

# The way is paved for the future of track construction

## New Durflex® track bed system saves operating costs - and the ear drums

You made your bed, you lie in it. This saying applies not only to people, but also to rail tracks. The fact is that the pollution of the environment adjacent to the railway with airborne and structure-borne noise is increasingly becoming a problem for railway companies, especially in residential areas. Noise barriers can only provide a partial solution to this problem.



Ballast is the traditional and most frequently used component of the track substructure, embedding the sleepers which are made either of wood, concrete or steel. In standard track systems, however, the ballast consists of unbound granular material. That means that the static load acting on the track when a train is passing can be absorbed without problems, but the dynamic load is a major source of noise and vibrations. In addition, the structure of the track bed changes. The ballast stones round off and are displaced over time. Therefore, it is necessary to tamp and level the track

ballast every four to six years, which again causes noise and vibrations.

In an attempt to tackle the problem at its roots and to reduce the operating and life-cycle cost of the railway tracks, the track system Durflex® was engineered. The media showed great interest when Frenzel-Bau, based in Freden, presented its innovative Durflex® system to the public at the beginning of April this year. The event was attended by the Mayor of the city of Bonn, Ms. Bärbel Dieckmann and Mr. Armin Keppel, president of the Federal Railway Authority. The short track section in Beuel served to test and optimise the machines and materials before trialing a pilot section of the new system in Lower Saxony in June.

The name given to the system by the press can be translated as 'whisper ballast'. Durflex® is a track bed system in which the gaps between the ballast stones within the load distribution area are completely filled with the flexible foam Bayflex®. The liquid mixture is injected straight into the gaps between the ballast stones. It then reacts and expands to a multiple of its original volume, forming an elastic

foam which fills the gaps. In addition, the ballast bed is provided with an underlying drainage mat made of rubber serving at the same time as insulation and separation layer.

When trains cross the rails, the ballast-foam system yields to the forces acting on it and returns to its original position after the train has passed. The ballast stones are not displaced but remain in their initial position, rendering tamping obsolete and prolonging the service life of the tracks. Moreover, the new system prevents deformation of the tracks, which again results in a reduction in the number of broken sleepers and rails. Overall, Durflex® notably increases the network availability.

The track system Durflex® is the first consolidated track system that considerably reduces airborne and structure-borne noise, can be built quickly and economically and is low in maintenance. Another advantage of Durflex® is that the system can be implemented both on new and existing tracks.





Durflex® is a joint project between the following companies:

**Frenzel-Bau GmbH & Co. KG**

Concept development and construction engineering

**Bayer MaterialScience AG**

Development of the PU foam material and the foaming technology

**Hennecke GmbH**

Development and construction of the PU machinery in the form of a mobile foaming system

„The project was built on partnership and collaboration, with a focus on the objectives and pioneering technological expertise“, says Jens Winiarz, project manager for moulded foam plants at Hennecke. The real challenge for us was to develop our technology in such a way that it is suitable for the raw material Bayflex® as well as for new and existing track bed systems.“

The development work involved a series of joint preliminary tests at Hennecke's technical lab for polyurethanes in Birlinghoven. Based on the experience acquired in the course of the numerous tests, a TopLine HK 650 high-pressure metering machine was modified to suit the application and subsequently installed in a container of a Deutsche Bahn train.

The machine is fed directly from bulk storage tanks and already heats the raw material during filling of the work tanks. A triple deflection mixhead (MX 18) was selected for mixing the PU components. The triple deflection ensures that the raw materials are optimally mixed before being injected into the ballast bed.



The Wintronic control system was also expanded or adapted specifically for the application. The control system adjusts the formulation for the online batch process. This allows foam-filling of different types of track beds. Moreover, the control system is capable of managing and archiving the foam output per sleeper.

As already mentioned, in Lower Saxony, a 300-meter-long, foam-filled pilot section was integrated into the main line from Hamburg to Hanover in June of this year. This project was subsidised by the Federal Railway Authority, the Federal Ministries for Transport, Construction and Urban Development, and the Federal Ministry of Economics and Technology. These tests have shown that the practical results are even better than those of the laboratory test.

Using the track system Durflex®, direct structure-borne noise can be reduced by up to 30 percent. This means that the level of vibration and the resulting noise near the tracks can be

considerably reduced especially when it comes to heavy freight transport. By integrating Durflex®, the level of noise damping can be improved in nearly the entire railway traffic. In addition, maintenance intervals for track bed systems can be extended, with the result that closures can be minimised and the service life and effectivity of the railways can be substantially increased.

