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Project Summary

Technology Transfer Outreach Publication

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Sponsor
University Transportation Center for Materials in Sustainable Transportation Infrastructure (UTC-MiSTI)

Project Title
The Strategy to Select the Combination of Innovative Sustainable Materials for Asphalt Mixtures

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Selecting the Combination of Innovative Sustainable Materials for Asphalt Mixtures

There are a number of innovations in asphalt pavement design and construction that can positively affect the sustainability of those pavements. These innovations include the use of recycled aggregates, reclaimed asphalt pavement (RAP), waste shingles, warm mix asphalt (WMA) and bio-asphalt generated from biomass. The purpose of this project is to integrate the various recycled material innovations used in designing more sustainable asphalt pavements. Engineers normally select one of these materials for asphalt pavement design and construction. A challenge to implementing these new technologies is the lack of a systematic approach to evaluating combinations of these materials.

Research Objective

The objective of this research is to provide a systematic approach to selecting the right combination of these components in designing an asphalt mixture. The individual materials to be considered include WMA and RAP. The research project will utilize data from existing research projects to develop a systematic approach to selecting the optimum combination of materials with performance and life cycle in mind. The deliverable will be a guideline for a life cycle assessment (LCA)-based selection approach for multiple streams of materials.

Methodology

This research will evaluate the rutting performance and moisture susceptibility of WMA and RAP mixtures using AASHTO T 283: Resistance of Compacted Bituminous Mixture to Moisture-Induced Damage, and AASHTO TP 63: Determining Rutting Susceptibility of Asphalt Paving Mixtures Using the Asphalt Pavement Analyzer. The research team will then conduct a hybrid life cycle assessment by reviewing the entire industrial process associated with producing RAP and WMA using analysis tools such as SimaPro and EIO-LCA.

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University Facts (2009-2010)

Total Enrollment	7148
Civil Engineering	546
Graduate Enrollment	1206
Number of Faculty	464
Placement Rate	87.5%

Michigan Tech ranks in the top 25% of public research institutions by the National Science Foundation and has annual research expenditures exceeding $57 million. More than 56% of Michigan Tech's student population is enrolled in science and engineering degree fields with a campus-wide graduation placement rate of 87%.

Michigan Tech houses a wide complement of transportation-related programs partnering in research, technology transfer, education, and workforce development. Under the umbrella of the Michigan Tech Transportation Institute, federally funded centers collaborate with state and internally funded centers and programs. Federally funded programs include the UTC-MiSTI, Michigan's Local Technical Assistance Program, and the Region 2 Tribal Technical Assistance Program. State funded research centers and laboratories include the Michigan Department of Transportation funded Transportation Materials Research Center and the Center for Structural Durability. Internal programs include the Center for Technology and Training, and the Rail Transportation Program.

For more information, visit the University's website. *www.mtu.edu*

Anticipated Research Findings

This research will produce characterization and performance data of WMA and RAP mixtures that will be used in parallel with life cycle assessment data to provide a systematic approach for identifying the best combination of sustainable materials. The deliverable will be a guideline of LCA-based selection for multiple streams for asphalt mixtures.

Anticipated Implementation

Laboratory based testing results will be used to complete the hybrid LCA and will lead toward a larger scale research project involving state and regional transportation authorities. WMA and RAP maintenance schedules will be determined from the rutting and moisture susceptibility results. Various combinations of recycled materials such as RAP and WMA materials in asphalt pavements will be determined from the hybrid LCA developed for this project. Pavement designs which are optimal in cost, performance, and environmental impact will be identified.

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