

Research could boost durability, cut cost of railroad tracks

November 21 2011

Every year, companies that own railroad track across the United States spend millions of dollars maintaining ballast, the crushed rock underneath railroad ties and steel rails. In addition to the high cost, railroads must reroute trains around operations that maintain ballast, delaying the delivery of freight.

Now, research at the University of Kansas may help to extend the useful life of [ballast](#), with the aim of saving time, money and the need to [quarry](#) new rock. Investigators in the School of Engineering are conducting a study on the promise of making ballast more durable using “geogrid,” a type of polypropylene netting typically employed in reinforcement of soil.

“Ballast helps to redistribute the load from the [trains](#),” said Bob Parsons, professor of civil, environmental and architectural engineering at KU. “Ballast is composed of large rock, but over time it gets contaminated from finer particles from rock dust, natural dust and coal dust from coal trains. And you have the soils from underneath coming up. So the fine particles fit between the larger stones of the ballast and contaminate it.”

Parsons said that the dust that infiltrates the ballast — a process called “fouling” — prevents water from properly draining from the ballast.

“If the water is allowed to stand there and soak in, the soils under the railroad are going to get soft and weak — then the ballast sinks down, and the track moves and gets out of alignment,” said Parsons.

To maintain track integrity, railroad companies must remove, clean and replace ballast in a laborious process called “undercutting.”

“Undercutting is a significant maintenance action where a railroad will lift up the track and a chainsaw-like device will saw out the upper layer of ballast.” Parsons said. “That ballast is run thorough a sieve where the fines are taken out, so you have just the larger pieces left, and that’s recycled and put back on the track.”

With nearly 150,000 miles of freight railroad track crisscrossing the U.S., improvements to the resilience of ballast could result in huge cost savings.

The KU researcher and his team have constructed a test segment of railroad track reinforced with triaxial geogrid made by the Tensar Corporation based in Alpharetta, Ga. The mesh material with triangular openings is used to reinforce the ballast and trap the larger rocks in a layer that could prevent fouling by dust and small particles.

“It’s a netting made of triangles. The ballast is placed on top of the geogrid,” said Parsons. “It will help with the rock breaking down and help lock the ballast into place and keep it from moving. By providing a framework, and making it more rigid and fixed and stronger in general, it prevents the ballast from breaking down into smaller particles.”

To test the performance of the geogrid, Parsons, along with colleagues and graduate students, built a test section of railroad under a specialized H-frame on a reinforced concrete base that supports a hydraulic cylinder with a 200,000-pound capacity. The researchers applied weight to the track section using ballast with geogrid and without.

“We built a railroad test section with two feet of sub-grade natural clay soil, and two feet of ballast with the [railroad](#) section sitting on those two feet,” Parson said. “Then we loaded it with a series that started with

around 25,000 pounds for 100 cycles, and then we stepped that load up to about 95,000 pounds. We measured the settlement that caused. Then we soaked it with water, then came back and loaded it again, and that caused a significant amount of additional settlement.”

The researchers measured rock breakage and accumulated dust resulting from the test loads. They are still analyzing the data, but Parsons said at first glance the ballast without the geogrid looked wet and had broken down into smaller pieces, while the ballast with geogrid did not appear to be as fouled by small particles.

“There’s a need for something to improve the performance of the ballast,” he said.

Provided by University of Kansas

Citation: Research could boost durability, cut cost of railroad tracks (2011, November 21)
retrieved 16 July 2024 from <https://phys.org/news/2011-11-boost-durability-railroad-tracks.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.