Use of Geosynthetics in Indian Railways

Geosynthetics are widely accepted and used by the Indian Railways for various applications, like Ground Improvements, Base stabilization for high embankments over soft soil, track bed stabilization, track drainage, steep slope stabilization, erosion control etc. Use of geosynthetics result in significant savings, improved performance on both short term and long-term basis.

The Indian Government has set a capex target of Rs 1.48 trillion for 2018-19 on Development of Railway Infrastructure. Dedicated freight corridors and high-speed corridors are also being planned which will entail heavy axle loads and will require railway tracks with stable track which increases the demand new technology which help to give the best quality of railway tracks with optimize design and increase the speed of construction, the use of good quality of geosynthetic materials for construction of new tracks. Here in this article we will focus on Track bed stabilization using PP Biaxial Geogrid

Problems faced during Railway Track Construction

In Railways, the Train wheel load is always in the same position and each train when passes produce fast cycles of loading and unloading (i.e. Pressure and De-pressure), which causes fast degradation of the railway structure due to deformations. The loading unloading cycle produce pump-up of the fines from the subgrade in to the ballast, which quickly loses its frictional properties: lateral and longitudinal deformations of the tracks then occur and average speed of all the railway line get reduced.

Since mining has got banned in a no. of parts of the country due to environmental issues, it became very difficult to required aggregates & sand both in terms of size and quantity for sub base formation.

Also due to high demand and less supply the prices of these materials are quite higher, giving a major impact over the total cost of project.

The relative movement of ballast particles under high speed axle loading is the main reason for ballast degradation. Therefore, Track maintenance is very important for functionality and safety of the track and railway operations. To reduce ballast degradation and avoid track bed settlement, it is must to maintain required Layer thickness and lateral movement must be restrained.

Solution

To reduce ballast degradation and avoid track bed settlement, Polypropylene Biaxial Geogrid (TechGrid PP) is the perfect solution. The inclusion of PP Biaxial geogrid within a layer of granular material results in strong interaction, mainly through interlocking of particles within the PP biaxial geogrid apertures, which ultimately leads to a significantly enhanced structural capacity, as shown in the Figure 1.

Techgrid PP function as a separator preserves the designated thickness and integrity of granular layers placed over weak soil. Techgrid PP act as a working platform undermining over weak soil by supporting the load of construction equipment, preventing excessive deformation of subgrade and facilitating proper compaction of granular layer/sub ballast. Techgrid PP improves the performance of ballast and sub ballast/blanket layers of railway track bed.

TechgridPP allows faster construction, enhances performance, provides long service life resulting in saving in immediate and life cycle costs as well as increased sustainability

About Techgrid PP

Techfab India Industries Ltd was founded in 2003 with the objective of providing world class geosynthetic products and services to serve the needs of infrastructure development in India.

From a modest beginning with the setting up of a manufacturing facility for woven geotextiles in Silvassa, we have rapidly grown to become the largest manufacturer of geosynthetics in India. Today we manufacture a wide range of products.

We have recently started manufacturing “PP Biaxial Geogrid-Techgrid PP”. TechGrid PP is a family of integrally formed biaxial geogrids manufactured from superior grades of polypropylene using a precisely controlled punching and drawing process.

Techgrid PP is manufactured by Techfab India Industries Ltd in the state-of-the-art manufacturing facility at Daman, Union Territory and Dadra & Nagar Haveli. Stringent controls on raw materials and manufacturing process ensures a high-quality product with consistent geometry, integral junctions, superior mechanical properties and excellent durability as per the requirements of the Standards.
Project - Stabilization of Tracks at Kharagpur Junction for platform 1 & 3

Site Condition – After visiting the site, it was observed that Track bed was in distressed condition, there was water leakage at some locations on the track bed resulting in moist condition. Track bed settlement was also observed at multiple locations.

Solution – After a careful evaluation of the project requirements and site conditions, given solution is that the existing ballast should be removed and redone using PP Biaxial Geogrid and Nonwoven Geotextile. The proposed section is as follows.

Placing a geotextile on the interface of sub-ballast and the sub-base. The geotextile gives a tensioned member effect and will act as a separator to separate the mixing of the large base particles with the sub-base. This will also give effective load distribution. The pumping of fines from subgrade to sub-base is reduced.

Placing a layer of Techgrid PP within sub ballast above geotextile. The ballast layer for example is subjected to repeated dynamic and cyclic loadings, as well as elevated temperature.

Techgrid PP act as a working platform underlying over weak soil by supporting the load of construction equipment, preventing excessive deformation of subgrade and facilitating proper compaction of granular layer / sub-ballast. Techgrid PP improves the performance of ballast and sub ballast / blanket layers of railway track bed.