

JOINT TRANSPORTATION RESEARCH PROGRAM

Principal Investigators: Sogand Hasanzadeh, Purdue University, sogandm@purdue.edu, 765.496.5210

Mirian Velay-Lizancos, Purdue University, mvelayli@purdue.edu 765.494.2209

Program Office: jtrp@purdue.edu, 765.494.6508, www.purdue.edu/jtrp

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Synthesis Study of Best Practices for Cleaning Tools and Paving Equipment: Asphalt Release Agents (ARAs) and Asphalt Cleaners (ACs)

Introduction

Hot mix asphalt (HMA) is one of the most commonly used materials in the transportation construction industry. During paving works, HMA can stick tightly to instruments and tools. For many years, diesel was widely used as an asphalt cleaning agent to solve this issue; however, diesel also reduced the strength and quality of HMA by destroying the bond between asphalt particles. Furthermore, diesel leakage can cause lung cancer or other respiratory diseases, fire hazards, and contamination to soil and groundwater near job sites. These are the main reasons why the Resource Conservation and Recovery Acts of 1976 banned the use of diesel. There



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Romanov, A. (n.d.). *Asphalt laying by workers* [Photograph]. Shutterstock. <https://www.shutterstock.com/image-photo/asphalt-laying-by-workers-1041610201>

is also a risk of having diesel residue in truck beds and paving equipment used to produce the next batch of HMA. This potential contamination may reduce the quality and durability of the HMA. Therefore, alternatives to diesel that address safety, health, and environmental concerns, while also offering the same level of effectiveness, should be investigated.

Asphalt release agents (ARAs) and asphalt cleaners (ACs) are excellent diesel substitutes. ARAs are non-hazardous, environmentally friendly products that build a barrier between asphalt and truck beds/equipment that prevents adhesion and minimizes cleaning. In the event that paving tools and equipment are already coated in HMA, ACs can clean and safely dissolve tough asphalt spills and deposits. This study aims to evaluate commercially available ARAs and ACs quantitatively and qualitatively to provide DOTs and asphalt paving contractors with the tools and information needed to shift towards a more sustainable and environmentally friendly products.

Findings

The study findings are listed as follows.

- We developed a comprehensive scoring system to qualitatively and quantitatively evaluate the ARA products published by NTPEP in terms of their functionality, environmental impact, cost-effectiveness, and safety.
- Given that NTPEP only evaluates the ARA products but does not recommend them, state DOTs should establish specifications for selecting the

most appropriate products to be used in their states.

- We developed a comprehensive scoring system that considered environmental, economic, and safety criteria to quantitatively evaluate the AC products that were listed by various state DOTs or proposed by known manufacturers (no official organization conducts tests for evaluating the functionality of ACs). A survey was developed to obtain further information from DOTs regarding their product selection process and their feedback on ARA and AC products. According to the responses, DOTs and contractors prioritized the functionality of the products over other criteria in their selection process.
- DOTs indicated the challenges they face when urging subcontractors to utilize ARAs and ACs as alternatives for diesel, because diesel is characterized by its functionality and lower price.
- We developed an interactive decision support dashboard to help INDOT make more informed decisions when selecting ARAs and ACs.

Implementation

Data Collection: To obtain the necessary information to perform the study, the research team accessed three sources: the NTPEP database, DOT-published ARA/AC lists, and data released by product manufacturers. AASHTO's National Transportation Product Evaluation Program (NTPEP) tests ARA products and publishes the results to help the asphalt industry decide which product is most suitable for their application, thus the NTPEP database was the primary source for relevant information on test data, biodegradability, and flash points. U.S DOTs published ARA lists to filter identified products. Lastly, the financial information, like the cost

per gallon, was directly obtained from the manufacturer. Since there is no official list of tested AC products available, DOT-published lists were used as a primary source, and AC manufacturers were contacted to obtain all required data.

Data Processing: After obtaining all data, an evaluation system was designed to assess each identified product. Four criteria were selected for ARA evaluation—cost-effectiveness, functionality, environmental, and safety—and three criteria were selected for AC evaluation—economical, environmental, and safety. A scoring system was then designed for each criterion mentioned, which resulted in a comprehensive ARA and AC database. The database and associated weights for each product were then reassessed based on information obtained from DOT personnel and contractors that have used the products. The final results were then used to develop into an interactive decision-making dashboard to help INDOT make more informed decisions regarding alternatives for diesel and to conduct follow-up field testing.

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