Last spring, after a protracted effort from a handful of dedicated researchers, the UVM Transportation Air Quality Lab (TAQLab) was finally opened. The new laboratory is a critical piece of the puzzle for researchers at the University of Vermont who are studying vehicle emissions. Two brand-new 2010 Toyota Camrys were delivered to the TAQLab on Wednesday, September 30th. Both cars are adorned with a colorful “wrap” depicting blue skies, puffy clouds, green fields, and the helpful phrase: “Tailpipe Emissions Testing Vehicle”. The cars look alike, but there is one major difference between them. Vehicle one has a standard combustion engine. Vehicle two is a gasoline/electric hybrid vehicle.

The Camrys will be used by a team of researchers to measure and compare the real-road emissions of hybrid vs. non-hybrid vehicles. Once these cars are broken in—driven to odometer readings of 1,000 miles—each will be outfitted with an onboard tailpipe emissions measurement system, consisting of around 20 instruments. Among these are two fast-response instruments to quantify two types of tailpipe emissions in real-time: particle number distributions and gaseous mobile source air toxics (MSATs).

The research is funded by the US DOT’s University Transportation Center program, and is part of the Transportation Research Center’s project, “Emissions and Performance of Alternative Vehicles in Northern Climates,” led by School of Engineering Associate Professor Britt Holmén, Ph.D.

Karen Sentoff and Mitch Robinson are graduate students working on the project, as well as designing their own theses in conjunction with the research. Both students are candidates for a Masters in Environmental Engineering at UVM. Ms. Sentoff plans to focus her research on the vehicles’ cold-start toxins. Mr. Robinson is interested in the emissions savings from hybrids in cities.

With the assistance of TRC’s partner, Resource Systems Group, Inc., Sentoff and Robinson carefully chose a loop to drive the cars that incorporates different types of roads in northern Vermont, including: rural arterial roads, interstate highway, and a significant hill. The route will be traveled repeatedly during each season, and researchers anticipate the winter data to be particularly interesting.

The new TAQLab is a joint venture of the UVM Transportation Research Center and the School of Engineering in CEMS. CEMS Assistant Dean, Dan Harvey, was instrumental in coordinating the details of the lab’s creation.

Mr. Harvey explains that, “though we looked at multiple locations, we finally settled on a spot right in our backyard. The laboratory is located in the Perkins Building on central campus, and is large enough to accommodate the testing vehicles.”

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New Transportation Energy Report

The Vermont Clean Cities Coalition, funded by the US Department of Energy and the Vermont Department of Public Service, has released the 2009 Vermont Transportation Energy Report, which presents data on fuel consumption, vehicle purchases, expenditures on transportation, and travel behavior. These data can be used as a basis for policy discussions and initiatives.

Transportation represents the largest source of Vermont’s greenhouse gas emissions from fossil fuel combustion (59%) and is the largest user of energy by sector (33%). Understanding Vermont’s transportation energy use is critical to tackling the challenges presented by global climate change, dependence on foreign oil, future energy demands, public health and the implications for accessibility and mobility.

Annual spending for the purchase of petroleum in Vermont is up 30% from 2004 through 2008. In this same five-year period, transportation expenses increased in the following sectors:

- Schools (pupil transportation spending) increased nearly 30%
- Local (reported municipal transportation expenditures) increased 46%
- State (Vermont Agency of Transportation) increased 28%

At the same time, Vermont witnessed a 5% decrease in total fuel sold for highway modes (2004-2008). “Vermonters are continuing to spend more for less product and the impacts of these costs can be seen in our household budgets and in state and local budgets,” said Karen Glitman, coordinator of the Vermont Clean Cities Coalition and co-author of the report. She explains that these data—on the transportation costs of schools, towns, and the state—illuminate the true impact of the increase in fuel costs.

“People easily notice the price changes at the pump,” Glitman said. “But gas prices have a real ‘ripple effect’ throughout our communities, not just the direct cost we pay at the pump. When you consider the cost of supporting our transportation infrastructure, and the increased fuel costs that our schools, towns and state have to deal with, you see that the price of gasoline has wide-ranging impacts.”

Summer Brown Bag Series: a Success!

The 3rd annual “brown bag” series, addressing critical issues in transportation, was attended by 230 over the summer. TRC staff, faculty and students presented 12 topics for discussion including:

- “Tailpipe Emissions & Public Knowledge: Informed or Ignorant Public?” (Tom Macias, Sociology)
- “Gas Tax Increases: Political Suicide or Visionary Leadership?” (Richard Watts, TRC)
- “PHEVS: Why the US Cannot Meet President Obama’s Goal of 1 Million by 2015” (Jon Dowds, Rubenstein School of Natural Resources & the Environment)

Graduate Scholars 2009-2010

Graduate student research assistantships of $28,000 were granted for the academic year 2009-2010 to the following UVM graduate students:

- Cassandra Gekas, CDAE
- Nate Belz, CEMS - CE
- Jonathan Dowds, RESNR
- Eric Garza, RESNR
- Diana Colangelo, MPA
- Lance Jennings, MPA
- Terrence Barrett, CEMS - CE
- Jonathan Maddison, MPA

These students work as research assistants (RAs) for 20 hours per week on transportation research related to the Center’s theme. Students may be in any graduate program within UVM’s colleges or schools.

Find out more by visiting “Graduate Studies” at www.uvm.edu/trc.
Nineteen Vermont high school students gained first-hand experience on the importance of safe driving as part of the Summer Transportation Institute (STI). Since motor vehicle crashes are the leading cause of death for Americans aged 15 to 20, and teenagers are involved in 3 times as many fatal accidents as other drivers, these workshops were particularly relevant for the participants.

To get a sense of the debilitating effects of alcohol, and especially the dangers involved with driving under the influence, students paired up and tried to accomplish normally easy tasks—such as walking in a straight line, sitting in a chair or applying lipstick—while wearing “Fatal Vision” goggles. The special goggles are designed to simulate the vision impairment that accompanies different blood alcohol content levels.

The students met Inspector Rick Moore and his assistant, a Labrador Retriever named “Canine Duke,” who has worked as a drug-sniffing dog for over nine years. Duke was led to a location with five sealed boxes, one of which contained a half pound of marijuana, and commanded to find the drugs. The students were delighted by Duke’s friendliness, as well as his usefulness.

The UVM STI is funded by the Federal Highway Administration and the Vermont Agency of Transportation. The Institute aims to provide awareness to high school students on transportation careers, along with the complex transportation system upon which we all rely.
Update on Workforce Development

The TRC Transportation Education Development Pilot Program (TEDPP) (funded by a grant from the Federal Highway Administration) is in the process of developing innovative programs to attract and retain skilled workers in the transportation sector of Vermont, New Hampshire and Maine. To illuminate the large impact that transportation has on the economy and the environment, the team developed the “Transportation Industry Fact Sheet” which will be used nation-wide as a reference for partners in the upcoming projects on the grant. Here are a few of the many surprising facts listed:

Transportation-related goods and services accounted for more than 10 percent—over $1 trillion—of US Gross Domestic Product (GDP). In 2006, federal, state and local expenditures on transportation totaled $199.4 billion.

Twenty million Americans are currently employed in transportation-related jobs, with careers as diverse as civil engineering, architecture, piloting of planes and ships, management of transit systems, planning transportation services, and design of intelligent transportation systems.

The Transportation Industry Fact Sheet can be downloaded from our website: www.uvm.edu/trc.

FOCUS ON GRAD STUDIES:

The following is a conversation with Nathan Belz, a graduate student with the TRC whose work on the project “Characterizing Older Driver Behavior for Traffic Simulation and Emissions Modeling” involves using a SENSR GP2x 3-Axis Accelerometer/Tilt Meter. This device will be mounted on top of a vehicle and used to measure speed, acceleration and deceleration, and global positioning.

Q – What is your project all about?
A – The objective of this research is to characterize the second-by-second driver behavior of older drivers in order to accurately account for the lead-vehicle dynamics of the aging population in traffic simulation and emission models. Field data on actual routes will be collected using in-vehicle instrumentation from 20 drivers in Burlington, VT. Trends and differences in speed and acceleration/deceleration data while drivers are not constrained by a vehicle in front of them will be explored.

Q – What inspires you about this research?
A – This research is like a stepping stone for my dissertation work on roundabouts. The techniques and instrumentation I am applying here will be similar to those I use to develop a capacity model for single-lane roundabouts and ultimately quantify the emissions reductions from the conversion of a signalized or stop-controlled intersection to a roundabout.

Q – What impact could this research have on peoples’ lives?
A – Obtaining second-by-second driving behavior is particularly important because of the variability present in the driving style of individuals - many models currently make the unrealistic assumption that people drive continuously at the speed limit between two given points. This research aims to identify the natural fluctuations that are occurring in driving behavior and, in doing so, improve the way that this behavior is reflected in current simulation models. Implications of this would be, for example, allowing for better planning and estimation of the advantages/disadvantages of transportation design alternatives.

Nate is from Readfield, Maine. He did his undergraduate and Master’s studies at the University of Maine, where his advisor was Dr. Per Garder (coming to the TRC Nov. 5th—see our fall seminar lineup on page 3 for more details!). Nate’s UVM Ph.D. advisor is Dr. Aultman-Hall.

Related jobs (in thousands):

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<thead>
<tr>
<th>Transportation-related jobs (in thousands):</th>
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<tbody>
<tr>
<td>Water transportation</td>
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<tr>
<td>Urban and regional planners</td>
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<td>Civil engineering technicians</td>
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<tr>
<td>Civil engineers</td>
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<tr>
<td>Construction equipment operators</td>
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<tr>
<td>Highway maintenance workers</td>
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<tr>
<td>Local bus drivers, transit and intercity</td>
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<tr>
<td>Jobs in aviation</td>
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<tr>
<td>Highway, street &amp; bridge construction</td>
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<td>Federal transportation workers</td>
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<td>Rail transportation workers</td>
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Visit the Workforce Development pages and click on “Links”.

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