SPARKING INNOVATIVE TRANSPORTATION SOLUTIONS

Issue 6
Spring/Summer
2004

HIGH-SPEED RAIL
HIGHWAY SYSTEMS
TRANSIT &
TRANSPORTATION SAFETY

Ignition

News from **TRB's IDEA** Programs

INSIDE:

- **Nevada DOT's Susan Martinovich on the Risky Road to Innovation**

TRB
TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

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News from **TRB's IDEA** Programs

THE IDEA PROGRAMS

Innovations Deserving Exploratory Analysis

IDEA programs provide start-up funding for promising but unproven innovations in surface transportation systems. The programs' goal is to foster ingenious solutions that are unlikely to be funded through traditional programs.

Managed by the Transportation Research Board, IDEA programs are supported by the member state departments of transportation of the American Association of State Highway and Transportation Officials (AASHTO), the Federal Transit Administration (FTA), the Federal Railroad Administration (FRA), and the Federal Motor Carrier Safety Administration (FMCSA).

The Transit IDEA program, which receives funding from FTA as part of the Transit Cooperative Research Program, is guided by a panel chaired by Fred Gilliam, President/CEO, Capital Metropolitan Transportation Authority in Austin, Texas. Harvey Berlin is the TRB program officer.

High-Speed Rail IDEA is funded by the FRA as part of its next-generation high-speed rail research. A committee chaired by Mike Franke, National Railroad Passenger Corporation, has oversight. Charles Taylor is the TRB program officer.

The NCHRP Highway IDEA program is supported by the member state departments of transportation of AASHTO through the National Cooperative Highway Research Program (NCHRP). It is guided by a panel chaired by Carol A. Murray, Commissioner, New Hampshire DOT; Inam Jawed is TRB program officer.

Safety IDEA is jointly funded by FMCSA and FRA. The committee is chaired by Ray Pethtel, Virginia Tech Transportation Institute. Harvey Berlin is TRB program officer.

Visit the IDEA web site:
www.trb.org/idea

Cover photo of Pyramid Lake, NV, courtesy of Nevada DOT.

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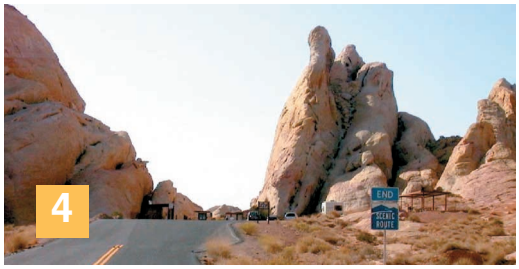
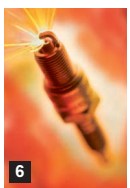
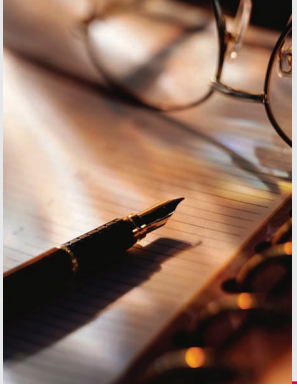
Contents







Nothing Ventured . . .

Explorer John C. Fremont probably arrived on horseback in 1844 when he found and named Pyramid Lake, Nevada, pictured on our cover. Transportation has changed some since Fremont's time. Today the Nevada DOT makes the trip a lot more comfortable. In this issue we talk with Nevada DOT's Deputy Director, Susan Martinovich, about how innovation effects change in the necessarily cautious culture of a DOT.

Fremont isn't the only pioneer mentioned in this issue. William J. Harris, who pushed the frontiers of materials engineering throughout his career of nearly 50 years, is gratefully acknowledged for his service to the IDEA programs. An early and active participant in the ITS IDEA program, Bill's advocacy was a driving force in establishing the High-Speed Rail IDEA program, which he ably chaired for six years. Bill retired from the committee in May and we will miss his wise counsel.

The New Ideas section features three promising projects from two programs. A simple way to select asphalt binders that resist thermal cracking and a one-step concrete slip form remover, the Road Recycler™, are both NCHRP IDEA projects. The Transit IDEA program is sponsoring investigation of a low-cost rail wheel gauge inspection technique that produces a digital profile of a train's wheel at full transit speed.

How the IDEA programs do business is diagrammed in the Business section. The process draws in partners and experts to provide essential reality checks as well as support for projects. It's a way of managing the inherent risks of innovation, without which nothing is gained.

Neil F. Hawks
Director, Special Programs
Transportation Research Board
of the National Academies

William J. Harris

Your comments are welcome
and may be sent to the editor at:
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Susan Martinovich
Deputy Director, Nevada DOT

Innovation
What's at Stake?

"There is no instant baby," Buckminster Fuller said, commenting on the gestation time for innovation. Fuller observed that the rate at which innovation is accepted is measured in units common to the industry in question[1]. We asked Susan Martinovich, Deputy Director of the Nevada Department of Transportation, for her perspective on implementing innovation. Martinovich, whose career at the DOT began with summer road striping jobs and includes seven years as assistant director of engineering, also serves on several AASHTO and TRB committees, including the project selection panel for the NCHRP IDEA program.

Transportation projects are often years, sometimes decades, in the making. Does Fuller's observation apply to implementing innovations at a DOT?

Technology in all fields has progressed tremendously over the decades with advances being made exponentially just over the last several years, and while changes in the transportation industry may not seem as quick or as sexy as in some other industries, there certainly have been many. There are efforts in design and construction that challenge us to do more with less. This means fewer people and resources to complete the work faster with fewer interruptions to the public. Unfortunately, the development of a project takes time and the reasons are both good and bad. Increasing regulations and constraints can impact the schedule, and while public participation and working through issues with stakeholders are proactive measures, they also affect project timelines. Ideas, processes, and technologies are continually being considered to develop ways to streamline and quicken work to the final product, but in transportation, new technology can be slow in institutionalizing within a DOT.

There seem to be two primary considerations that contribute to the slow pace of incorporating new innovation: quality and driver behavior. Quality is a fundamental goal of all transportation agen-

[1] Designing the Future (From Dymaxion Lab III), Buckminster Fuller Institute, http://www.bfi.org

cies. It means designing and building projects that meet customers' needs and that last over time. Factors affecting quality include not only materials used but placement procedures as well. Testing and training for a new innovation can take time. There are also many people involved in evaluating innovations: the designers in knowing when to incorporate the item most efficiently, the inspectors in knowing specifications to place the product, and the contractors in having the tools and equipment for the work. New and innovative ideas may be great in theory and on paper, but they must be practical for agencies to take the risks.

> "Quality is a fundamental goal of all transportation agencies."

The other consideration that slows the pace of innovation is designing and operating items used by the public. New lane striping patterns or new signs and messages, for example, must be evaluated for a broad range of users. People are not one-size-fits-all, but highway features must be.

But while the downside of implementing innovation is the upfront time for development, the benefits can be tremendous. Examples range from high early strength concrete, asphalt mix designs, striping and pavement marking materials, and size and types and material requirements for lettering of highway signs to software programs that better link data systems.

How is a DOT persuaded to implement an innovative technology?

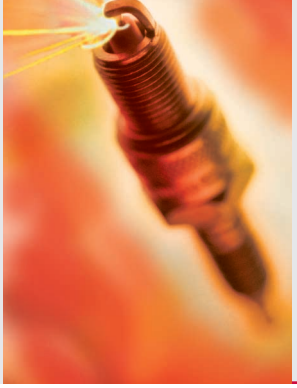
The answer is when the need and potential benefits outweigh the risks; construction is expensive and mistakes are costly and very difficult to correct. The decision to implement something new could be made in response to an event, such as a highly visible or publicized accident, or to a political mandate. Benefits to highway users from congestion relief and savings in user costs during and after construction may also help drive the decision. Engineers by nature are conservative, but management styles that push the norm to change how business has always been done, and demand by leadership and the public to be innovative and cost effective improve the climate for trying new ideas. The more an idea, process, or suggestion can meet a need with relative ease and low cost, the more an agency will be open to pursue it.

Where do obstacles to implementation occur?

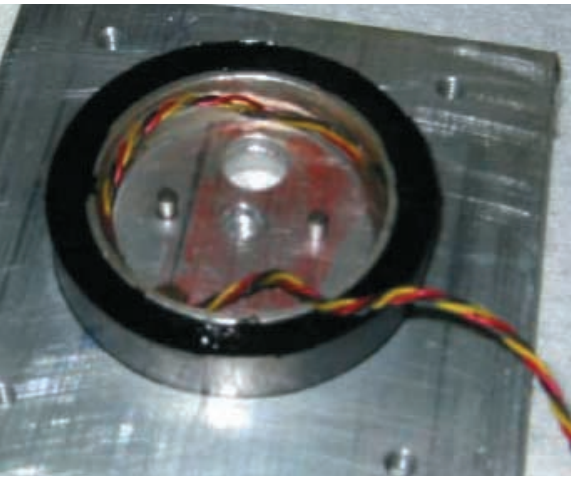
Communication is key to getting a 'foot in the door' for new innovation and technology. From formal presentations to casual conversations, there needs to be a sharing of problems and solutions. While one state's solution may not solve another's problem completely, parts may be applicable and can lead to different directions not previously considered. Agencies do not have the time or resources to re-invent ideas. Stakeholders and users should also be involved in the decisions on evaluation and uses of innovation and technology. Assumptions should not be made about what can be used or tolerated. Do a reality check. As an example, a new product for striping may be inexpensive and effective, but if it is hard to work with, requires more people to place the product or expensive modifications to existing equipment, it doesn't matter how good the product is if it is not on the ground being used to provide the benefits.

DOTs both have and are stakeholders. At Nevada DOT, you encourage the participation of those affected by DOT projects and, as a member of several national committees, you convey the DOT's needs to those who sponsor and conduct research. Does this exchange of information influence the development of innovative technologies?

The transportation industry is exciting. Agencies seek and welcome ideas that can help them to do their jobs without additional burdens. A continual circle of communication is created when agencies direct research for their specific needs and research develops ideas and products for agencies to evaluate and use. It is really exciting when the circle tightens to encompass the two and a successful product results. That's innovation. ❖



Easy as ABCD



In this case those early bits of the alphabet stand for asphalt binder cracking device. Of course, cracking is not a desired quality in pavements, so a device that indicates the temperature at which an asphalt binder develops cracks could be useful in learning how to avoid them.

Research has demonstrated that low-temperature thermal cracking, which causes premature failure of asphalt pavements, is primarily a function of binder properties. An accurate and simple test to determine which binder will be least susceptible to thermal cracking could be a real advance in prolonging pavement life.

The principal investigator of this NCHRP IDEA project, Sang-Soo Kim at Ohio University, uses the dissimilar rates of expansion and contraction of asphalt binders and metals to determine the temperature at which thermal stress will cause cracking.

The device is actually a short tube of aluminum, steel, or invar with an electrical strain gauge glued to the inside and asphalt binder molded to the outside. A thermocouple may also be used to closely monitor temperatures.

Comparative testing with known field performance data is being conducted in cooperation with the TRB Binder Expert Task Group and the Ohio Department of Transportation to validate the test procedures. ❖

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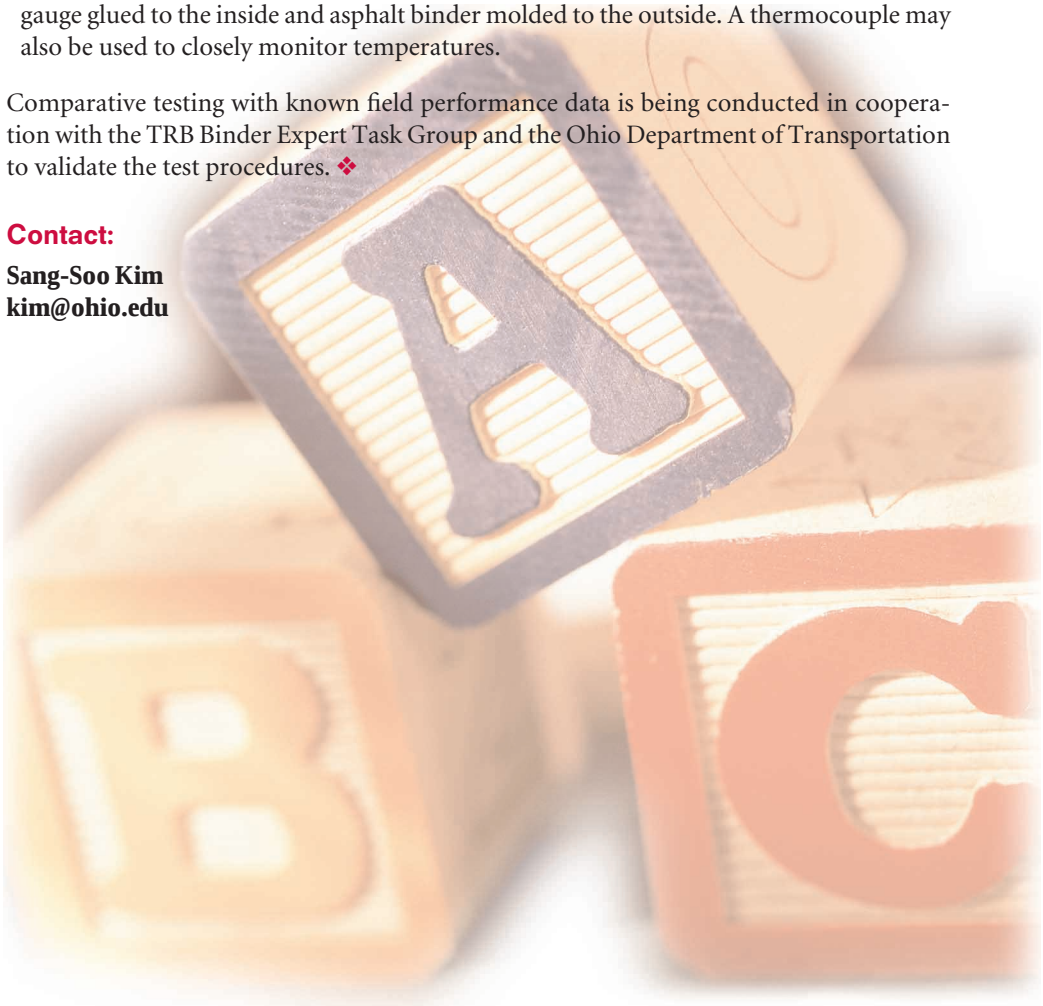

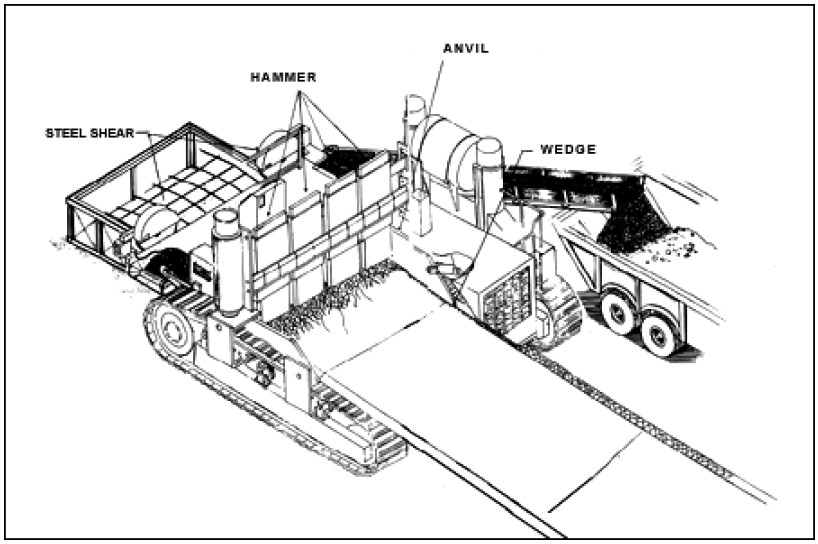

It Lifts and Separates

If all goes as planned, the Road Recycler™ will lift a 12-ft wide, foot-deep section of concrete pavement, pulverize the concrete into reusable aggregate, separate and cut the steel rebar, and leave behind a roadway ready for repaving.

In a current NCHRP IDEA project, Road Processing Resources, Inc. is developing a hammer and anvil system that reflects energy from the hammer's blows back into the concrete, crumbling it and releasing it from the steel. The rubblized concrete is loaded by conveyor into trucks and the steel is sheared into 3-foot sections and dropped into containers, all in a continuous one-step process.

Pneumatic hammers and controls are being designed and tested by two industry partners. Mechanization of the lifting wedge and anvil has been developed in collaboration with an engineering firm. The panel machine, rigged for testing both gravity drop and pneumatic hammers, is now in Minnesota for continued testing and demonstration. ❖

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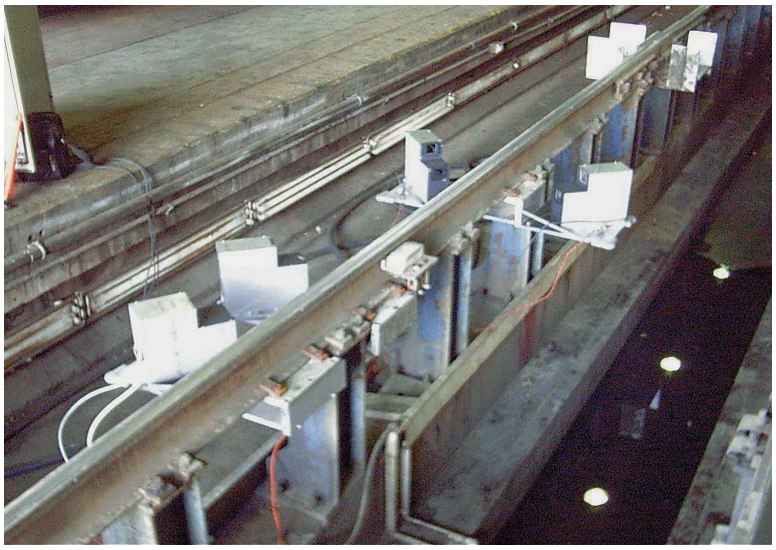

Passing Inspection

Interaction between rail car wheels and the track they ride on can cause uneven wear patterns on the wheel, a leading cause of train derailment. A low-cost means of accurately assessing the condition of rail wheels was developed in Transit IDEA project 17. An array of lasers, sensors, and cameras installed at track side scan a cross section of the wheel and produce a digital profile of it that is processed by geometric algorithm software. Inspection includes wheel cracks, flange angle, hollow tread, wheel diameter, as well as other characteristics, and is done at normal transit speeds.

With IDEA funding to prove the concept of automated rail wheel gauge inspection, Principal Investigator Zahid Mian was able to attract funding from other sources to refine the inspection system. A unit purchased by CSX Corporation will be installed this summer and other purchases are pending. ❖

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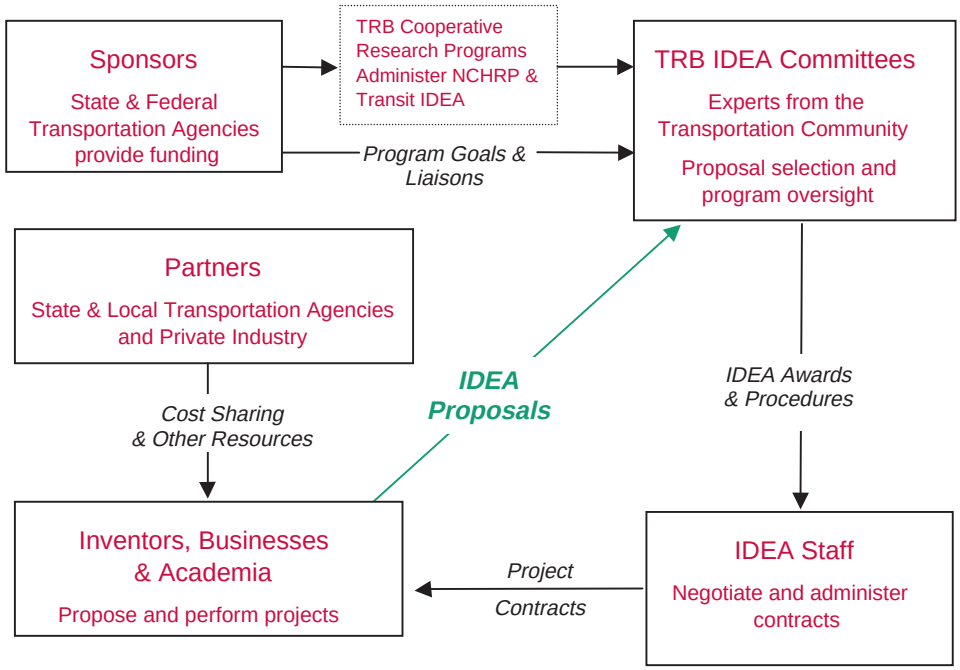
Business

IDEA Process & Participants

Innovation, like inspiration, cannot be programmed into a research plan. That's why agencies sponsor IDEA programs, to catch the occasional breakthrough that will advance the sponsor's overall goals. The diagram shows the collaborative process that supports national goals one good idea at a time. ❖



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