DURFLEX® - Ballast foaming on the track

Innovative track system for railborne traffic for reducing maintenance and sound emissions through the injection of elastic polyurethane foam

DURFLEX®

funded by the German Federal Ministry of Economics and Technology

low in emissions + durable

Jörg Frenzel
FRENZEL-BAU GmbH & Co KG

Worldwide licensee: Bayer MaterialScience
The aim of the system is to reduce noise

- Generated by a complex variety of causalities and interdependencies within the entire ‘superstructure’ system; this must always remain in focus
  - Currently, main focus is on wheel/rail contact
  - Total roughness is seen as main parameter of acoustic behaviour

But this is the result of a number of areas of action:

- A: wheel – wheel set – vehicle body
- B: rail – sleeper – superstructure body

- Components also contribute to noise directly, even without an effect on roughness

The issue I wish to discuss:

Role of superstructure form, and experiences with the DURFLEX® system
New DURFLEX® superstructure form entails foaming of the ballast in the load transfer area

DURFLEX® consumes oscillation energy through pore-buffer structure (elasticity) with damping effect through covering of the ballast rubble

DURFLEX® also prevents the generation of noise through quiet positioning (stability) of superstructure elements

Reduces rail roughness and additional noises (cracking, striking of sleepers; crunching of ballast etc.)

Causality not yet recorded in full detail, but the measured results provided verify effectiveness

In any case, the following must be noted: compared to the other typical superstructure forms...

- for the ballast superstructure, the behaviour of the loose rubble is set against an elastoplastic composite form unit for the ballast
- for the fixed track, the behaviour of an impact resistant concrete plate is set against the elastoplastic composite form unit
DURFLEX® preserves the ballast structure after dynamic stabilisation passage. Durable prevention of twisting and setting.

DURFLEX® track system

- Protective layer
- Drainage mat (d = 20 mm with double-sided geotextile)
DURFLEX® - The superstructure system

DURFLEX® secures usability of the ballast bed over long time periods with no extra interventions and service interruptions (for plugging, alignment, cleaning etc.)

Setting records
Uelzen section (Hamburg-Hannover) since 06/2007
Daily 140,000 t, 25 t axle through steel transport and v ≤ 200km/h
DURFLEX® - The superstructure system

DURFLEX® ground pressure
DURFLEX® measurements show significant noise reduction

Table comparing total levels [dB(A)]

<table>
<thead>
<tr>
<th></th>
<th>ICE – 200 km/h</th>
<th>IC – 185 km/h</th>
<th>Regional train – 160 km/h</th>
<th>Freight train – 100 km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB measurement</td>
<td>80.6</td>
<td>82.8</td>
<td>79.9</td>
<td>92.5</td>
</tr>
<tr>
<td>B measurement</td>
<td>79.9</td>
<td>83.3</td>
<td>80.5</td>
<td>90.6</td>
</tr>
<tr>
<td>RB measurement</td>
<td>81.0</td>
<td>83.8</td>
<td>80.5</td>
<td>95.6</td>
</tr>
<tr>
<td>Difference RB-AB</td>
<td>0.4</td>
<td>1.0</td>
<td>0.6</td>
<td>3.1</td>
</tr>
<tr>
<td>Difference R – B</td>
<td>1.1</td>
<td>0.5</td>
<td>0.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Taken from measurement report in Dec. 2009
DURFLEX® measurements also show significant oscillation reductions.

Vibration Einfügungsdämmung

**USM:** Günstige Wirkung im Frequenzbereich 8 Hz -35 Hz, sehr wichtig für Erschütterungseinwirkungen auf Menschen.

**Drain:** Physikalisch unvermeidbare geringfügige ungünstige Auswirkung im höheren Frequenzbereich (analog HGT, jedoch hier geringere Auswirkung).
Following these positive experiences with DURFLEX®, further possible applications are being researched and developed for the superstructure in cooperation with www.hyperion-ip.eu.

Foundations for development

- Use of recycling / reusable products
- Combination with modern materials
- Environmental compatibility
- 100% recycling
- Long-term usability – lifespan
- Lowering of LCC / improved economic scheduling
- Reduction of maintenance costs
- Increase in track usability / efficiency
- New materials can protect, form, absorb sound and adhere

LCC • Noise reduction • Maintenance • Use of resources • Environmental compatibility • Efficiency

Optimisation of sleeper / rail / wheel / acceptance interfaces
DURSYS® family in cooperation with Hyperion

**DURCOAT®** for damping rail webs on InnoTrans as shown at the DB AG stand

**DURCOAT®** oscillation-damping coating for sleeper and rail
DURSYS® family in cooperation with Hyperion

DURCOAT®
Oscillation-damping surface coating for wheel, axle and housing

Coating and/or covering for protection from impacts, corrosion, external substances, noise

DURCOAT®
Simple
- to apply
- to recycle
- to form
- to dimension
- accompanying coatings function at all times and in all places
DURSY® family in cooperation with Hyperion

DURSTICK®

Form-locking connection of rail ends achieved through adhesion in place of welding

Anticipated:

- Resistant to load and weather
- Application independent of temperature and humidity
- Reduction of tension problems
- Inclined rail joint increases quietness and reduces wear to rails/wheel
- Increased efficiency through simple process organisation
DURSYS® family in cooperation with Hyperion

DURCRET® bi-block wing sleeper, new sleeper form manufactured from plastic with noise-reducing effect

- Triple-point bearing increases rail rigidity
- Sleeper form increases transverse displacement resistance and reduces noise generation
DURSYS® family in cooperation with Hyperion

DURMINOR®, the low noise barrier as additional passive 'noise control'