

**RESEARCH PROBLEM STATEMENT**

<b>DATE:</b> 9/6/2019	<b>PROJECT AREA:</b> Pavements
<b>TITLE:</b> Use of Rejuvenator for Enhancing Properties of Asphalt with High RAP	
<b>PROBLEM STATEMENT:</b>	
<p>The use of a high content of recycled asphalt pavement (RAP) in hot mix asphalt (HMA) has increased in recent years due to the increasing costs and demands for crude oils and aggregates. However, the use of high RAP in new mixes is expected to have some performance issues such as low resistance due to fatigue and low-temperature cracking. This is mainly due to the oxidative aging of RAP binders. To avoid this problem, mixes with high RAP contents usually require the use of a softer binder (e.g., PG 58-22) or softening agents such as rejuvenators. The use of a softer binder puts the contractor in a non-compliance situation as it is not often an approved PG binder of the agency. For instance, ArDOT allows only three binders (PG 64-22, PG 70-22, and PG 76-22) on its highways. Furthermore, PG 58-22 binder is more expensive than the base binder (PG 64-22). The second solution of using a softening agent (e.g., waste cooking oil (OCO), or Engine Bottom Oil (EBO)) appears to be a good alternative to enhance the performance of high RAP mixes as it will allow contractors to use ArDOT approved binders without increasing the cost of materials significantly.</p>	
<b>OBJECTIVES:</b>	
<p>The primary objective of this proposed research project is to assess the effectiveness of softening agents (commercial rejuvenators and industry wastes) in highly aged binders. Specific objectives of this study are: (1) Quantify the level of aging of RAP when a softening agent is needed; (ii) Determine the optimum amounts of different types of softening agent; (iii) Evaluate the effects of softening agents on binders' performance grade (PG); and (iv) Observe the changes in morphological phases and interactions of virgin and aged binders at molecular level.</p>	
<b>FORM OF RESEARCH IMPLEMENTATION AND RETURN ON INVESTMENT:</b>	
<p>Potential implementations of this project are recommendations for changes in ArDOT's Standard Specifications' SECTION 416.03, which states, "...An approved softening agent may be required in conjunction with a new asphalt. The softening agent with accompanying specifications shall be submitted and approved prior to use..." The main benefit of this project is to facilitate the use of high RAP or excessively aged RAP by utilizing the beneficial effects of softening agents. Also, the use of WCO and EBO will reduce the waste and is expected to reduce construction cost. Transportation agencies are expected to save a significant amount of taxpayers' money by using high RAP and industrial waste.</p>	
<b>Estimated Project Duration:</b> 24 Months	
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Standing Subcommittee  
Ranking

Advisory Council  
Ranking

Statement Combined with  
Statement Number(s)