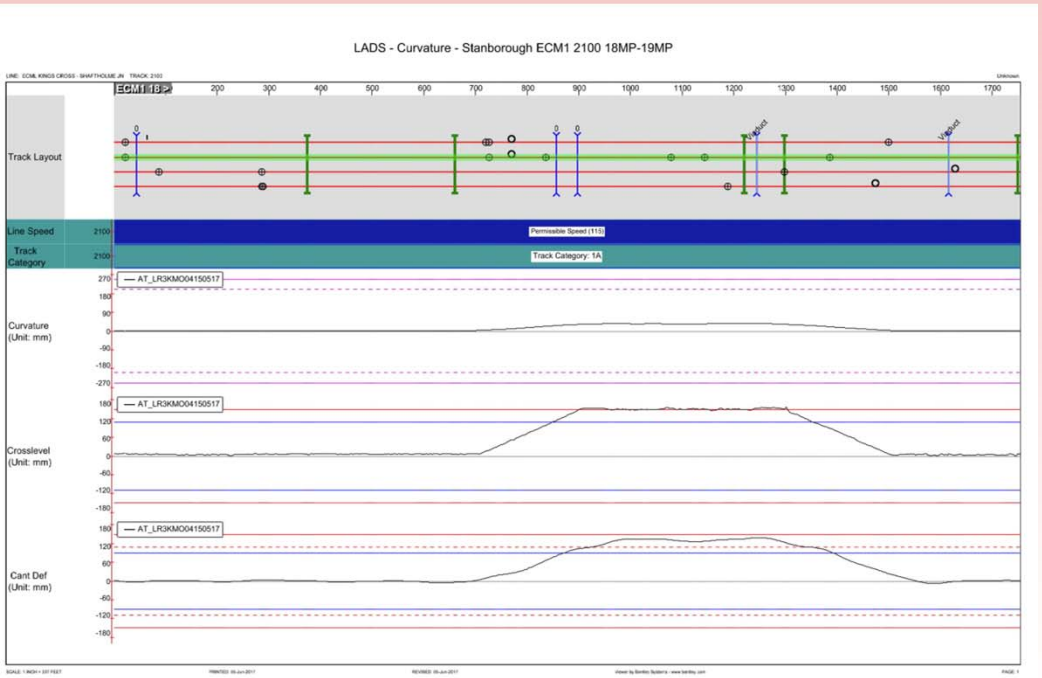
Stanborough Severe RCF Site



GLBUMS01 Infrastructure Systems GEOGIS (CURRENT)
User: #QGP0357 Track Category Browse 05/06/17 16:02:49

ELR ECM1 Track id 2100

Sel Val	Start Mileage	Finish Mileage	Permissible Speeds (N)	(R)	(W)	O/R	An Tons	Max Axle	Old Cat	EMGTPA	Cat
	13.0147	20.0257	115				21.84	21.10	125H30	34.8965	1A
	20.0257	20.0550	115				21.12	21.10	125H30	33.8530	1A
	20.0550	20.1084	115				21.03	25.50	125H30	33.7508	1A
	20.1084	20.1100	115				21.14	25.50	125H30	33.9249	1A
	20.1100	21.0396	115				21.03	25.50	125H30	33.7508	1A
	21.0396	23.0330	115				25.19	25.50	125H30	40.0355	1A
	23.0330	23.1474	125				25.19	25.50	125H30	40.0355	1A
	23.1474	27.0990	125				16.90	21.10	125H30	27.5704	1A
	27.0990	27.1364	125				16.91	21.10	125H30	27.5917	1A
	27.1364	31.1628	125				17.07	21.10	125H30	27.8832	1A
	31.1628	32.0044	125				16.88	21.10	125H30	27.6062	1A
	32.0044	32.0082	125				21.60	25.50	125H30	34.1323	1A



Stanborough Severe RCF Site

SITE DETAILS

- East Coast Main Line Fast Track
- 4 Track Configuration
- Track Category: 1A
- Tonnage: 39.7 EMGTPA
- Max. Static Axle Load: 21.1t
- Line Speed: 115mph
- Cant: 150mm
- Cant Deficiency: 120mm
- D/E: 80%
- RCF Depth: 5mm+
- Minimum Permitted Head Loss: 11mm – Actual Head Loss: 3mm
- Residual Head Loss: 8mm

Stanborough RRV Rail Milling

Stanborough RRV Rail Milling

Stanborough RRV Rail Milling

Stanborough RRV Rail Milling

Stanborough RRV Rail Milling

STANBOROUGH – REPORTING

Daily Work Report

STRABAG Rail GmbH
Business Unit Rail Treatment/Products

Daily Machine Report

STRABAG

Bessemerstraße 42b
12103 Berlin/Germany
Phone: +49 30 670690936
Fax: +49 30 670690969

TA Time Available:
Ordered Meters: 300 m/h

Machine Type: SF02 W-FS Truck
UK Machine No.: 99 70 9919 090-9
Serial No.: 0LH-001

Employer/Client: **Network Rail**
COSS: Rob Patten
Mobile: 07790 012477
Cost Unit: 516 JCCC
Date: **04.12.2016**
Week: **36**

Geographical Area: Hatfield. Stanborough Lakes. LNE
Stabling Point: Welwyn Garden City Up Sidings. Off track
ELR: ECM1
TID: 2100
Start Mileage and chains: 18 Mile 32ch
End Mileage and chains: 18 Mile 68.5ch

Transport from: **Gretna Green**
to: **Welwyn Garden City**
km: **290 Miles**

Operator/Maintainer	Hours
Robert Gall	11,98
Patrick Schmiedt	11,98
Gerd Berger	11,98
Rob Patten	11,98

Time from	Time to	Activity	km from	km to	Performance meter	OT Operating Time hh:mm	Prepare Machine hh:mm	TT Travel Time hh:mm	TD Planned Train Delay hh:mm	CD Client Delay hh:mm	Travel within Train Connection hh:mm	Travel by own Power hh:mm	Shunting hh:mm	Maintenance hh:mm	MD Machine Delay hh:mm	TSD Tips Stone Delay hh:mm	Supplier (STRABAG) Delay hh:mm	Comments:
0:01	2:25	Prepare machine and safety briefings					02:24											
2:25	2:45	On track the machine in the Up Sidings					00:20											
2:45	3:00	Leave the sidings and travel past K184 sig and wait						00:15										
3:00	3:29	Travel down to milling site on the Down Fast						00:29										
3:29	3:39	Prepare the machine					00:10											
3:39	5:20	Milling and Grinding	18 Mile 32ch	18M 68.5ch	734	01:41												1st pass, 0.9mm
5:20	5:45	Travel back to 18 Mile 44ch and prep the machine						00:25										
5:45	6:29	Milling and Grinding	18M 44ch	18M 61ch	342	00:44												2nd pass, 0.9mm
6:29	6:38	Travel back to 18 Mile 44ch and prep the machine						00:09										
6:38	7:19	Milling and Grinding	18M 44ch	18M 61ch	342	00:41												3rd pass, 0.9mm
7:19	7:27	Travel back to 18 Mile 44ch and prep the machine						00:08										
7:27	8:11	Milling and Grinding	18M 44ch	18M 61ch	342	00:44												4th pass, 0.9mm
8:11	8:50	Prep machine and travel up to K184 and wait						00:39										
8:50	12:00	Enter the Up Sidings and sart the machine maintenance						03:10										no/wrong skip, unload into
		Page 1 of 3																STRABAG's big bags
				Pass:	**1760**	03:50	02:54	05:15										metres finished

Pre Shift documentation completed: yes/~~no~~
Operator/plant certification in order: yes/~~no~~
Measurement documentation delivered: yes/~~no~~
Performance achieved: yes/~~no~~
Quality achieved: yes/~~no~~

Tim Kniveton
Employer's Site Representative

Comments:

Rob Patten +447790012477
STRABAG Machine Supervisor

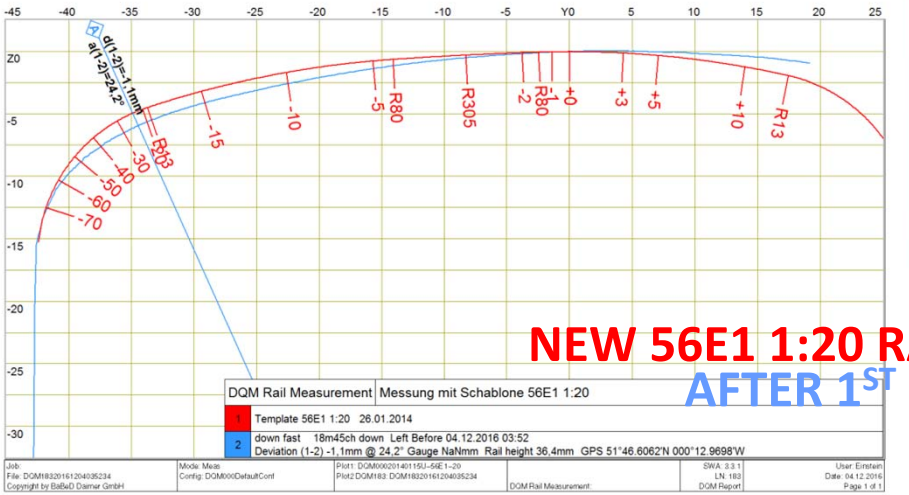
STANBOROUGH – REPORTING

Digital transverse profile measuring instrument (DQM)

STRABAG RAIL GmbH
Bereich Gleisbaumaschinen
Bessemerstraße 42b
D-12103 Berlin

Tel.: 030/ 670 690 984
Fax: 030/ 670 690 985
berlin@strabag-rail.com
www.strabag-rail.com

STRABAG



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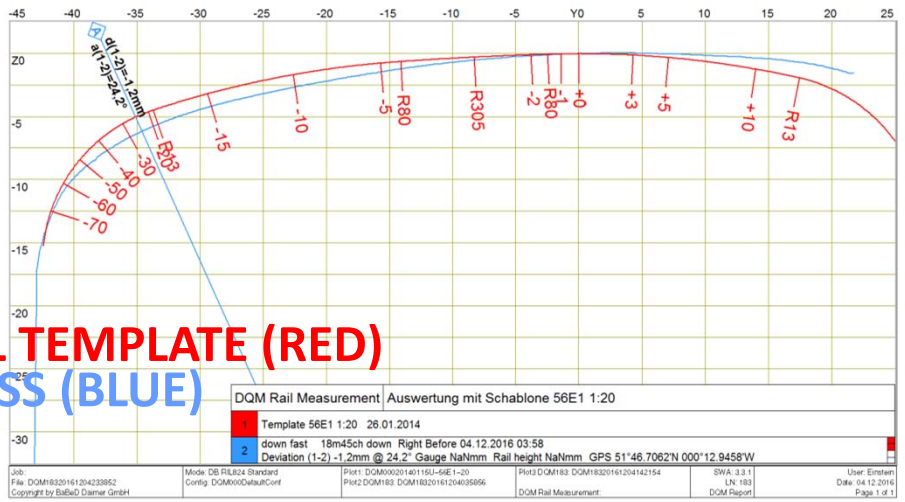
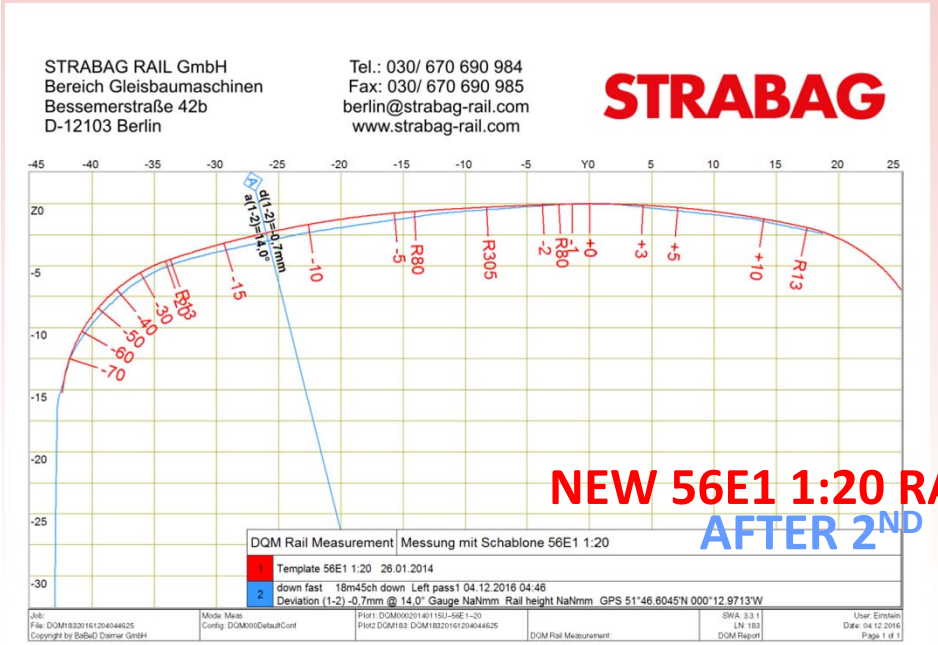
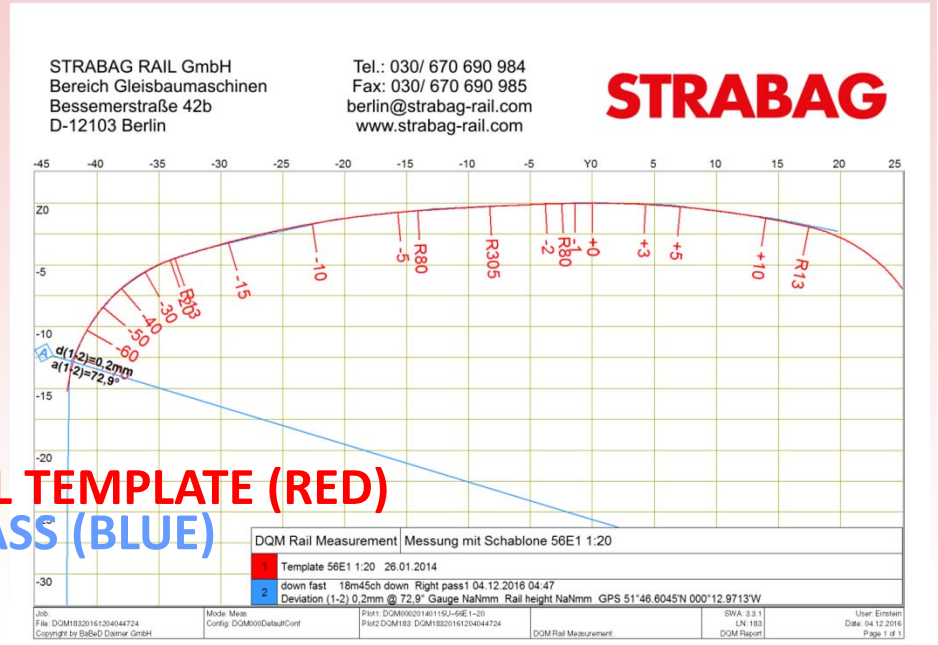


NEW 56E1 1:20 RAIL TEMPLATE (RED)
AFTER 1ST PASS (BLUE)

STANBOROUGH – REPORTING

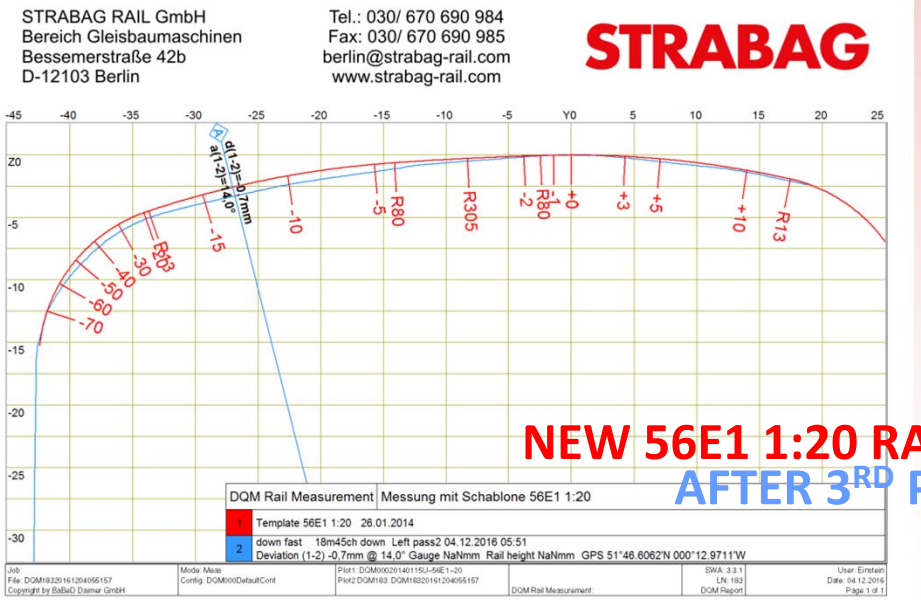


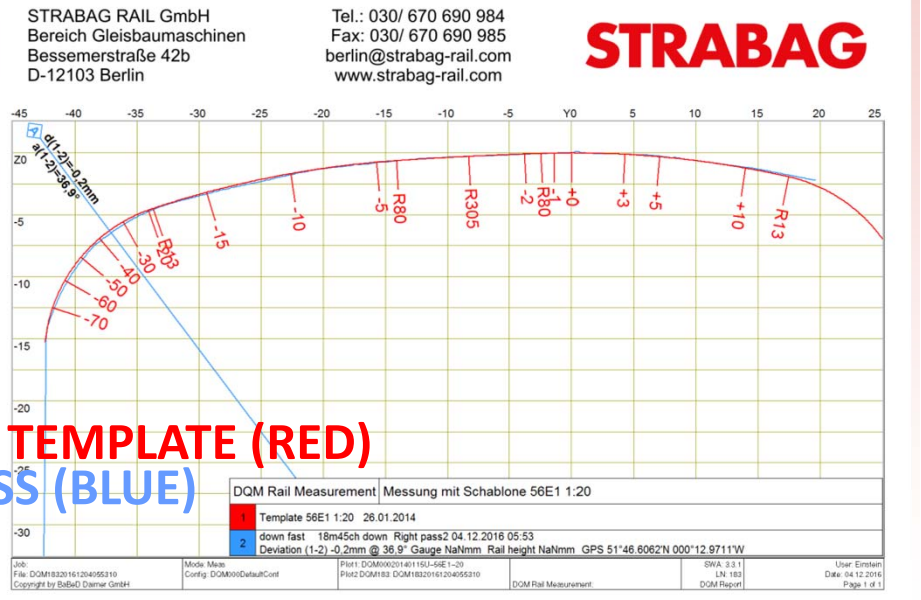


NEW 56E1 1:20 RAIL TEMPLATE (RED)

AFTER 2ND PASS (BLUE)

STANBOROUGH – REPORTING

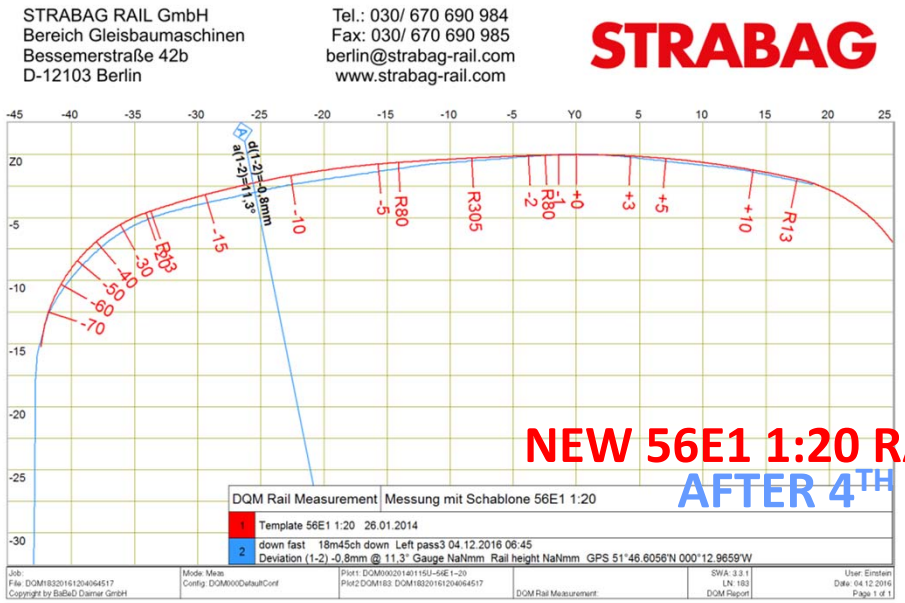


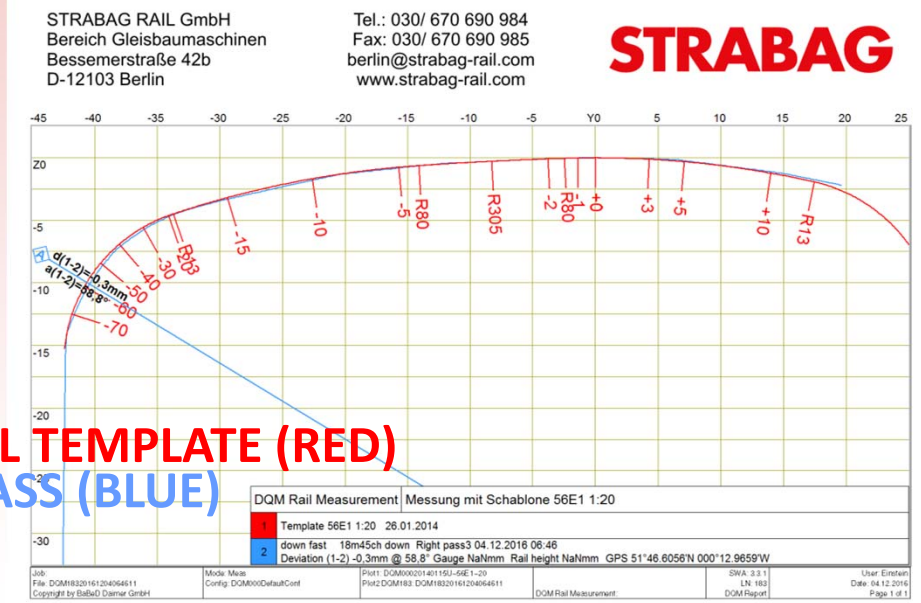


NEW 56E1 1:20 RAIL TEMPLATE (RED)

AFTER 3RD PASS (BLUE)

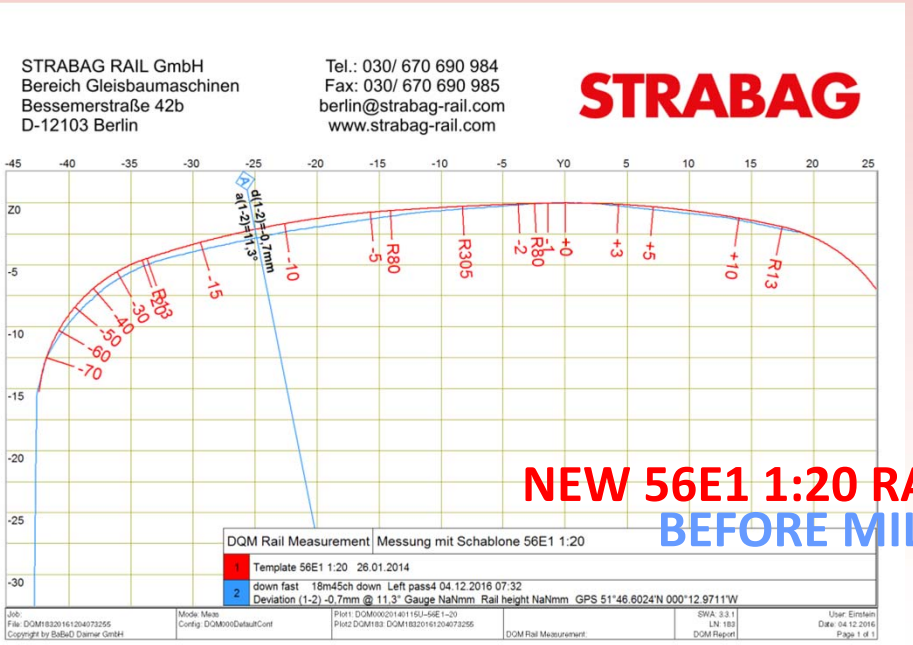
STANBOROUGH – REPORTING

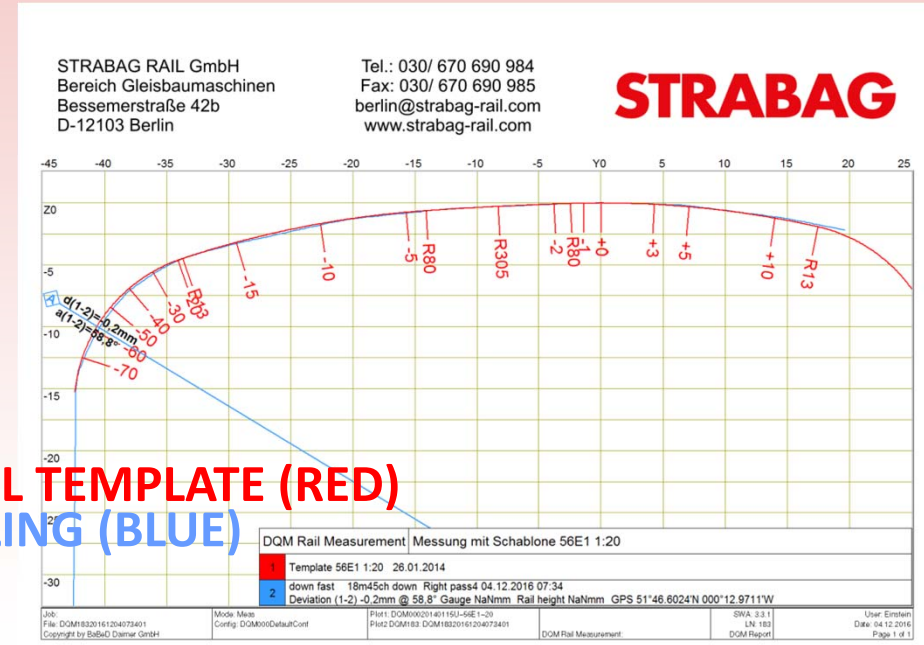




NEW 56E1 1:20 RAIL TEMPLATE (RED)
AFTER 4TH PASS (BLUE)

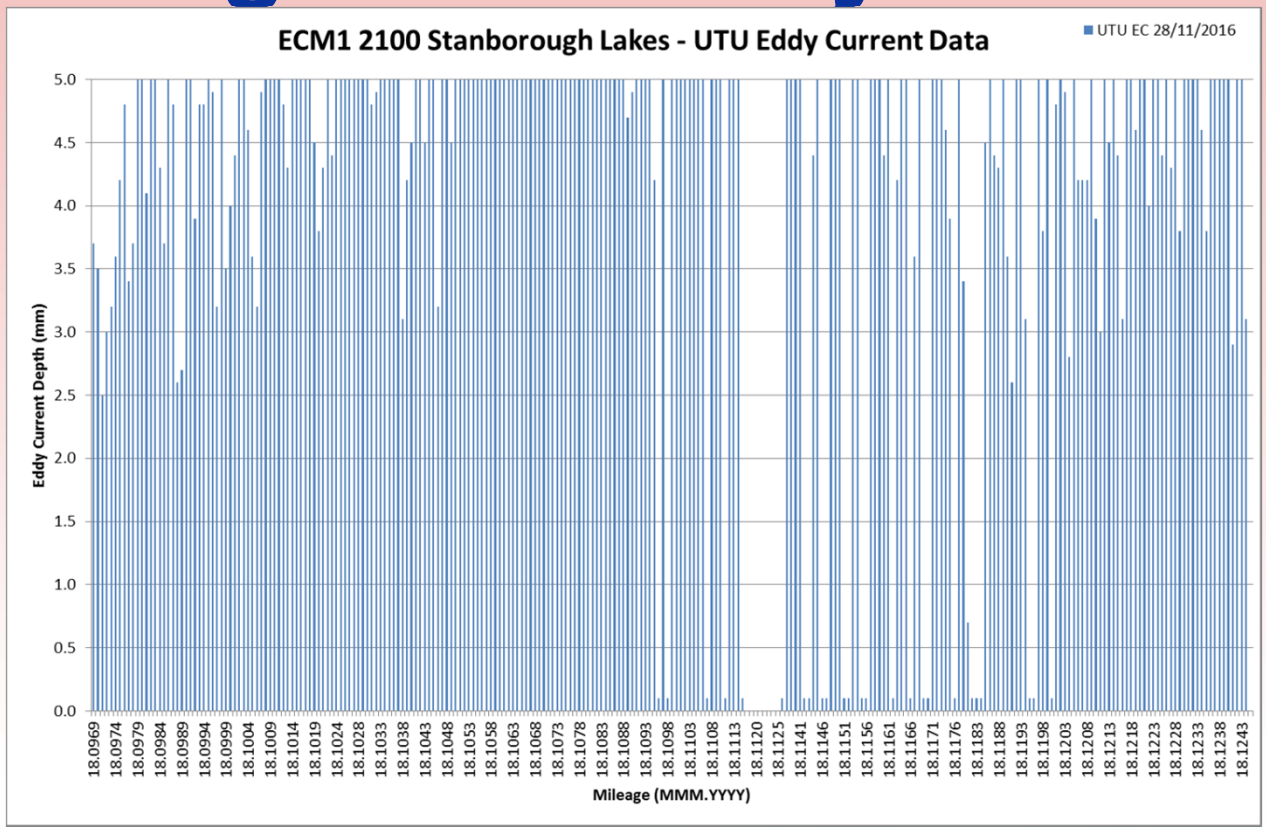
STANBOROUGH – REPORTING



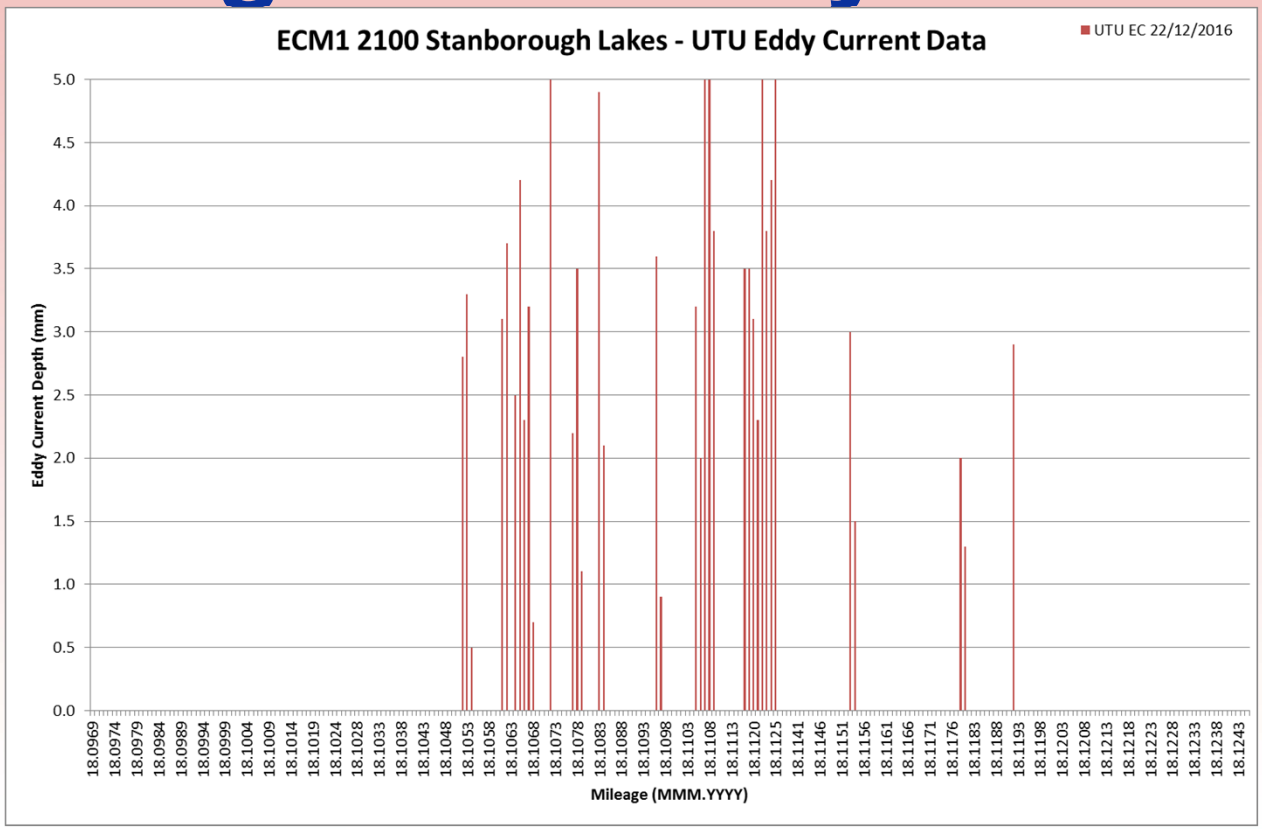


NEW 56E1 1:20 RAIL TEMPLATE (RED)
BEFORE MILLING (BLUE)

Stanborough UTU Eddy Current Data



Stanborough UTU Eddy Current Data



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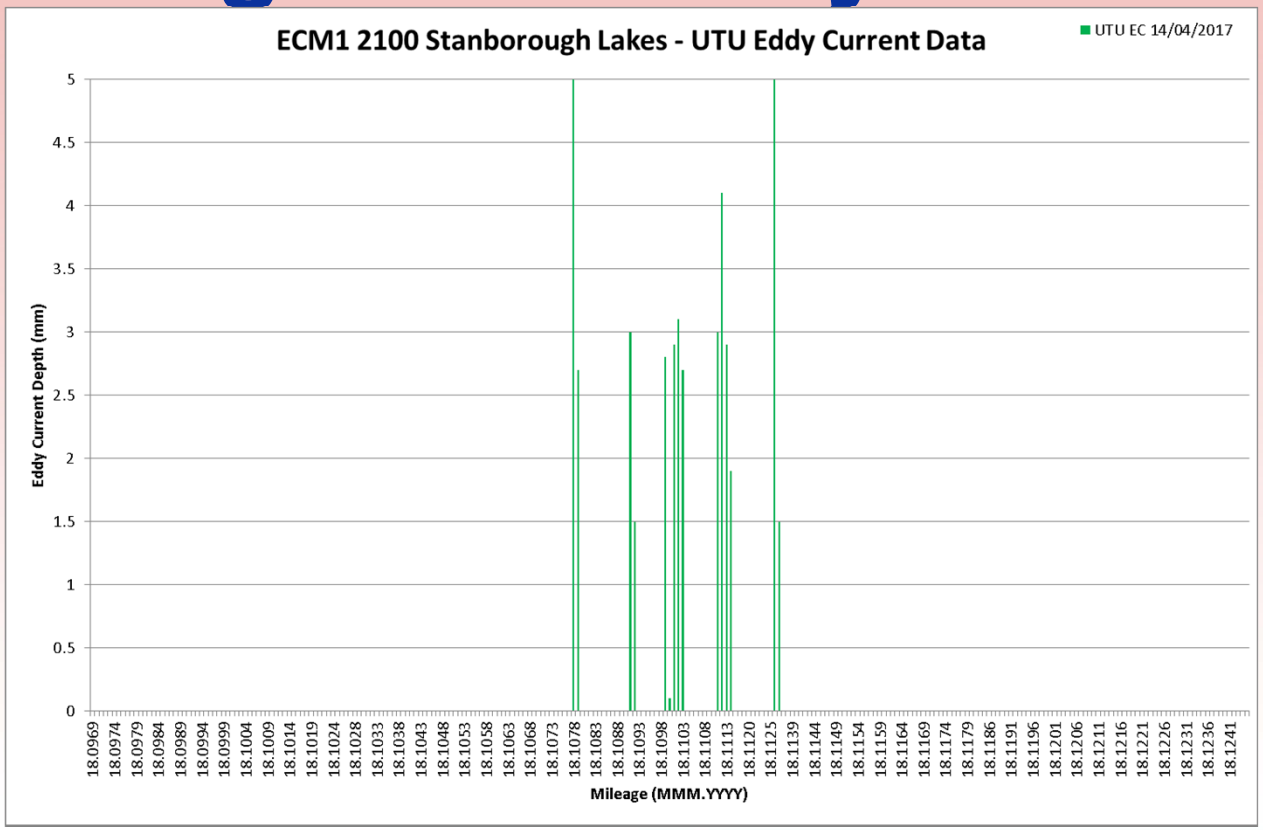


Rail Milling – Future Developments

Rail Milling Trains

- Schweerbau HSM
  - Turnkey Lease Contract
  - Planned start mid 2018

- Linsinger SF06-FFS
  - Purchase Contract
  - Planned start end 2019

Rail Milling – Future Developments

Schweerbau HSM

- **3 car train – 2 milling cars + 1 polishing car**
- **4 milling units, Ø 1.40m**
- **720 cutters per milling head**

- **Productivity 600 m/hr – 2000 m/hr**
- **Up to 5mm of metal within a single pass**

Rail Milling – Future Developments

Schweerbau HSM

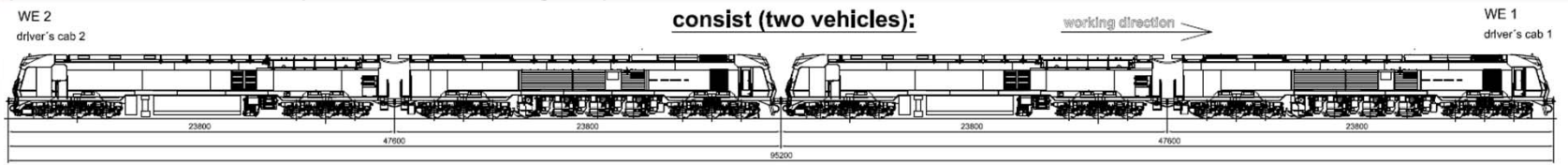
- **Fully automated and computer controlled milling**
- **Free of dust, sparks and interference with the clearance gauge**

- **Each cutter can be used on average 6 times before it needs replacing**
- **Average cutting distance before cutters need to be turned 7000 meters**

Rail Milling – Future Developments

Linsinger SF06-FFS

- **Duplex 4-car Consist – Each machine can be split into 2 independent rail milling machines**
- **8No. Milling units per Consist**
- **Processing Speed up to 20m/min**
- **Individual material removal from 0.3 up to 5mm one working pass with a processing speed of 1 km/hr.**

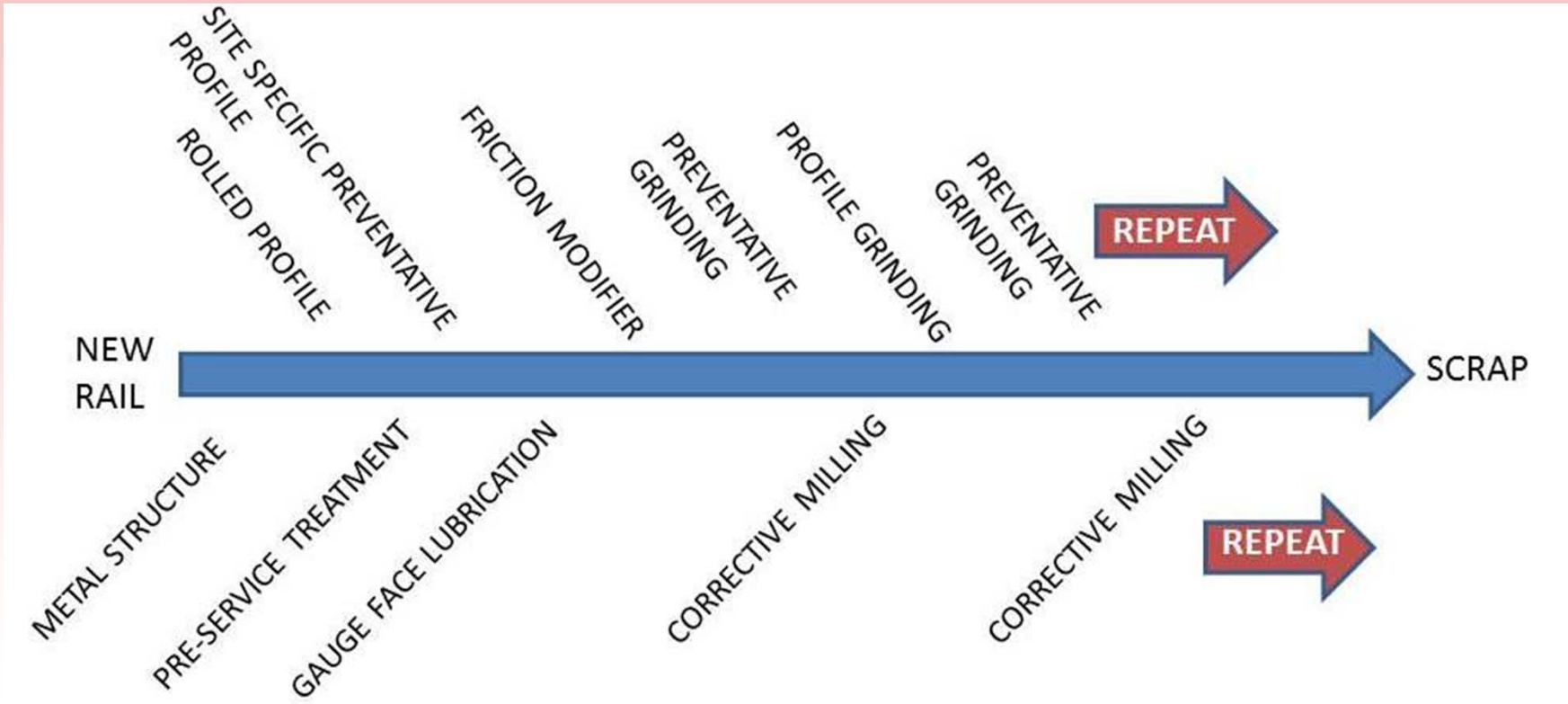


Rail Milling – Future Developments

Linsinger SF06-FFS

- **Switches and Crossings can be machined**
- **Tier 4 Final engine**
- **Sparks and Dust free milling operation**
- **Machine is equipped with transverse and longitudinal measurement equipment, head check detection equipment, rail height measurement equipment**

Rail Management Life Cycle



THANK YOU!

sorin.castravete@networkrail.co.uk