Researcher creates cooking-oil-based 'bioasphalt'

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A Washington State University researcher has developed a way to use restaurant cooking oil in a type of asphalt that looks and handles just like its petroleum-based counterpart.

The road surface developed by Haifang Wen, assistant professor in Civil Engineering in the WSU Department of Civil and Environmental Engineering, may soon have Washington motorists driving the first highways in the nation paved with waste cooking oil-based asphalt.

"We are shooting for summer 2014 to construct a trial road—probably at least a quarter mile long," Wen said.

Wen recently received a 2014 Federal Highway Administration grant of $1 million to continue his research. It follows a $190,000 grant from the National Science Foundation.

Faced with increasing petroleum prices, new environmental regulations, and changes to the crude oil refining process, asphalt has become a scarce and costly commodity. Made from the residue left behind after production of gasoline, plastics, and other materials, lowly asphalt still commands $700-800 per ton, or half the price of gasoline at $1,500 per ton, Wen estimates.

"Every year in the U.S., we use about 30 million tons of asphalt binder for roads," more if you include roofing shingles," Wen said. "It's easily a multi-billion dollar business."

But, it's also a business that will need to make inroads into an industry that hasn't changed much over the years.

"Only in the last decade has the green asphalt industry started coming together," Wen said. "It's slowly picking up—more slowly than I wish."

In Iowa, for example, scientists are making a corn-based bioasphalt from residue left after the production of ethanol. In North Carolina, swine manure is being incorporated as a paving substitute.

"Building roads is a big investment in taxpayer money," said Wen. "In general, a one-mile road in a rural area costs at least a million dollars to build. With the waste cooking oil technology, we can reduce the cost of asphalt binder to under $200 per ton, making road building much cheaper."

Asphalt binder, the sticky "glue" that holds crushed stone and sand together to form pavement, only accounts for about five percent of the final hot mix asphalt (HMA) that is steamrolled into glossy new lanes and boulevards.

HMA has to be tough and reliable, able to withstand the ravages of heavy trucks as well as the extremes of Mother Nature. In Wen's lab, each component of his bioasphalt is subjected to a series of rigorous stress tests, such as intense heat, freezing temperatures, compression, and loading.

After four years working with a chemist and "adjusting the recipe," Wen is confident that his green, sustainable asphalt "is as good as the old-school petroleum asphalt.

"I am very excited to have patented a solid technology."

All of which has the undivided attention of both federal and state highway agencies. Wen has been collaborating with both and says the industry is "very interested and eagerly awaiting the roll out of (his) product."

Nationwide, it's an industry that supports more than 300,000 Americans in about 4,000 asphalt plants, one in every congressional district, according to the National Asphalt Pavement Association.

Wen's waste cooking oil asphalt study also fits with President Obama's 2012 Moving Ahead for Progress in the 21st Century Act (MAP-21)—where Congress is addressing the need for sustainability in the national infrastructure system, including surface transportation.

Provided by Washington State University

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