CASE STUDY

SOLMAX

NH117 NAKHON-NONGTAO, THAILAND

Improving the durability and performance of pavement under heavy traffic conditions

Industry: Transportation
Sub-industry: Roadways
Location: Thailand
Product: **MIRAFI**® H_2Rx

Overview

The Department of Highways, Thailand, entrusted Solmax with a critical research project to enhance the longevity and performance of National Highway No. 117. This highway, a vital artery connecting the provinces of Nakhon Sawan, Phichit, and Phitsanulok, had been facing severe pavement damage despite recent rehabilitation efforts. The primary aim was to evaluate the effectiveness of the **MIRAFI** H_2Rx woven geotextile in managing moisture content within the road pavement structure. This project, conducted over 30 days in collaboration with Mattech Co., Ltd., involved a detailed study and implementation to address persistent pavement issues that traditional methods failed to solve.

Challenge

The National Highway No. 117 was originally constructed in 1976 (northbound lanes) and 1997 (southbound lanes). It underwent substantial rehabilitation from 2015 to 2021. Despite these efforts, the highway continued to suffer from severe pavement issues, including longitudinal cracks, block cracks, alligator cracks, and rutting. The average daily traffic in 2021 was 21,500 vehicles, with heavy trucks accounting for 10 percent. The primary challenge was to mitigate these damages through an innovative approach involving geosynthetic reinforcement.

The installation process began with the removal of the existing asphalt surface and base course using a milling machine to a depth of 400 mm (15.75 in). This was followed by placing and compacting soil-aggregate subbase to the specified elevation. Field instrumentation and **MIRAFI** H_2Rx woven geotextile were then installed for monitoring and stabilization purposes. A 50 mm (1.97 in) layer of loose crushed rock was added for base leveling, followed by the creation of a cement-stabilized base. This mixture was compacted to achieve a thickness of 250 mm (9.84 in) and 95% of modified Proctor density. Finally, a prime coat was applied, and the asphalt surface was laid.

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The project involved a research and development initiative as part of the highway's rehabilitation. A 1 km (0.62 mi) field trial was constructed between Station 14+000 and Station 15+000 (LT), divided into two sections, one with geosynthetic reinforcement and one without, each spanning 500 m (1,640 ft). The sections were equipped with various field instrumentation, including horizontal inclinometers, moisture sensors, suction sensors, rain gauges, and data loggers. These instruments were crucial for monitoring and comparing the performance of the sections under actual traffic loads and climatic conditions in Thailand.

Given the extensive instrumentation required for this project, specialized expertise was indispensable for both installation and data interpretation. To address this challenge, Solmax collaborated with proficient companies to manage the installation and interpretation of the data collected from the site. This collaboration was essential to ensure accurate monitoring and meaningful insights into the performance of the geosynthetic reinforcement under real-world conditions.

Solution

Solmax's role in this project was to provide the **MIRAFI** H_2Rx woven geotextile, which was chosen for its superior reinforcement capabilities, lateral drainage, and separation properties. A total of 2250 m² (24,219.36 ft²) of **MIRAFI** H_2Rx was used in the project. This product was selected because the highway frequently experienced flooding during the rainy season, which routine maintenance efforts, including pavement overlay, could not resolve. The woven geotextile offered additional support to the pavement structure, helping to mitigate moisture-related issues and improve the overall durability of the road.

The **MIRAFI** H_2Rx woven geotextile provided several advantages. Its ability to reinforce the pavement structure, coupled with its drainage and separation properties, made it an ideal choice for this project. The geotextile helped prevent the infiltration of water into the underlying layers, thereby reducing the risk of moisture-induced damage such as longitudinal cracks and rutting. Additionally, the product's performance in terms of preventing longitudinal cracking was notably superior to sections where the geotextile was not installed.

No alternative products or solutions were considered for this project, as the **MIRAFI** H_2Rx was deemed the most suitable based on its specific properties and the challenges faced by the highway. Despite some on-site challenges, including the theft of monitoring and data collection equipment, the results demonstrated that the use of the woven geotextile had a positive impact on the pavement's performance.

One of the key lessons learned from this project was the importance of accurate monitoring and data collection in evaluating the performance of innovative materials like geosynthetics. Although some equipment was stolen, the data obtained highlighted the effectiveness of the **MIRAFI** H_2Rx in preventing longitudinal cracking, a significant improvement over traditional methods.

The successful completion of this project benefited both the client and the communities relying on National Highway No. 117. By enhancing the pavement's durability and reducing maintenance needs, the project contributed to more reliable and safer transportation for the region. The construction was completed ahead of schedule, demonstrating the efficiency and effectiveness of the solutions implemented. Overall, this case study underscores the value of innovative geosynthetic solutions in addressing complex infrastructure challenges.