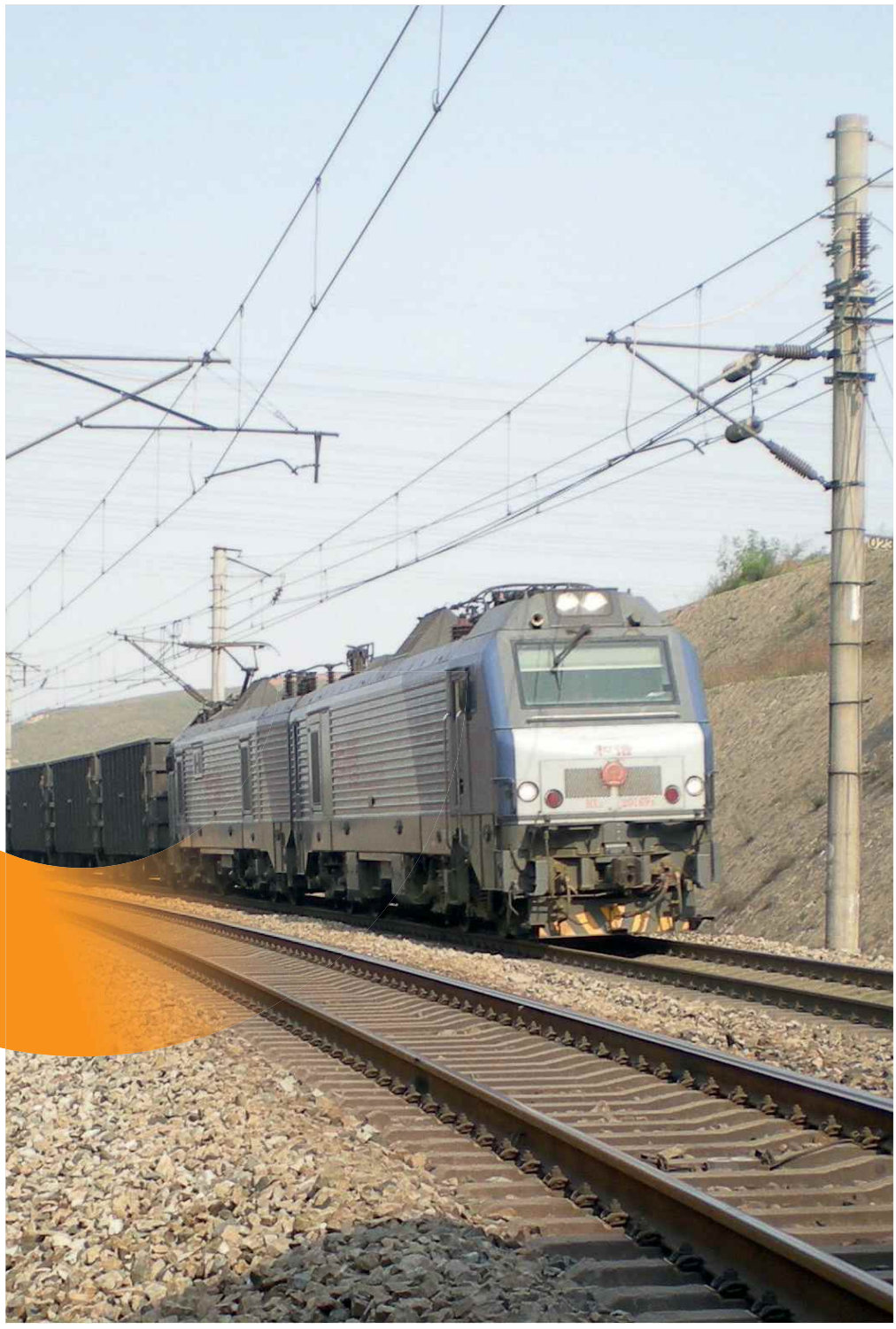
TRACK IMPROVEMENTS ON DAQIN COAL LINE

CASE STUDY
Daqin Coal Line
(CHN)



EFFECTIVE SUPERSTRUCTURE PROTECTION.

getzner

IMPROVEMENT OF TRACK QUALITY AND LOWER DETERIORATION RATES

THE PROJECT

China's heavy haul network is expanding rapidly. The 653 km Datong–Qinhuangdao ("Daqin") line is the main corridor transporting coal from western provinces to Qinhuangdao (Shanxi and Shaanxi provinces and the Inner Mongolian Autonomous Region), China's largest coal-exporting port.

Increasing track availability on heavy haul lines has been a key focus of research and development for many years. One effective approach is the use of elastic polyurethane components in ballasted track systems, which reduce maintenance and increase line availability.

The double-track electrified Daqin line (25 t axle load), opened in 1992, transports up to 450 MGT per year. To withstand these loads, an extra-wide subgrade and 75 kg/m rails ensure optimal load distribution. The technology meets international standards: it was China's first heavy haul railway to use a computerised centralised traffic control system and the first line in the country to use an optical fibre communication system. Based on the breakthroughs implemented in this line, China was able to make substantial progress in heavy haul railway transportation.

Cost drivers on the open track

Heavy haul operators face major challenges: up to 130 trains per day and 1.3 MGT daily tonnage require a highly durable superstructure. Damage to components and increased wear caused by heavy traffic reduce route availability, increase maintenance requirements and drive up operating costs.In particular, ballast degradation is common under high loads, leading to damage of rail clips and sleepers. Since ballast is the weakest element of ballasted track, preserving its integrity protects the entire superstructure.

Reducing loads on ballast

Decreasing the load on the ballast can be achieved by enlarging the sleeper–ballast contact area and improving load distribution along the rail. Introducing defined elasticity into the superstructure helps prevent overloading of individual components. Elastic rail pads under the rail foot significantly enhance load distribution. Under sleeper pads (USPs) amplify this effect and further increase the contact area between sleeper and ballast. Under ballast mats (UBMs) provide an additional way of introducing defined elasticity into the track system and relieve the interface between the ballast bed and hard subgrades.

THE GETZNER SOLUTION

Installation of elasto-plastic USPs

To address superstructure degradation on heavy-haul routes, Getzner initiated trials with elasto-plastic under sleeper pads (USPs) on selected sections of the Chinese Daqin coal line. In 2016, the Taiyuan Railway Bureau installed polyurethane USPs on two test segments. One of these sections, located between km 296+700 and 298+160, covers a total length of 1.46 km and includes a curve, three bridges with a combined length of 375.9 m, and three tunnels totalling 277 m. The frequent changes in subgrade conditions along this track made it an ideal location to evaluate the performance of an elastic superstructure. To match the mechanical and boundary conditions of the site, Getzner's engineering team selected two USP types: the elasto-plastic SLB 2210 G and the slightly more elastic SLB 1510 G. This installation enabled a systematic assessment of elastic components under demanding heavy-haul operations.

No damage or maintenance required

Fourteen months after installation, the line had carried 519 MGT. During this time, the unpadded section required two tamping cycles, while the padded section required none. No defects such as fractured sleepers or rail clips, white spots or hanging sleepers were detected in the padded section, and track quality and geometry remained at a very high level.

Durable and economical track system

With polyurethane USPs of types SLB 2210 G and SLB 1510 G installed on the Daqin coal line, maintenance demand was significantly reduced and track availability increased. To date, the padded track has required no tamping even after more than 1,000 MGT, compared with four tamping cycles on the unpadded track. The use of USPs therefore enables a durable, low-life-cycle-cost track system for China's heavy-haul network.

» ***By conducting comprehensive statistics and analyses of the track geometry maintenance costs were reduced and several positive effects were witnessed since the application of Getzner USPs.***

Damaged ballast, rail clips and sleepers due to inhomogeneously embedded sleepers

BENEFITS

- Improved track availability and fewer track closures
- Lower deterioration rates therefore decrease of maintenance requirements
- Operation of a durable track system with lower life-cycle costs (LCC)
- Positive influence on the lateral track resistance
- Less damage to superstructure components
- Track quality and geometry at a high level

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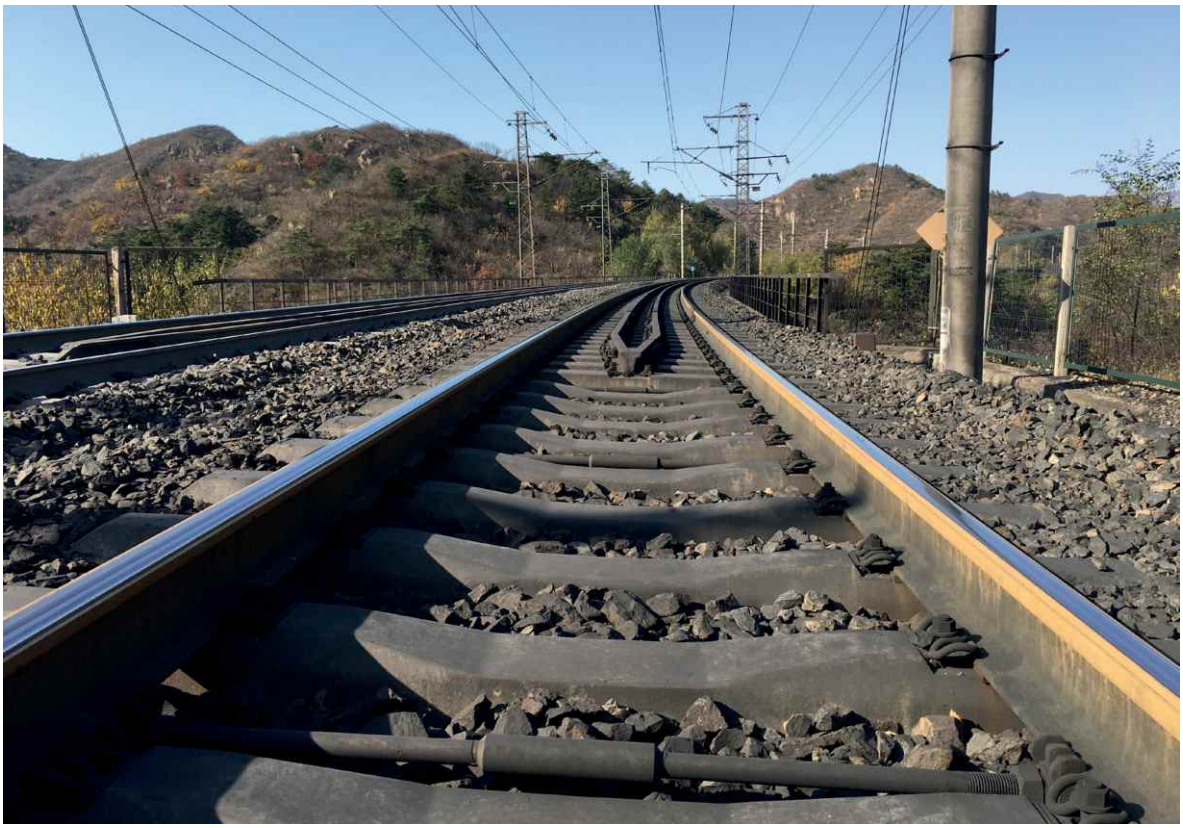

ADVANTAGES

The use of elastic polyurethane under sleeper pads on the Daqin Coal Line significantly improves the durability and performance of the track superstructure under extreme heavy haul conditions. By reducing loads on the ballast and improving load distribution between rail, sleeper and subgrade, wear on critical components is minimised. This leads to a substantial reduction in maintenance activities such as tamping, fewer component failures and consistently high track geometry quality. As a result, track availability increases, unplanned closures are avoided and operators benefit from a robust, low life-cycle cost track system capable of handling axle loads of 25 tonnes and cumulative tonnages exceeding 1,000 MGT.

Operator	Taiyuan Railway Bureau
Track length	1.46 km of under sleeper pads
Solution	Under sleeper pads of type SLB 1510 G and SLB 2210 G (at the transition, 25 m at each side)
Loads	25 metric tons and total tonnage of 1,000 MGT

Additional references can be found on our website:

getzner.com/references

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