

RMRC



Recycled Materials Resource Center



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Research Project 86

Assessing the Life Cycle Benefits of Recycled Material in Road Construction

Project Objectives

- Determine the environmental and economic benefits of using recycled material in the reconstruction of two separate roadways using BE²ST-in-Highways and PaLATE.
- Demonstrate the viability of life cycle analyses in evaluating the advantages of sustainable road construction.

Project Summary

This case study was undertaken to investigate the environmental and economic benefits of using recycled materials in roadway construction.

Life cycle assessments (LCAs) and Life Cycle Cost Analyses (LCCAs) of two separate reconstruction projects in Wisconsin were undertaken to measure both economic and environmental savings. Recycled materials used in both projects were fly ash, bottom ash, foundry sand, recycled concrete aggregate (RCA), and recycled asphalt pavement (RAP).

The first project was located on the north-south corridor of Interstate-94 in Kenosha County and analysed using BE²ST-in-Highways. Criteria analysed were Energy Use (TJ), GWP (Mg), Water Consumption (kg), SCC (\$), Hazardous Waste (kg), In Situ Recycling (m³) and Total Recycling (m³)

The second was on the Beltline Highway from Whitney Way to Seminole Highway in Dane County, and was analysed with the Pavement Life Cycle Assessment Tool for Environmental and Economic Effects (PaLATE). Criteria analysed were Energy (TJ), Water Consumption (g), CO₂ (kg), NO_x (g), PM₁₀ (g), SO₂ (g), CO (g), Hg (g), Pb (g), RCRA Hazardous Waste (g), cancerous human toxicity potential (HTP) (kg) and non-cancerous HTP (Mg).

Percent improvements were calculated for each criterion by comparing the environmental impacts of the roadway using recycled materials with a reference roadway that used entirely virgin materials.

Project Partners

CH2M-Hill, We Energies, Wisconsin Concrete Pavement Association, Engineering News-Record, Hoffman Construction Inc., Wisconsin Department of Transportation

End Results

Both case studies demonstrated the environmental and economic benefits of using recycled materials. In both cases energy and water consumption, CO₂ emissions and hazardous waste generation were reduced. Greater reductions were seen in the I-94 project (25-39%) than the Beltline (9-13%). This is because the ratio of recycled to virgin materials were different.

Further Information

The Recycled Materials Resource Center (RMRC) is a national center that promotes the appropriate use of recycled materials in the highway environment. It focuses on the long-term performance and environmental implications of using recycled materials