FLEET DEMONSTRATION OF SCHOOL BUS FUEL-FIRED COOLANT HEATERS

During the summer of 2006, Program Opportunity Notice 1028 was issued to support the development, qualification and/or demonstration of innovative transportation products and systems. One of the projects selected for funding was a fleet demonstration of fuel-fired school bus coolant heaters by Brown Coach, Inc. of Amsterdam, NY. Department staff managing the project include: Mike Smith, Rusty Seastrum and Ira Schaffer of the Passenger Carrier and Safety Bureau.

The benefits of preheating internal combustion engines in cold climates are well documented and include: significantly reduced fuel consumption, decreased pollution, extended engine life, and reliable cold-start operation. While some of these can be accomplished using electrically-powered coolant immersion heaters, diesel-fired coolant heaters offer an alternative with additional functionality including: 1.) Preheating to near full operating temperature without need for engine idling and reducing cold-start emissions; 2.) Cabin auxiliary heating to reduce or eliminate idling while stationary, and; 3.) Providing supplemental heat during the drive cycle for better engine efficiency, reduced emissions, and increased passenger comfort.

New York State has more school buses (45,000) than any other state in the nation, yet diesel-fired coolant heaters have had little deployment, in part due to concerns with the potential infiltration of heater emissions into the passenger cabin. In a recent NYSERDA project last year, NYSDOT allowed the installation of thirty-two units at the Ravena-Coeymans-Selkirk school district, with the requirement that an interlock be installed to preclude heater operation during the drive cycle. While this type of installation achieves the first two benefits listed above, it does not permit the third.

Increased application of highly efficient engines in school buses has led to a lack of reject heat sufficient to fully heat the bus cabin while the buses are operated at low speeds under a light load. Properly configured, the fuel-fired coolant heaters can be used to provide supplemental heat during the drive cycle that both increase passenger comfort while ensuring the engine maintains temperature for reduced emissions. As emissions regulations are further tightened, this later consideration will become of increasing importance across all bus operations.

The current demonstration project will install thirty-six (36) diesel-fired coolant heaters in a school bus fleet and monitor their performance during the winter season. Heaters will be located in an enclosed box, rear of the rear axle, and exhausted at the rear of the bus such that all three benefits identified above can be realized without the need for interlocks that disable auxiliary heater operation during the drive cycle. The Tellex Proheat Units recommended for this effort have onboard data recording and diagnostics capability that facilitate...
analysis of heater performance in this application. They also generate 45,000 BTUs, which unlike some lower-output alternatives, should be sufficient to provide supplemental heat during engine operation. Brown Coach has installation and maintenance experience with these heaters on motor coaches, and considers these to be state-of-the-art in commercially available diesel fired heating technology.

For more information, contact Joe Tario at 862-1090 ext. 3215 or jdt@nyserda.org

(The Transportation Research and Development Bureau would like to thank the New York State Construction Materials Association for allowing us to reprint the following article from their publication "Material Matters.")

**WARM MIX IN NEW YORK STATE IN 2006**

The Hot Mix Asphalt (HMA) producers in New York State have always tried to be on the leading edge of new technology in our industry. The following pieces demonstrate how two producers continue this trend.

![Image of WMA technology]

Barrett crews place WMA on Route 80 in Tully.

**Barrett’s Hot Mix is Actually Warm**
Frank Simmons, Regional Manager, Barrett Paving Materials, Inc.

Early in 2006 Barrett Paving Materials in Syracuse decided to explore the New European Warm Mix Asphalt Technology (WMA). WMA technology was discovered when European companies were developing an additive to liquid binders to aid in compaction. It was determined that HMA could be compacted at much lower temperatures and still achieve the same end result. Warm Mix Was Born. Barrett along with New
York State Department of Transportation (NYSDOT) and the New York State Thruway Authority jointly decided to explore the WMA for use in Central New York. The following are some examples of what was done in 2006.

**NYS Thruway Authority**

After several meetings, a Thruway Project in the Weedsport area and a NYSDOT project on Route 80 in Tully were chosen as test areas for WMA. Both projects were under construction and each offered their own challenges.

Full lane, full depth excavations up to 24” in depth; after excavation was complete, excavation areas had to be paved in with 37.5 mm base, 25 mm binder, and 12.6 mm top. All this had to be completed to accept traffic by 6:00 am the following morning.

Due to the deep mat heat retention, rutting was a major concern and proved to be inevitable with the conventional mix. The inconvenience to the traveling public was increased each night because the same lane closure had to be reset so that shimming of the previous nights work could be performed.

This appeared to be a perfect application for WMA. To the Contractor’s and Thruway’s pleasant surprise, the rutting was eliminated due to the Warm Mix Asphalt. This was completed at a substantial reduction in mix temperature and saving the traveling public lane closure inconvenience.

**NYS Department of Transportation Project**

Route 80 & Route 11, Tully (NYSDOT Contract #D260247) was selected for a Hot Mix vs. Warm Mix comparison. On the morning of 9/16/06, 1000 metric tons of 9.5 mm hot mix asphalt was place eastbound. All testing was completed and test locations were clearly marked. WMA was installed in the afternoon adjacent to the conventional hot mix. Testing on the WMA was done opposite to those tests run on the hot mix. The pave speed, roller pattern and all other construction practices remained the same for both mixes. The screed temperature for the hot mix was +/-295°F while the WMA registered at 230°F. There were no visible fumes with the warm mix and the paving crew saw no issues during the laydown process.

Barrett and NYSDOT Materials is continuing to monitor the performance of the Warm Mix Asphalt vs. the Hot Mix. The initial conclusions are very positive. If you have any questions about this project, please contact Frank Simmons of Barrett Paving: (315)652-4585. If you have any questions for NYSDOT please contact Greg Wichser, Materials Bureau, gwichser@dot.state.ny.us.

**Low Energy Asphalt—The Cool Mix**

Gregory Harder, P.E., Vice President, McConnaughay Technologies

On Friday, September 15, 2006, Suit-Kote Corporation in cooperation with McConnaughay Technologies introduced for the first time in North America an exciting new warm mix technology from Europe, - LEA (Low Energy Asphalt). This new process was demonstrated to many local and state officials on New York State Route 11, just south of Polkville, NY (located in Cortland County).

Although the weather did not cooperate as much as we would have liked, the rain that fell from the sky did not have a negative impact on our event or the products workability. Many of the onlookers and invited guests walked away from the job site overly impressed and hopeful that this product can be integrated into the state and local road maintenance processes into the future.

Traditionally, hot mix asphalt (HMA) is produced in either batch or drum mix plants at a discharge temperature of between 280 degrees Fahrenheit and 320 degrees Fahrenheit. These temperatures are needed to dry the aggregate, coat it with asphalt binder, and achieve the desired workability.
The HMA industry is embarking on a program to substantially reduce mix production temperatures. These reduced temperatures would decrease the energy required to make HMA, reduce emissions and odors from plants, improve the working conditions at the plant and paving site, extend the paving season and allow for greater haul distances to the jobsite. In addition to many of the anticipated benefits of LEA, we also found that this process will also contribute a substantial reduction in fuel consumption compared to Alternative processes and products.

The LEA process allows the mix discharge temperature at the plant to be between 190F and 200F. A chemical additive is injected into the liquid asphalt stream prior to mixing with the heated aggregate. A portion of the fines required for the mixture is unheated (wet) and added to the heated aggregate/asphalt blend. The chemical additive along with trace amounts of moisture from the wet fines portion provide the mix with the necessary workability, allowing density to be achieved at the paving site. The chemical additive also improves the adhesion properties of the mixture.

Although most of the preliminary testing has been completed, we have contracted with the French company LEACO to assist us in conducting an exhaustive laboratory review in conjunction with extensive field monitoring to make sure that this process is of the superior quality that Suit-Kote customers have grown to rely on for the past eighty-five years. Once this review is completed in a manner that is satisfactory to our quality control engineers and scientists, we will then proceed to the next step of introducing it to the marketplace. If you have any questions for NYSDOT please contact Greg Wichser, Materials Bureau, gwichser@dot.state.ny.us.
RESEARCH PAYS OFF - TPF-5(066) “MATERIAL & CONSTRUCTION OPTIMIZATION FOR PREVENTION OF PREMATURE PAVEMENT DISTRESS IN PCC PAVEMENT”

Sixteen states, including NY, participated in the National Transportation Pooled Fund project seeking ways to optimize materials selection and construction methods to improve the longevity of Portland cement concrete (PCC) pavements. The project developed optimal mix designs and test methods for monitoring key performance parameters when designing and constructing PCC pavements. In addition, this project evaluated both conventional and new technologies and procedures for testing concrete and concrete materials to prevent material and construction problems.

One of the results of this five year study was a user friendly reference manual “Integrated Materials and Construction Practices for Concrete Pavement”. The manual identifies the focal properties of PCC and also provides detailed information about technologies and procedures used to test those properties and predict pavement performance.

The manual was presented to NYSDOT, in a workshop sponsored by FHWA, on April 18 – 19 in Albany. More than 70 engineers from across the state participated in the workshop. The manual can serve as a training tool and reference to help concrete paving designers, construction engineers and EIC’s. It also bridges the gap between recent research and practice regarding optimizing the performance of concrete for pavements. The manual is intended to help the reader recognize factors that lead to premature distresses in concrete and also provides quickly access how-to and trouble shooting.

For more information on this or other pooled fund projects please visit the TPF site at http://www.pooledfund.org.

RESEARCH IMPLEMENTATION AND THE MOST COMMON MISTAKES TO AVOID

The value of research lies in its ability to instigate positive change in the way we “do business.” Unless research findings are capable of improving “our business” and/or making them more cost-effective, funds invested in research are wasted. Although we never dispute the logic of this argument, there are avoidable mistakes that we often make, risking the loss of valuable research investments. These mistakes are:

Research is not tied to action

Questions about what we will do with the results of the research, and how we will implement the findings of the research were never addressed. This situation is equivalent to running a marathon only to give up five steps from the finish line. When research plans are not tied with a plan outlining how findings will be implemented and who will be in charge with implementing them is a very serious, yet common mistake that we often make. Implementation plans with clear action steps, processes and assignment of responsibilities must be developed. The clearer and more comprehensive the implementation plan, the more likely it is to be successful.

Communication between researchers and affected entities are not adequate and/or did not start early enough

Entities affected by the research findings must be involved in the conceptualization of the research project and must guide the project from inception to implementation. Without their input and support, research findings would be separated from their needs and realities on the ground and resistance would hinder implementation. These entities are key stakeholders and must be regarded as co-researchers. They must feel ownership of the process and the products of research; otherwise, research findings will never leave the pages of the report. Forming committees, task force or advisory panels to solicit input of affected entities is critical to avoiding the mistake of poor communication.
Research was conducted without buy-in from management
Without the support of management for the implementation of the result of the research project, implementation is doomed to failure. Research projects must serve the strategic priorities of the organization and must be consistent with operational objectives to be viable and to gain support of management. Involving management from the start is crucial to ensuring that the research is consistent with an organization’s strategic plans.

Researchers do not see implementation as part of their role
A common assumption among researchers is that their role ends with the production of research findings; that implementation is someone else’s responsibility. When the researcher who has the most in-depth knowledge about how a product works, or how a process is best institutionalized leaves the scene, affected entities are left on their own to figure out how to implement a product without much support from the person who produced it. Implementation must be part of the researcher’s roles.

The absence of a research champion
Research often disrupts the status quo and is likely to produce resistance. Resistance to change is likely to intensify when a champion of the research is non-existent. A champion ensures buy in from all stakeholders. The champion becomes the advocate for the project consistently removing obstacles and breaking down resistance to change likely to be instigated by the research.

Research does not document success or potential success
A common mistake that researchers make is failing to pay attention to documenting research success. This leads to a common prevalent misconception; that research is a luxury that you conduct only when you have excess funding. This perception makes research projects constantly vulnerable to budgetary cuts. Researchers often fail to adequately document the impact of research without realizing that they are compromising all research activity. Without documenting the impact of research as a problem solving, improvement and a cost-saving tool, the common misperception of research as an add on is likely to persist. Such misperception of research renders implementation also an add-on. If research is devalued, its implementation will also be devalued and will not be given proper attention.

Practical tips to ensure a clear path to implementation
1. Prepare implementation plans that set specific and clear steps to implementing research findings into the organization.
2. Involve all stakeholders from project conceptualization to implementation.
3. Give people ownership of the process and outcome. The more people feel they own the research, the more likely the findings will find a hospitable reception.
4. Champion the research. Relinquish ownership but maintain strong advocacy for the research and leadership for its progress.
5. Instill commitment to implementation as the most critical part of the process. Include implementation in researchers’ functions.
6. Make implementation the indicator of your success.
7. Monitor implementation and consistently assess progress, identify and remove obstacles.
8. Evaluate and document the impact of the research.

For questions about research implementation, please contact Sam Elrahman, Transportation Research & Development Bureau, NYSDOT at 518.457.4689 or at oelrahman@dot.state.ny.us
TRANSPORTATION RESEARCH RECORDS AVAILABLE ONLINE

A new online service from the Transportation Research Board providing full text access to Transportation Research Records published after 1996 is now available to NYSDOT employees at http://trb.metapress.com/home/main.mpx. Currently over 7,600 papers are available with more being added as new records are published. Papers published in the Research Records have undergone a peer review process refereed by TRB technical committees and are considered a primary source for both scholarly and practical transportation research. Employees do not have to register as users unless they want to utilize the special features. Additional information on the new service is provided on TRB’s website at http://www.trb.org. Please take advantage of this valuable resource and if you have any questions contact Lynne Webb, NYSDOT Library for further assistance.