

## Recycled Portland Cement Concrete: Turning Old Roads into New Road Beds

In this day and age of “green” products and manufacturing processes, the Louisiana Department of Transportation and Development (DOTD) is always looking for ways to reduce, reuse, and recycle materials used in the construction of our roads and bridges. With thousands of miles of portland cement concrete (PCC) pavements and hundreds of bridges across the state nearing the end of their useful service life, the opportunity to make use of this old concrete in building new roadways is too good to pass up. For over 20 years, DOTD has allowed the use of “crushed concrete,” officially designated as recycled portland cement concrete (RPCC), as an aggregate for use in base course as well as certain other aggregate applications. It started with large interstate route rehabilitation projects, typically with a plant set up on site. The material was removed from the existing roadway, hauled to the plant, processed, and put back into the new road bed, typically as an aggregate base course. When processed and placed properly, it is considered equivalent to a crushed stone material in base course applications.

Over the years, the industry has developed more mobile crushing and screening equipment, and suddenly contractors could economically recycle old PCC roadways on remote and much smaller projects than before. With significantly reduced hauling distances, it has become the aggregate of choice for most projects involving an old PCC pavement. But it didn't take long for suppliers to realize that other sources of concrete could also be crushed and used as aggregates. It became more difficult for DOTD to monitor the source and quality of the uncrushed “raw” material. A procedure was developed and implemented, becoming part of the Materials Sampling Manual as S801 - Source Approval, Sampling and Testing Program for Recycled Portland Cement Concrete. It was implemented in 1999 and is

*cont. on page 4*

## Plan to Prevent



In the midst of what may be considered the worst oil spill disaster in the history of the United States, it is deemed necessary to discuss measures that the environmental regulatory agencies have taken to prevent disasters of this nature from occurring. While it is impossible to plan for every potential incident, such as the malfunctioning equipment in the instance of the Gulf of Mexico oil spill, the US Environmental Protection Agency's (EPA's) Spill Prevention, Control, and Countermeasure (SPCC) plan and the Louisiana Department of Environmental Quality's (LDEQ's) Spill Prevention and Control (SPC) plan are regulatory measures currently required and will be spotlighted in this article. Although both plans are aimed at spill control, the LDEQ's version is a bit more stringent than the federal regulations.

*cont. on page 6*

# 2010 TCCE/TEA/TUG Conference

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DOTD hosted the 2010 joint conference for the AASHTO Technical Committee on Cost Estimating (TCCE), Transportation Estimators Association (TEA), and Transport Users Group (TUG) in Baton Rouge from October 21 through October 28. There were a total of 145 attendees from the transportation departments of 28 states and two Canadian provinces, the city of Baton Rouge, Texas Transportation Institute, American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Association (FHWA), Oman Systems, Architecture, Engineering, Consulting, Operations and Management Technology Corporation (AECOM), and InfoTech.

The TCCE/TEA portion of the conference included workshops on cost and risk management and national indexing and inflation and presentations on using construction records to enhance cost estimating, probabilistic cost estimating, national highway construction cost index, and highway construction materials trends and forecasts. The TUG portion of the conference offered attendees the opportunity to interact with InfoTech employees and fellow end-users of the Transport Suite of software. Presentations were given on the development and implementation of web Transport. The following Technical Application Groups (TAGs) met to discuss, recommend, and vote on enhancements to the various portions of Transport: construction management, field management, cost estimation, materials management, contract monitoring, civil rights & labor management, data warehousing, information technology, and preconstruction.

A presentation and tour of the John James Audubon Bridge was also offered. A special thanks to Wayne Marchand for helping set that up.

Some good Louisiana food and fun was thrown in for good measure. A Mardi Gras experience, complete with costumed revelers throwing beads and a Second Line, ended both the TEA and TUG receptions. The TUG attendees enjoyed a wonderful meal at Boutin's Cajun Restaurant.

The conference committee worked hard to put this conference together. Thanks go to Cassandra Collins (Materials Section) and Charles Nickel (Project Management Section) for their hard work in assisting with the planning of this conference. Special thanks to everyone who volunteered to work the conference: Cassandra Collins, Charles Nickel, Cookie Dauphine (IT), Micah Olivier (IT), Jason Dunlap (IT), Edward Prawitz (IT), Sarah Collins (IT), Joe Bond (61), Tim Thomas (61), Cathy Starnes (Contract Services), Susan Williams (Contract Services), John Wells (Contract Services), Sharon Knight (Contract Services), Masood Rasoulia (Contract Services), JR Connors (Materials), Jeff David (Contract Services), and Elnur Musa (Project Management). The conference would not have been a success without their help and dedication. 



Contributor: Beth Roberts, conference chair

## Warm Mix

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DOTD recognized that there are potential benefits of warm mix asphalt such as less fumes and emissions, less energy consumption, lower plant wear, lower compaction effort (which increases density), decreased binder aging, and extended paving days. DOTD is currently allowing the use of warm mix in their specifications as long as the mix meets Section 502 specifications with modified temperature requirements. To ensure the mix has good quality and durability, DOTD has permitted the following requirements until further study: the minimum mixing temperature must be at least 270°F; the mix temperature at the job site must be is no cooler than 50°F below job mix formula (JMF), and the minimum paving temperature must be at least 230°F.

There are two major categories of warm mix—foaming and chemical.

The foaming process is performed by injecting water into the liquid asphalt cement, which causes the liquid asphalt to foam and expand in volume. The foaming action helps the liquid asphalt coat the aggregates at a temperature in the range of 230-270°F. Foaming was used in Louisiana on US 171.

In the chemical process, the chemical is added along with the asphalt binder to help disperse the asphalt binder, which leads to better coating of the aggregates at a lower temperature. A chemical additive can lower the mixing temperature as much as 100°F. Chemical additives such as Evotherm and Rediset have recently been used in Louisiana on LA 3121 and LA 116. The Louisiana Transportation Research Center (LTRC) has initiated a research study on the use of warm mix in Louisiana.

Both methods have to be approved by the materials engineer during the approval process. A plant equipment diagram must be inspected and approved by the district lab engineer and a copy must be forwarded to the materials engineer, who has to approve the chemical additive on a case-by-case basis until DOTD gains knowledge and experience with each one. For each JMF, the laboratory test results for the proposed asphalt cement mixed with the proposed dosage of chemical additive, must be shown to meet specifications. 

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*2010 TCCE/TEA/TUG Conference photos*



## Recycling Portland Cement Concrete (continued from page 1)

undergoing significant revisions to coincide with the development of the new spec book.

At the heart of the procedure is the inspection of the plant by the district lab engineer (DLE). The equipment, stockpile configurations for both raw and crushed material, and methods used to remove steel and other unwanted debris from the raw material are evaluated and recorded in an inspection report. This report, along with the Preliminary Information Form for Aggregate Source Approval, is submitted to the Materials and Testing Section with samples of the aggregate as part of the source approval process.

The other primary component of this process is monitoring the material before, during, and after the crushing and screening process. Specifications require that ONLY portland cement concrete be incorporated into the process. This means that it is PROHIBITED to add soil or other granular materials to the stockpiles before, during, or after the crushing and screening process. The producers must cooperate with the district lab's and project engineer's staff to ensure proper monitoring of the material. Distinct, separate stockpiles must be maintained, with size limits stipulated in S801 based on the source(s) of the raw material. It is imperative that once a stockpile is sampled by DOTD for source approval and/or acceptance testing; no additional material be added to that stockpile. Upon completion of sampling, the producer must start a new stockpile if his production continues.

When a producer requests approval of a specific recycling plant for the first time, the DLE inspects the plant and, if necessary, makes recommendations to the producer on changes that may be needed to allow DOTD staff to be able to properly monitor the production and stockpiling processes. Once the producer has the plant operating properly and producing material that will meet the specifications, the DOTD inspector will sample and assign an identify-

ing number to the stockpile(s). Sufficient material for source approval testing and the required acceptance testing shall be obtained. Again, no material shall be added to the stockpile once the samples are taken.

The samples are taken to the district lab, and the acceptance testing required in Section 1003 of the specifications for the intended use of the material is performed. If all samples pass the acceptance testing, the remainder of the sample is shipped to the Materials and Testing Section for source approval testing. Source approval testing primarily focuses on the durability of the material for its intended purpose. Current specifications require Los Angeles Abrasion testing (AASHTO T96) and Magnesium Sulfate Soundness testing (AASHTO T104) to be performed on RPCC samples prior to approval. This testing can take several weeks to perform, depending on the number of samples currently awaiting source approval. It is important that contractors and producers recognize this time frame when scheduling placement of material.

Upon successful completion of the source approval testing, the plant is assigned a source code. With the implementation of SiteManager Materials, this source code will be called the Producer/Supplier code. This code will remain with this plant, even if/when it is moved to a new location. Each new stockpile will be assigned an identifying number when it is sampled. That number will be used to track it through the system, along with the plant's Producer/Supplier code. This process repeats itself as long as the plant remains at that location. The size of the stockpiles depends on the source and variability of the raw material. It is preferred that the individual stockpiles be made as large as the procedure allows. Numerous small stockpiles increase the number of samples that must be taken, which increases the time it will take for approval. If the plant is relocated,

*cont. on page 5*

# Greg Charles Retiring!

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Gregory P. Charles started work at DOTD's Materials Laboratory in June of 1979. He took his first training course (Standard Specs) that November and began climbing the career ladder with great ambition. It was with determination and hard work that he achieved success and promotion at every opportunity making it to Lab Manager in February of 1989. Over the next 20+ years, the titles for Greg's position changed, first to lab supervisor, then to Dual Career Ladder (DCL) in 2002. But through the course of his career, Greg could always be counted on for his depth of knowledge and willingness to advise those who were in need of information on soils or aggregates.

In retirement, Greg plans on continuing to pursue his love of collecting—adding to and managing his extensive displays of baseball paraphernalia, comic books, coins, champion wrestling belts, rocks, vintage cola bottles, and whatever else that might stir his interests. Spending time with his father will be a priority, and they may even move back to Palmetto, which is “home” for Charles senior.

Whatever he does or wherever he goes Greg will be missed here at the Materials Lab. We look forward to seeing him around though. He has promised to still be available for questions and answers and for that we are truly grateful.

Good luck Greg! 

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## *Recycling Portland Cement Concrete (continued from page 4)*

it must be inspected by the district lab engineer at the new location, and a new inspection report must be completed before material is stockpiled or sampled.

One important exception exists within the source approval testing process. When an existing DOTD pavement or structure is the sole source of the raw material used to create a stockpile, and DOTD is able to monitor its demolition, transport, crushing, and stockpiling in such a manner that the DLE or the professional engineer (P.E.) can provide certification to that effect, then the materials engineer administrator may, at their option, waive the requirement for the magnesium sulfate soundness testing. This will significantly

reduce the amount of time required to complete the source approval testing.

Recycled portland cement concrete can be a very good aggregate for several different uses in highway construction. As with all materials, its performance and value depend on how well the producer, contractor, and DOTD work together to execute the quality control and quality assurance programs developed for it. If properly executed, it can be an excellent example of DOTD's intentions to be a more efficient and environmentally friendly agency.

For more information on the process to produce or use RPCC for DOTD projects, visit our Web site, at <http://www.dotd.la.gov/highways/construction/lab/>. 

## Plan to Prevent (continued from page 1)

The origin of the SPCC dates back to 1988 when a Task Force was formed by the EPA in the aftermath of the Floreffe, Pennsylvania oil spill. The Task Force's main focus was to examine the federal regulations governing oil/petroleum spills from above ground storage tanks. As a result of this examination, it was proposed that EPA clarify certain provisions in the Oil Pollution Prevention regulations, establish additional technical requirements for regulated facilities, and require the preparation of facility-specific response plans (to be known as SPCC plans). These amendments to the Oil Pollution Prevention regulations were finalized in 2002. Moreover, it has since been amended to extend compliance dates and elucidate specific regulatory requirements.

In Louisiana, a SPC plan must be prepared by all facilities that do not transport oil/petroleum, but have an oil/petroleum storage capacity of 660 gallons for an individual container (a requirement only at the state level), an aggregate aboveground oil/petroleum storage capacity greater than 1,320 gallons for two or more containers, or a completely buried storage capacity greater than 42,000 gallons and a reasonable expectation of a discharge into or upon navigable waters of the United States or adjoining shorelines. These facilities are required to have some form of secondary containment, be visually inspected periodically, and have engineering specifications to provide adequate overflow equalization between tanks, structural stability, and appropriate sensors and alarms. Oil/petroleum storage includes all containers storing oil/petroleum at a facility that are equal to or greater than 55 gallons. The capacity of the containers, as opposed to the actual amount of oil/petroleum stored in the container, is the determining factor. Prevention, as opposed to reactive measures found in oil spill contingency plans, is the key to the SPC plan as it is to help prevent any discharge of oil/petroleum into navigable waters or adjoining shorelines.

Across the state of Louisiana, the DOTD meets the SPC regulatory criteria and, therefore, must comply with the regulations. To facilitate this effort, the Environmental Evaluation Unit (EEU), of the Materials and Testing Laboratory, is initiating steps to assist with the development and implementation of SPC plans. The first step of the developmental process is to assess the oil/petroleum storage program within each district of the DOTD. Surveys will be sent to each district to ascertain specific site information. Based on the results of the surveys, a determination will be made as to whether that particular DOTD facility will be required to have a SPC plan. From that point forward, the EEU will work closely with personnel at the district levels to prepare the SPC plans, which must also be certified by a registered professional engineer. The facility operator must review the plan every three years and amend it whenever there is a physical change affecting the potential for a spill, e.g., as taking down or adding tanks. The facility operator must also document the three year review and amend the plan to include more effective prevention technology as applicable. Although the SPC plan will be site-specific, certain elements must be included for each SPC plan to comply with the provisions of the regulations. The SPC plan should address operating procedures implemented to prevent oil/petroleum spills and also control measures to prevent oil/petroleum from entering navigable waters or adjoining shorelines.

In determining if your facility could discharge oil/petroleum into navigable waters or adjoining shorelines, the location of the facility must be considered in relation to streams, ponds and ditches, storm or sanitary sewers, wetlands, mudflats, sandflats, or farm tile drains. The distance to navigable waters, volume of material stored, worst case weather conditions, drainage patterns, land contours, soil conditions, etc. must also be taken into account and shall not include consideration of man-made features such as dikes, equipment, or other structures that

*cont. on page 7*

# MatLab Updates

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a. SPECIFICATION COMMITTEES – New committees are underway to write a new standard specification book. This is the time to review and send your valuable comments.

Here is the chairman of each committee:

Part 1	Ed Wedge
Part 2, 3, 4	Mark Morvant
Part 5	Chris Abadie
Part 6, 9	John Eggers
Part 7	Robert Mays
Part 8	Hossein Ghara
Part 10	Luanna Cambas
Part T	Peter Allain (this is a new section, “Traffic”)

John Wells is co-chair for each of these committees.

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b. American Society for Testing and Materials (ASTM) Standards - ASTM standards are available to everyone on the LTRC library Web site. AASHTO standards have been available on this Web site for a year. But, we still need to get the word out!

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c. TEST PROCEDURES – Here are the DOTD Test Procedures that were recently revised or created:

- TR 111 Abrasion of Lightweight Coarse Aggregate
- TR 119 Determination of Deleterious Materials
- TR 121 Fine Aggregate Angularity – FAA
- TR 411 Dry Preparation of Disturbed Samples for Test
- TR 413 Organic Material in Soil

*cont. on page 8*

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## *Plan to Prevent (continued from page 6)*

may serve to prevent an oil/petroleum discharge. For more information on the requirements of these regulations, you may contact the EEU directly or by reviewing the state and federal environmental regulations. The Louisiana SPC regulations are cited in the LAC 33.IX. 901-907 and can be found on the LDEQ's Web site at [www.deq.state.la.us](http://www.deq.state.la.us). The US EPA SPCC regulations are cited in 40 CFR 112 and can be found on the EPA's Web site at [www.epa.gov/oilspill](http://www.epa.gov/oilspill). 

Contributor: Nicholas Andre' Larks, environmental impact specialist 3

## MatLab Updates (continued from page 7)

TR 430 Determination of pH Value of Water, Soil or Lightweight Aggregate

TR 520 Determining Percent Weight of 2, 4-Dichlorophenoxy Acetic Acid in Herbicides

TR 521 Determining Percent Weight of MSMA Concentration in Herbicides Via ICP Atomic Emission Spectrometer

TR 523 Determination of Titanium Dioxide in White Waterborne Traffic Paint via X-Ray Diffractometer

TR 529 Percent Lead (Pb) in Paint Chips Via Induced Coupled Plasma (ICP) Spectroscopy

TR 530 Determination of Embedment Coating on Embedment Coated Glass Beads for Pavement Markings

TR 645 The Determination of In-Place Stiffness by the Dynamic Cone Penetrometer (DCP)

Cassandra Collins did the formidable task of compiling, formatting, reviewing, and distributing all of this! Richie Charoenpap will be taking over the next round of test procedure updates, acting as chair for this committee.

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d. NEW PRODUCTS – The New Products Evaluation Committee has created a spot on our website for Specialty Products. Check it out at [www.dotd.la.gov](http://www.dotd.la.gov), then go to Construction, then to Materials, then to New Products Evaluation, and then to Specialty Products. These products have been evaluated by the New Products Evaluation (NPE) Committee and are believed to have merit. However, they are not appropriate for the standard specifications or qualified products list, due to their specialized nature. District designers, maintenance and construction personnel, and contractors may find this listing useful in addressing challenging and unusual issues. DOTD will be adding many more materials in the future. Bert Wintz, Theresa Taylor, and Jerry Mason of IT did a great job!

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e. SiteManager Materials – SiteManager Materials (SMM) is in the testing phase at the Materials and Testing Section. Test values obtained in SMM are being compared to the MATT System with good results. All laboratory test templates have been completed and specification values are being assigned to every test template field. District laboratory and field templates are in the final stages of completion. SiteManager Materials implementation is being postponed due to the recent EPR implementation and in order to accommodate the extensive changes being proposed in asphalt specifications.

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f. ASPHALT – There are now new specifications\* for thin lift asphalt, which include a “Fine Mix,” “Dense Mix,” “Coarse Mix,” and “Open Graded Friction Course.” This specification will be Section 501 in the new spec book. Chris Abadie and Bill King of LTRC are the authors.

The new Asphalt Memo provides direction for district designers when selecting asphalt mixture types. The Asphalt Memo is at [www.dotd.la.gov](http://www.dotd.la.gov) under Dept Policies/Manuals, Asphaltic Pavement Design, and Specification Policy and Standards Memo.

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g. INORGANIC ARSENIC IN GLASS BEADS - In the 2010 regular session, the Louisiana Senate enacted Senate Bill No. 402 prohibiting the manufacturing, sale, or use of glass beads on highway

*cont. on page 9*

## MatLab Updates (continued from page 8)

markings if the beads contain more than 75 parts per million of inorganic arsenic. The bill also stated that the test method shall be based on EPA Method 6010B in conjunction with EPA method 3052 for sample preparation. All beads that were purchased for maintenance before August 15, 2010 will have to be tested before use. Due to the harmful chemical used in the testing and equipment availability, the Materials Lab could not perform the test procedures as stated in the new law. The Material Lab Chemical unit had to locate an independent lab in a short amount of time to perform the tests as stated by law. DOTD employees worked hard on finding a qualified independent lab. A lab was located and all glass bead samples were sent to the lab before August 15. This effort saved the department an estimated glass beads value of \$472,000. Special thanks to Gang 050!

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h. CONCRETE – New specifications\* for concrete will allow less air content than was previously required:

- a. 2 – 7% for Class AA(M), Class AA, Class F, Type B, and Type D
- b. 6 – 9 % for Class Y
- c. 0 – 7% for Class A(M), Class A, Class D, Class P(X), Class P(M), Class P, Class S, Class M, Class R, and Type E

John Eggers of HQ Construction was the author.

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i. CONCRETE ADMIXTURES – New specifications\* and a new Qualified Products List (QPL)\* Type have been created to allow for a new category of admixtures called, “Specific Performance” admixtures. They help improve the rheological properties but do not fit the categories of water-reducing, air-entraining, or set-accelerating. This type of admixture must comply with ASTM C494. Gang 033 put this spec and QPL change into action!

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j. STEEL – In an effort to improve delivery time for steel bolts, nuts, and washers, DOTD is now testing physical and chemical properties simultaneously. The down side is DOTD can't retest the physical properties if something fails. For any failure, a check sample will be requested. The Materials Sampling Manual defines a check sample as two samples to replace the one that failed. Good idea, Gang 033!

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k. PROFILING –Melinda Braud has done an excellent job of writing a user guide on profiling titled, “Profiling Highways”! It gives step-by-step instructions for what to do to certify profilers, set up profilers, check settings, view the data, and to analyze the data. Request a copy today—melinda.braud@la.gov. She is also available to train at the districts!

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l. ENVIRONMENTAL EVALUATIONS UNIT - Please join the Environmental Evaluation Unit of the Materials Lab in welcoming its two most recently hired environmentalists to the Department: Abby Marston and Kimberly Carter. Abby has primary responsibility for the Department's Active Underground Storage Tanks (UST) Program, while Kimberly is primarily responsible for the Department's Solid and Hazardous Waste Program. So, a big WELCOME is given to Abby and Kimberly.

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*cont. on page 10*

## MatLab Updates (continued from page 9)

m. PRIVATIZATION –Kim Garlington, District 08 Construction Coordinator has been tasked with writing the “Request for Qualifications” for a privatization pilot for District 02 and District 08. This is on hold for now—pending asphalt specification development.

n. DISTRICT LABS – Congratulations to Marcia Granger who has taken over as District 03 lab engineer. She has been of tremendous support to the MatLab for many years with her asphalt and spreadsheet expertise. Jason Winget is an acting lab engineer for District 04 – welcome aboard!

\*As always, check exact contract requirements for each project. Time is required for new specifications to be implemented into all projects.

Contributors: Nicholas Andre’ Larks, Bert Wintz, Nancy Hill, Richie Charoenpap, Tuan Tran, and Joubert Harris

## Quality Matters

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