

Bi-Monthly Progress Report:

Project Number and Title: 2.1 Asphalt Mixtures with Crumb Rubber Modifier (CRM) for Longevity and Environment

Research Area: NEW MATERIALS FOR LONGEVITY AND CONSTRUCTABILITY

PI: K. Wayne Lee, University of Rhode Island (URI), Civil and Environmental Engineering

Co-PI(s): George Veyera, Professor of Civil and Environmental Engineering, URI

Reporting Period: April-May 2019

Date: 5/31/2019

Overview:

Provide overview and summary of activities performed during previous two months....

A URI team had performed a research on the feasibility of using CRM in 1996. They found out that adding CRM into the paving asphalt mixtures shows same or better performance on rutting and fatigue cracking resistance than conventional asphalt mixtures. To confirm the benefits of CRM and to set up experimental design, a series of literatures was conducted. Researches conducted by other groups also reported that the addition of CRM to asphalt binders improved some of binder's properties such as reducing the inherent temperature susceptibility of the binder.

Provide context as to how these activities are helping achieve the overarching goal of the project...

The project goal is to develop asphalt mixtures with CRM that provides durable and sustainable pavements compared with the traditional pavement with hot mix asphalt (HMA). Thus, URI team started investigating new generation of asphalt mixtures with CRM for longevity of the pavement. Figure 1 shows the flowchart of the research of WMA containing CRM and Reclaimed Asphalt Pavement (RAP) to improve durability and to extend the life of transportation infrastructure.

Describe any accomplishments achieved under the project goals...

Adding CRM into asphalt binder increases the viscosity and as a result, the compaction temperature of asphalt rubber mixture should be higher. However, it was learned that warm mixed technology (WMA) guarantees to lower the viscosity and lowers the compaction and mixing temperature. Thus, a preliminary study with a WMA additive, i.e., Evotherm was conducted. Evotherm is approved by NEAUPG and is a promising additive. It was found that using the Evotherm improves the short-term and long-term performance compared with the traditional asphalt binder.

Describe any opportunities for training/professional development that have been provided...

The graduate students working on the project is a MS student in Civil and Environmental Engineering. She is receiving training that will help her doctoral program as well as our 2nd and 3rd year research projects.

Describe any activities involving the dissemination of research results (be sure to include workshops, seminars, and conferences attended/held for dissemination of information regarding this project) ...

Neha Schrestha made a presentation at CVE601 Graduate Seminar course on May 1, 2019.

Neha Sherestha, George Veyera and K. Wayne Lee submitted one page extended abstract, entitled "Investigation on Rheological Properties of Warm Mix Asphalt" at the US-Korea Conference (UKC) 2019 which will be held in Chicago, on August 15-17, 2019.

Participants and Collaborators:

What organizations have been involved as partners on this project?

University of Rhode Island, Dept of Civil and Environmental Engineering.

Have other collaborators or contacts been involved? If so, who and how?

Name of Technical Champion: Paul C. Petsching, P.E.
Title: Senior Civil Engineer
Organization: Rhode Island Department of Transportation
Phone number: 401-222-2694 ext. 4218
Email: paul.petsching@dot.ri.gov

What students have participated in the project? (Include class standing, major, role in the research)

Neha Sherestha, CVE MS student, Literature review and conducting a pilot study on WMA mixtures.

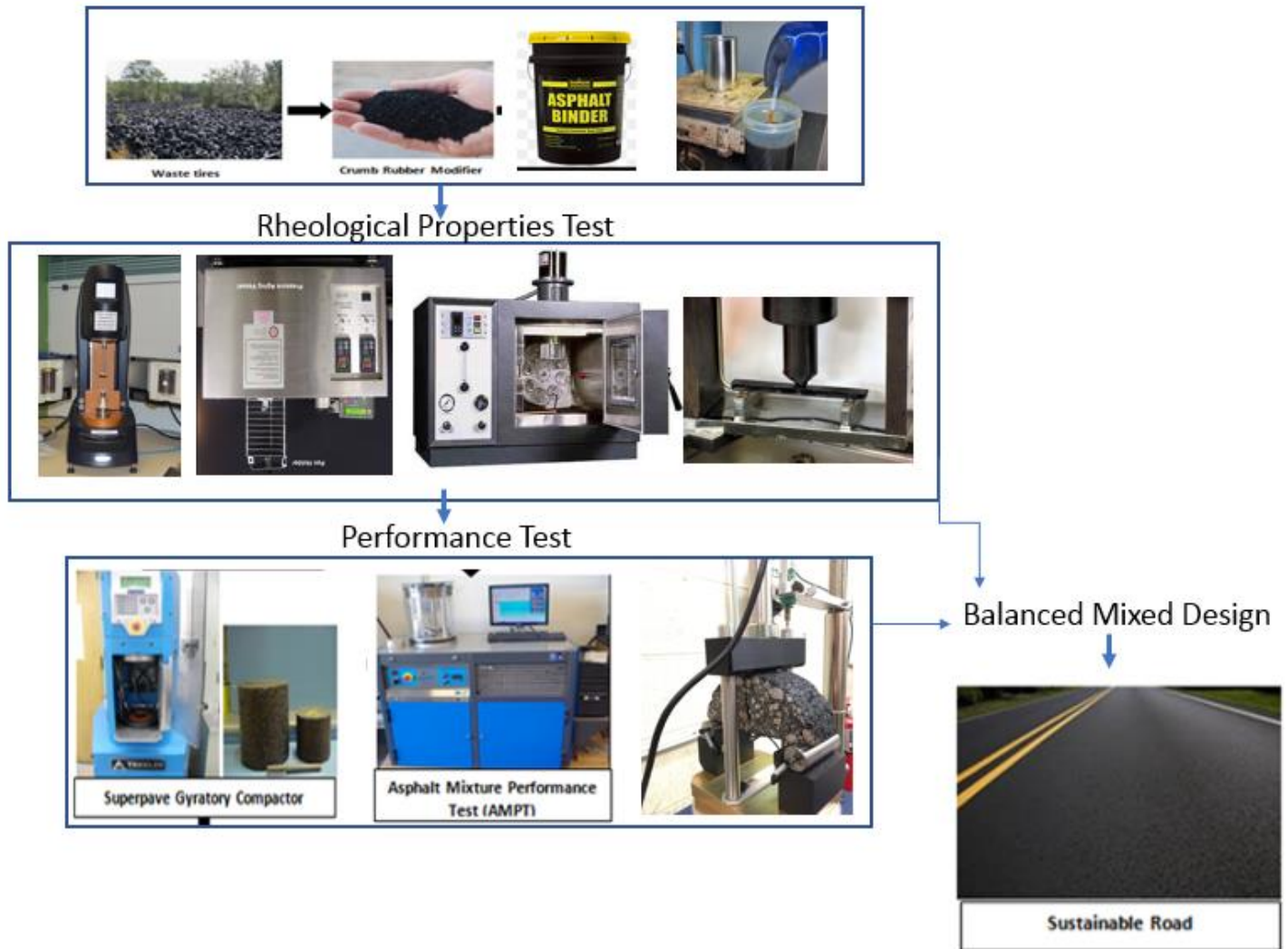


Figure 1: Flowchart of the Research Project

Changes:

Discuss any actual or anticipated problems or delays and actions or plans to resolve them...

URI research team originally planned to make cold-recycled foamed asphalt mixtures with CRM and a new apparatus “Laboratory foamed bitumen WLB10S” was needed to develop the foamed bitumen. But, unfortunately the foamed machine

purchasing process has been postponed due to late approval of competitive research proposal by TIDC. Thus, URI research team has decided to work with additives, i.e., Evotherm and to evaluate the performance of WMA with additives.

Discuss and changes in approach and the reasons for the change...

If the pilot WMA study will be successful, we plan to add CRM and/or RAP.

Planned Activities:

Description of future activities over the coming months.

CRM will be added in the WMA mixtures with and without RAP at different percentages. A series of performance test will be conducted using asphalt mixture performance tester (AMPT), semi-circular bending test (SCBT) and Asphalt Pavement Analyzer (APA) at different loading frequencies with different temperatures. Through these activities, we will be able to predict the performance in the field and to develop balanced mixed design (BMD) for WMA asphalt mixtures containing CRM and/or additives, e.g., Evotherm. The performance prediction will be conducted using AASHTOWare Pavement ME design (PavementME) software.