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

Eddy Current Testing (ECT)
- Allows accurate measurement of sub-surface cracks and internal material anomalies

Rail Milling
- Circular milling head with tungsten carbide tipped cutter teeth
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

### Technical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>Strabag GmbH</td>
</tr>
<tr>
<td>Owner</td>
<td>STRABAG Rail GmbH</td>
</tr>
<tr>
<td>Maximum travelling speed</td>
<td>20 mph Level Track</td>
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<tr>
<td>Maximum working speed</td>
<td>2 mph Level Track</td>
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<tr>
<td>Maximum travelling speed through I &amp; K</td>
<td>5 mph Level Track</td>
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<tr>
<td>Maximum travelling speed through raised cabs</td>
<td>5 mph NO</td>
</tr>
<tr>
<td>Maximum working cant</td>
<td>150 mm NO</td>
</tr>
<tr>
<td>Maximum working gradient</td>
<td>0.1:25 NO</td>
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<tr>
<td>Minimum travelling radius</td>
<td>38 m N/A</td>
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<tr>
<td>Minimum working radius</td>
<td>50 m N/A</td>
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<tr>
<td>Maximum tonnage loaded</td>
<td>N/A</td>
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<tr>
<td>Maximum service braked towed lead</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*NOT PERMITTED OUTSIDE A POSSESSION WORKSITE*
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
  - Sideware
- Requested profile and tolerance
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

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

BEFORE TREATMENT
Stanborough RRV Rail Milling

AFTER 1st MILLING PASS
Stanborough RRV Rail Milling

AFTER 2nd MILLING PASS
Stanborough RRV Rail Milling

AFTER 3rd MILLING PASS
Stanborough RRV Rail Milling

AFTER 4th MILLING PASS
# STANBOROUGH – REPORTING

## Daily Work Report

**STRABAG Rail GmbH**  
**Business Unit Rail Treatment/Products**  
**Starnbergstrasse 40h**  
**82199 Aulendorf/Germany**  
**Phone:** +49 8051/1609733  
**Fax:** +49 8051/1609840

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### Daily Machine Report

**Make/Model:**  
**Serial No.:**  
**Hours:**

<table>
<thead>
<tr>
<th>Operator</th>
<th>Net Hours</th>
<th>Operating Hours</th>
<th>Total Training Time</th>
<th>Training Hours</th>
<th>Net Train Time</th>
<th>Total Delay Time</th>
<th>Delay Hours</th>
<th>Total Hours</th>
<th>TBR</th>
<th>Net Hours</th>
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<tbody>
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</tbody>
</table>

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### Performance

- **Performance Notes:**
  - **Net Hours:**
  - **Operating Hours:**
  - **Total Training Time:**
  - **Training Hours:**
  - **Net Training Time:**
  - **Total Delay Time:**
  - **Delay Hours:**
  - **Total Hours:**

---

### Transport

### Supplier

- **Supplier:**
- **Operator/Maintenance Hours:**

---

### Machine Breakdown

- **Breakdown Description:**
  - **Net Hours:**
  - **Operating Hours:**
  - **Total Training Time:**
  - **Training Hours:**
  - **Net Training Time:**
  - **Total Delay Time:**
  - **Delay Hours:**
  - **Total Hours:**

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### Notes

- **Operational Notes:**
  - **Net Hours:**
  - **Operating Hours:**
  - **Total Training Time:**
  - **Training Hours:**
  - **Net Training Time:**
  - **Total Delay Time:**
  - **Delay Hours:**
  - **Total Hours:**

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### Other Information

- **Other Information:**
  - **Net Hours:**
  - **Operating Hours:**
  - **Total Training Time:**
  - **Training Hours:**
  - **Net Training Time:**
  - **Total Delay Time:**
  - **Delay Hours:**
  - **Total Hours:**

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### Signatures

- **Operator:**
- **Maintenance:**
- **Supervisor:**

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### Remarks

- **Remarks:**
  - **Net Hours:**
  - **Operating Hours:**
  - **Total Training Time:**
  - **Training Hours:**
  - **Net Training Time:**
  - **Total Delay Time:**
  - **Delay Hours:**
  - **Total Hours:**
STANBOROUGH – REPORTING

Digital transverse profile measuring instrument (DQM)

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)

HEAVY HAUL SEMINAR • JUNE 7-9, 2017
WRI 2017
STANBOROUGH – REPORTING

NEW 56E1 1:20 RAIL TEMPLATE (RED)
AFTER 4TH PASS (BLUE)
NEW 56E1 1:20 RAIL TEMPLATE (RED)
BEFORE MILLING (BLUE)
Stanborough UTU Eddy Current Data

ECM1 2100 Stanborough Lakes - UTU Eddy Current Data

UTU EC 28/11/2016

Network Rail

HEAVY HAUL SEMINAR • JUNE 7-9, 2017

WRI 2017
Stanborough UTU Eddy Current Data

ECM1 2100 Stanborough Lakes - UTU Eddy Current Data

UTU EC 22/12/2016
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