

RTRI Develops a Low-Cost Ballast Track Maintenance Method

The Railway Technical Research Institute (RTRI) developed “Ballast Stabilization Method Using Biodegradable Polymer” as a low-cost ballast maintenance measure to prevent aged ballasted tracks from subsiding.

[Main features]

- Biodegradable polymer and accelerator are poured into fine-grained ballast to reinforce the ballast and prevent the track from subsiding and to reduce maintenance cost.
- The repairing material is widely used as a ground stabilizing material. As it does not cement the ballast too hard, ordinary tamping is still effective to maintain the ballast.

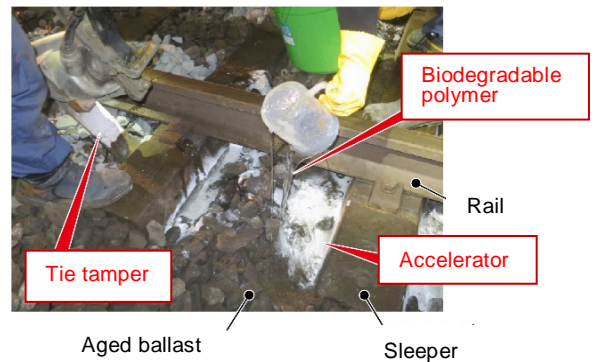


Fig.1 Processing the ballast with biodegradable polymer

[Effects]

This method has already been applied to more than 10 spots of railway tracks for the test purpose. At one rail joint where mud pumping is occurring, the track was subsiding 20mm in three months (Figure 2), but since this method was applied (Figure 3), the ballast has subsided just 10 mm in two years. This data has confirmed that this method has prevented ballast subsidence more effectively than conventional tamping (Figure 4). At this site, tamping had been necessary twice a year. After the method was applied, no tamping has been necessary for two years and it resulted in 30% cost reduction.

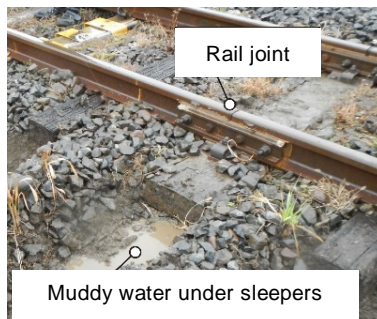


Fig. 2 Before the method is applied

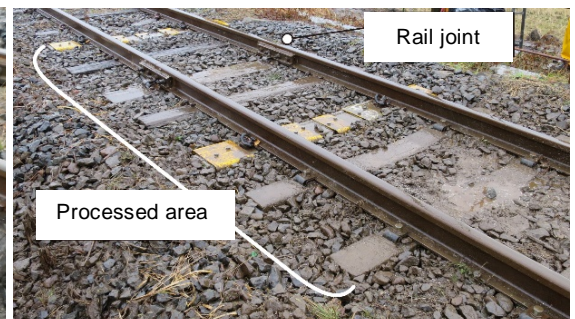


Fig. 3 After the method is applied

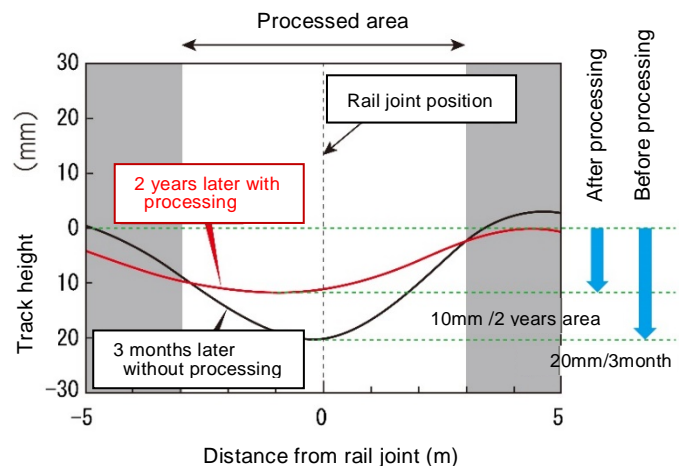


Fig. 4 Effect of the method

[Overview]

In order to fundamentally repair aged, fine-grained ballasted tracks, the ballast needs to be replaced with new one. However, it is difficult to implement such replacement due to its high cost, in particular, on lines with smaller transport amount. Therefore it has been required to develop a low-cost, effective repair method that can be applied to these lines.

With this method, biodegradable polymer and accelerator are poured in ballast that has been finely grained over years and it improves the strength of ballast and mitigates the subsidence of ballasted tracks. Ordinary tie tamping machine is available to apply this method and trains can run on the tracks one hour after the work. The biodegradable polymer (polyvinyl alcohol) and the main ingredient of the accelerator, silicate soda, are commonly used as ground stabilizing materials. Since these materials do not harden the ballast excessively, ordinary maintenance by tamping machines still works after this method applied. As ballast subsidence can be reduced by this method, the tamping interval is extended and as the result, maintenance cost is reduced.

[Work process]

1. The accelerator is tamped in below sleepers by a tie-tamping machine (Figure 5 (a))
2. Biodegradable polymer is poured onto the ballast, then additional ballast is placed, and the sleepers are tamped again (Figure 5 (b))
3. Mixed with fine-grained ballast, the biodegradable polymer gets hardened in a few minutes, the fine grains of the ballast get cemented (stabilized) and stronger, and trains can run on the track within an hour.

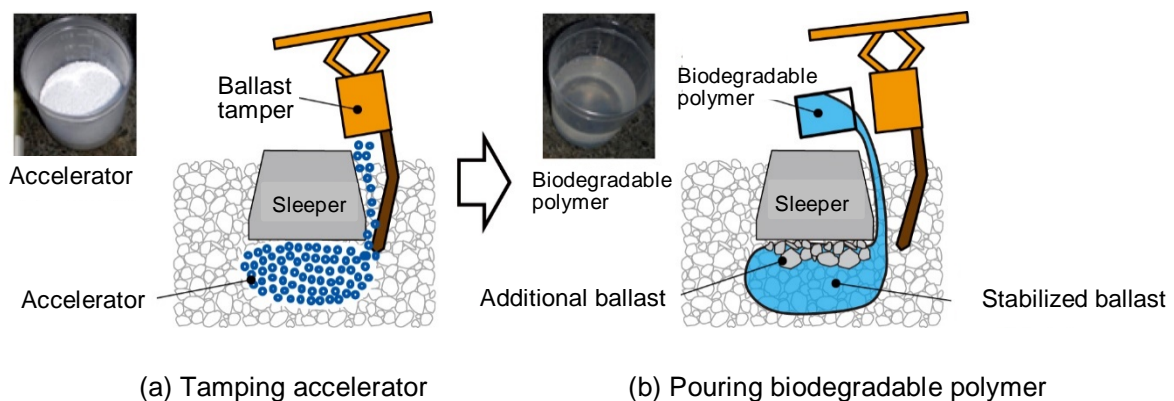


Fig. 5 Work Process of ballast stabilization method using biodegradable polymer

The biodegradable polymer used in this system has been marketed by Kowa Kasei Co., Ltd. since March 2018.