2022 Mid-Continent Transportation Research Symposium
Ames, Iowa
September 14–15, 2022
intrans.iastate.edu/events/midcon2022/

Use of Waste Quarry Fines as a Binding Material on Unpaved Roads

Jeramy Ashlock, Iowa State University
Sajjad Satvati, Iowa State University
Bora Cetin, Michigan State University
Halil Ceylan, Iowa State University
Cassandra Rutherford, Iowa State University

Abstract

The performance of quarry fines byproducts for stabilizing granular-surfaced roads was investigated using several test sections in two Iowa counties, and a benefit-cost analysis (BCA) was performed to determine the most beneficial quarry fines types. Five quarry fines sources were selected and used to construct three test sections in Jones County and four test sections in Boone County. The associated costs of materials, hauling, and equipment for both construction and maintenance were analyzed over the project duration. To evaluate the performance of the test sections, extensive laboratory and field tests were performed before and after construction, as well as after the 2019-2020 freeze-thaw season. A benefit-cost analysis (BCA) was performed using the documented construction and maintenance costs for service life scenarios of 20, 30, 40 and 50 years. The benefit-cost ratio (BCR) was evaluated for all test sections based on various performance measures including change in gravel content, average fines content, total breakage of the gravel and sand fractions, gravel-to-sand ratio, stiffness, shear strength, surface roughness, and dust emissions. The results showed that stabilization using the quarry fines improved performance by increasing binding between surface aggregates, reducing dust emissions and gravel loss, and increasing the stiffness and strength of the granular surface layers. The Limestone and Moscow Mine sections in Jones County, and Moscow and Ames Mine sections in Boone County had the best performance and cost-effectiveness among all stabilized sections.