

Evaluating Recycling Efficiency of Asphalt Plants (RES2016-04)

Purpose of the project

This project is a continuing joint effort of TDOT and UT to determine the percentage of the aged asphalt binder in recycled asphalt pavement (RAP) and recycled asphalt shingles (RAS) that can be blended into virgin binder and reused in recycled asphalt mixtures. In a previous study, UT researchers have developed a laboratory procedure to determine the blending efficiency of RAP and RAS mixtures. They also validated the proposed method with laboratory-prepared asphalt mixtures containing RAP and/or RAS. The purpose of the current research project is to use the developed laboratory procedure to determine the plant-produced asphalt mixtures. Specifically, the objectives of the project are:

- (1) To evaluate the blending efficiency of typical plant mixtures containing RAP/RAS;
- (2) To explore the factors affecting blending efficiency of RAP/RAS mixtures;
- (3) To provide recommendations for improving blending efficiency of recycled mixtures.

Scope and Significance of the project

With the increased use of RAP and RAS into asphalt mixtures, the effects of RAP and RAS on asphalt pavements have become increasingly important. If the aged binder in RAP and RAS cannot be 100% blended into virgin binder and reused in the recycled asphalt mixtures, the performance of asphalt pavements will be suffered and its service life will be shortened. Therefore, the recycling efficiency issue has to be solved so that the benefits of using RAP/RAS can be realized and durable asphalt pavements can be ensured. This research project will build upon the previous TDOT-sponsored RAP/RAS studies and determine the blending efficiency of different asphalt mixing technologies used by the asphalt plants in Tennessee and evaluate its impact on the performance of the resulting asphalt mixtures.

The scope of the research work includes:

- To complete a synthesis of literature review on RAP/RAS recycling technologies and DOT survey on RAP/RAS recycling practices in the US, especially in the Southeastern region;
- To evaluate the blending efficiency of typical RAP/RAS recycling technologies used in Tennessee;
- To investigate the effects of plant mixing parameters on blending efficiency of plant mixtures;

Expecting outcomes

The following outcomes will be provided upon the completion of this research project:

- A synthesis of literature review on RAP/RAS recycling technologies and state DOT survey results of RAP/RAS recycling technologies and the associated blending efficiency;
- Blending efficiency results of typical plant mixtures in Tennessee;

- Factors affecting blending efficiency of RAP/RAS mixtures;
- Recommendations for implementation and specifications of RAP/RAS recycling practice;
- A final report documenting all test results, analyses, and findings.

Time periods and status of the project

The research project started on January 1, 2016 and is scheduled to completion by September 30, 2017 (the start date on the agreement is October 1, 2015, but was delayed due to contracting approval). The project is now progressing as planned.

Currently, a laboratory procedure based on fluorescence microscopy was proposed for quantifying the aged binder mobilization rate of RAP mixtures directly from asphalt plant. The procedure was derived from the mean gray value of single aggregate coated with asphalt, and then the mobilization rate of whole mixture can be obtained on the basis of surface area ratio of virgin and RAP aggregates. A linear blending chart was used to relate the mean gray value of binder blend to aged binder content. Three types of plant mixes, including one warm mix with foaming technology, two hot mixes with or without rejuvenator, were used to validate the proposed method.

Contact information

Principal Investigator:
Baoshan Huang, Ph.D., P.E.,
Dept. of Civil and Environmental Engineering
The University of Tennessee
Knoxville, TN 37996
Phone: 865-974-7713
E-mail: bhuang@utk.edu