Slag-cement injection is a proven method of railroad subgrade stabilization. Hayward Baker has been performing railroad subgrade stabilization since 1987.

Even advanced electronic, computerized railroads are only as good as their track. Track misalignment can be caused by:
- Increasing traffic, volumes, and speeds
- Unstable fill over soft areas
- Water trapped in ballast pockets
- Cross-tie mud pumping
- Subgrade squeezing
- Deep shear failures
- Poor drainage

Railroads and industries operating railroads may be plagued by these problems which result in poor track geometry. The increased need to re-level tracks using new ballast and tamping can also add to the problems cited above by creating or increasing the size of ballast pockets.

The solution is slag-cement injection, a proven technique for reducing subgrade maintenance.

Safety and performance can be improved without disrupting rail traffic.
Slag-cement injection is cost-effective with numerous advantages over other stabilization techniques, including no loss of track time.

Soils such as clays and silts will lose shear strength as the subgrade deforms under rail traffic which allows for water to be trapped in the ballast. As this process begins to accelerate, ballast is added to re-level the track which makes the situation worse. By pumping grout under pressure into the ballast pockets, the subgrade can be dewatered and the soil can achieve a measure of stability as the grout sets up and reacts with the soil.

Slag-cement slurry injected into the subgrade displaces trapped water and impedes reentry. As cracks, soft spots, voids and ballast pockets are filled, the subgrade structure is strengthened.

The increased strength results in improved subgrade shear strength, reduced need for maintenance and reduction in slow orders. Slag-cement injection is often the most cost-effective and least intrusive stabilization system available. In addition, it offers numerous advantages:

- Strengthens the subgrade by reduction of water and chemical modification of soils
- Reduces ballast pocket water retention
- Controls moisture movement in the subgrade by filling voids and sealing water pathways
- Reduces volumetric changes in expansive clays

The injection process has proven effective in fine grained soils, including expansive clays and water sensitive silts. Preconstruction injection can prevent future subgrade problems as well.

With worldwide resources and experience, Hayward Baker can provide engineered Ground Modification™ of railroad subgrades throughout North America.

Slag-cement injection is quick and will not disrupt normal traffic flows even in sections with very high train counts. Hayward Baker uses specially designed hi-rail mounted injection trucks equipped with couplers and air brakes for moving loaded slurry tanks. Injection units can penetrate 30 ft into the subgrade – deeper than conventional equipment and with greater slurry control.
A Class 1 rail line was plagued by chronic maintenance on its tracks between Des Moines and Sioux City, Iowa. Soft subgrade threatened the tracks at several locations and the railroad was seeking a repair method. Working with the owner’s maintenance engineers, Hayward Baker injected slag-cement slurry into every other crib, 14 to 40 ft deep.

Post-injection performance indicates that the subgrade has been successfully stabilized, and the railroad has minimized its maintenance costs. “The constant attention that had to be directed toward this stretch of track has been eliminated,” stated the railroad’s maintenance operations manager.

A railroad suffered recurring, expensive track misalignment created by roadbed settlement near St. Joseph, MO. Slag-cement slurry was selected as the long-term solution. Electric Cone Penetrometer Testing (CPT) revealed very weak soils to depths of 18 to 20 ft with water-saturated ballast pockets. Hayward Baker’s use of CPT enabled the engineers to accurately locate the distressed zones and deliver the proper amount of slurry to precise locations.

Based on the test findings, an injection program was designed to penetrate 20 ft deep and stabilize every crib. Hayward Baker initiated production within 24 hours after completion of the soil testing.

Unstable subgrades can threaten every railroad. For over 25 years, Hayward Baker has provided solutions to these problems. Numerous miles of track have been stabilized effectively with slag-cement injection. Before and after photos of the track, above, show the successful results of such treatment.

Electric Cone Penetrometer Testing can in some cases be used to indicate the effectiveness of subgrade treatment.
Industrial plants and railroad yards rely on injection stabilization to extend the time between maintenance cycles.

Years of experience have shown that slag-cement injection can consistently and effectively treat subgrade problems and that Hayward Baker can deliver a solution anywhere – efficiently, safely, and effectively.

Hayward Baker also provides the complete range of geotechnical construction services for ground improvement, structural support, earth retention.

Why Should You Choose Hayward Baker’s Subgrade Stabilization?

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Industrial plant railroads and railroad yards are subject to more subgrade problems than mainline carriers. Without in-house track maintenance personnel, maintenance cycles are less frequent in an industrial setting. Various rulings by regulatory agencies have forced industrial plants to be more aware of potential liabilities due to derailments and spills. Because track structure continuity can be altered by as little as one to three percent moisture change in the subgrade, many industries rely on slag-cement injection stabilization to extend the time between maintenance cycles.

One example is a Texas chemical company that maintains several miles of track. The quality track, with solid ties and good ballast, required continuous maintenance due to the underlying soils being near sea level.

Geotechnical consultants recommended Hayward Baker to provide railroad subgrade stabilization using slag cement injection. More than 26,000 track feet were successfully treated thereby reducing maintenance and derailments. After two years of monitoring, there has been zero maintenance in the injected areas despite unusually heavy rainfall.