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Georgia Southern Turns Old Tires into New Highways

February 18, 2013

Georgia Southern University associate professor of civil engineering, Junan Shen, Ph.D., has been selected by the Georgia Department of Transportation (GDOT) to conduct the second phase of a project to investigate the performance of rubberized asphalt mix for use in road construction in Georgia. The nearly \$300,000 research project will examine how “green” material derived from scrap tires will make a viable alternative for use in road construction.

The second phase of the project is a two-year study to determine how to make a durable, energy-saving, green pavement using “crumb” rubber. In addition to Shen and his research associate, Zhaoxing Xie, Ph.D., up to four Georgia Southern undergraduate civil engineering students will be hired to assist on the project.

Shen completed the first phase of the project, examining the long-term performance of three roadway sections: (1) I-75 near Valdosta, Ga.; (2) I-75 near Perry, Ga.; and (3) I-20 in Augusta, Ga. in December 2012. Each of these sections of interstate was paved with open-graded friction course (OGFC) and stone matrix asphalt (SMA) underlying the OGFC. Test sections were visually inspected for surface distress following the guidelines in GDOT’s Pavement Condition Evaluation System (PACES) manual. Core samples taken from the test sections were evaluated in the laboratory on selected physical properties, including durability.

The objective of the second phase of the project is to make durable, economical and green asphalt mixtures containing crumb rubber. Shen and the students will examine the mechanism of rubberized asphalt mixtures produced via the “dry process” and “wet process” through a series of laboratory tests. The interaction of crumb rubber with asphalt binders will be examined at a microscopic level using advanced laboratory equipment such as Scanning Electron Microscopy, Fourier Transform Infrared Spectroscopy and Gel Permeation Chromatography. The team will then study the rheological (flow) behaviors of the asphalt binders modified with crumb rubber by using Georgia Southern’s new Dynamic Shear Rheometer and Bending Beam Rheometer, which were recently purchased for the University’s Asphalt Laboratory.

The team will then design rubberized asphalt mixtures and subject the material to an accelerated weathering test. “I am particularly interested in seeing how the mixtures can survive weather aging,” said Shen. In addition, other performance properties such as the rutting and anti-stripping properties of the designed mixtures will be evaluated. Lastly, a comprehensive comparison of the mixtures designed with crumb rubber will be conducted considering both the laboratory and the field performance obtained through the team’s study. Based on the results, Georgia Southern researchers will then provide the GDOT with recommendations for building durable, economical and green rubberized pavements. “The potential cost savings and ultimately the environmental impact could be tremendous for the state of Georgia,” said Shen. “Georgia Southern has made a significant investment to establish a new Asphalt Laboratory, and we are excited about the services that we are now able to provide to the paving industry and government agencies.”