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Article

Pavement’s limits tested at University of Waterloo

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At the University of Waterloo, undergraduates, post-graduate and post- doctorate researchers are testing the limits of pavement and even considering applications that wouldn’t have been dreamt of a generation ago.

"We have about 15 projects on the go," says Professor Susan Tighe, director of the Centre for Pavement and Transportation Technology (CPATT).

A division of the university's Department of Civil and Environmental Engineering, the centre is a research facility with a central laboratory facility at the university, a number of small satellite laboratories and a test track in another part of Waterloo, Ont. which has attracted visitors from around the world.

"Whatever is tested in the labs is tested on the track."

Unlike the well-known National Center for Asphalt Technology in Auburn, Ala., the facility conducts studies into both asphalt and concrete pavement which makes it unique in North America, she says.

It was created in 2002 with $9 million in seed funding provided by a mix of public and private sector partners such as McAsphalt Industries, the Ontario Ministry of Transportation and the Ontario Hot Mix Producers Association.

Since 2005 it has been self-financing through the research projects which it conducts for various transportation agencies and private sector firms. Some examples of those projects include studies into the use of recycled materials in asphalt and concrete and improving road and runway performance.

Asked to cite examples of a direct link between the centre's work and actual road projects, Tighe says that is not always easy. Often transportation agencies will take those findings and include or adapt them in their contract specifications.

But a test section of perpetual pavement, built on Highway 401 near Woodstock, Ont. a few years ago, was specifically designed and built according to the centre's recommendations.

"The key thing to remember is that it is long term," says Tighe of the various projects which can last anywhere from two to four years. These projects are conducted by an amalgam of undergraduate, graduate, and post-doctorate students completing their master thesis. Although most are civil engineering students, some are from mechanical engineering or environmental engineering.

"My philosophy is to empower students to manage their own projects, to act as a coach and mentor. They have to be willing to get their hands dirty," says the professor, explaining that a major factor in the centre's success is the amount of practical training provided.

In the integrated central lab, the researchers have access to a myriad of highly sophisticated machines and equipment. Just one example is the Braking Availability Testing Device which is being used in a project designed to improve airport runway pavement braking performance. One of the most frequent air transportation accidents/incidents in the past few years is "runway overruns" caused by snow and contaminants, she points out.

Another example is the Material Testing Station where samples of asphalt are placed under different temperature and loading conditions to evaluate their performance.

"We can simulate conditions as cold as -30 C. By adding liquid nitrogen we can bring the temperature down lower."

Cold winters are certainly a reality in Canada, as well as hot summers and it's that combination which makes the design and construction of durable pavement such a challenge, says Tighe.

Another challenge and reality is climate change, especially in Northern Canada where roads and runways are built on permafrost. But underneath are "weak" layers of soil. Transportation departments in Northern Canada are worried about this potential problem and have contacted the centre.

"We're still in the discussion stage," says Tighe, adding that CPATT has developed pavement for solutions for a Transport Canada airport runway and a company road in the Alberta oil sands.

On a wall outside of Tighe's office is a display case with samples of pavement test specimens. It promotes the research the centre conducts, as well as giving passersby a window into the future applications of pavement. One of the items is a miniature solar panel. The purpose for including is to demonstrate the future possibilities of embedding solar panels in pavement.

At this point constructing roads with solar panels is too cost-prohibitive, says Tighe.

"But we (the centre) are laying the groundwork for its eventual use."

Tighe says the centre's achievements are often measured by "incremental

improvements".

But those improvements, even if they only help bring a one per cent reduction in construction and administration costs, can be substantial when spread across the country.

"Or they help reduce greenhouse gases."

Although she can call on support and assistance from approximately 15 professors in different faculties, Tighe is currently the centre's only designated professor. That will change in September when a second professor comes on board.

by label: DAN O'REILLY *Jul 25, 2014*

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