CREATEs Research Projects, Workforce Development and Outreach Programs

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Laboratory-based research studies

- Evaluating green technologies, such as warm mix asphalt and reclaimed asphalt binders
- Determining laboratory performance of different types of rejuvenators in hot mix asphalt
- Developing ways of incorporating a broad range of polymers in binders in collaboration with refineries to increase performance and reduce cost.
Past Research Projects

- Evaluating new design methodologies for NJDOT, FHWA, and NCHRP
- Developing construction and pavement design specifications
- Sponsors include: FAA, FHWA, FL DOT, NCHRP, NJDOT, RIDOT, WI DOT, refineries, polymer and rejuvenator manufacturers
Industry Projects

- Evaluation of performance of waste derived oils in neat and polymer modified binders
- Evaluation of degree of blending of RAP and binders with various rejuvenators
- Chemical analysis (SARA and GPC) of binders to determine impact of adding rejuvenators or lighter fractions
CREATEs Fellowship Program

Steve Buzby
Gabriel Wickizer
Samuel Feldman
Darren Weiss
Zachariah Wenig
Ryan Kruger
Marissa Ciocco
Dylan Livingston

DVEWC Awards
CREATEs Fellowship Program

- Goal is to provide hands-on experience to undergraduate students (freshman to seniors) in laboratory and the accelerated testing facility.
- We have 20+ fellows in the last three years.
- Supervised by Faculty, research associates and lab managers.
- Broad range of experience.
- They get a first preference for interview from sponsor
Objective: Impact of different cross-linking agents on the rheological and morphological properties of PMAs.

Two cross-linking agents (an aromatic oil and silicon oxide) and SBS Modified PG 70-22 were used.

Dosage Rates: 2 and 4% by weight of virgin binder.

Morphology: Florescent microscope.

Rheology: Dynamic Shear Rheometer (DSR) & the Multiple Stress Creep Recovery (MSCR) tests.
Recently Completed Research

Alternatives to Nuclear Density Testing

- **Objective:** Replacing the NDG with non-nuclear alternative method(s) during the compaction of soils and dense graded aggregates.
- Briaud compaction device (BCD), light weight falling deflectometer (LWD), and dynamic cone penetrometer (DCP).
- A procedure for compacting large soil samples in the lab was also developed as part of this study.
Objective: Investigate the environmental impacts of unbound reclaimed asphalt pavement (RAP) while it is freshly processed and after subjecting it to an accelerated weathering process.

Weather RAP in an environmental chamber at Columbia University

Screen leachate from RAP using two toxicity testing assays:

- Microtox® assay
- Japanese Medaka fish early life stage larval assay
On-Going Research

Evaluation of Incinerated Waste Aggregates

- **Objective**: Evaluate the performance of hot mix asphalt (HMA) incorporating aggregates obtained from incinerated waste.
- Conduct mix design according to Superpave procedures.
- Evaluate volumetrics and performance:
  - Bulk and Rice Specific Gravities
  - APA
  - OT

Sponsored by Industry Partner
On-Going Research

HMA Characterization using the Simple Visco-Elastic Damage Model (VECD)

- **Objective:** Evaluate the effect of specimen geometry on fatigue predictions using PP-VECD approach in smaller-medium NMAS and binder rich mixtures.

- Four mixtures:
  - 9.5ME, 12.5 SMA, HPTO, and BRIC.

- Laboratory Testing:
  - **AASHTO TP 79:** Dynamic Modulus and Flow Number for Asphalt Mixtures Using AMPT
  - **AASHTO TP 107:** Damage Characteristic Curve of Asphalt Mixtures From DTC Cyclic Fatigue

AMPT user group Collaboration with FHWA
On-Going Research

Rejuvenator Oil Dosage in High Reclaimed Asphalt Pavement (HRAP) Mixtures

- **Objective:** Determine the impact of mixing procedure of rejuvenator oil dosage for HRAP (50%) mixtures using mechanistic characteristics of Low RAP binder mixtures.

- **Laboratory Testing:**
  - **Rheological Properties:** DSR, BBR, MSCR
  - **Mixture Testing:** APA and OT
On-Going Research

Fuel Resistant Asphalt Binders

Objective: Develop fuel resistant asphalt binders using bio-polymers.

Potential Applications:
- Airport hangers and taxiways
- Parking pavements
- Drive-ways
- Gas stations

Laboratory Testing:
- **Rheological Properties:** DSR, BBR, MSCR
- **Mixture Testing:** APA and OT
Identify Appropriate Pavement Preservation Strategies for RIDOT

- **Objective:** To develop optimal timing for different pavement preservation strategies utilizing last six years of pavement performance data and PAVE ME data (using RI traffic distribution)

- These strategies are:
  - Crack seal and Rubberized Chip Seal
  - Level and overlay
  - Stress Absorbing Membrane Interlayer and
  - Paver Placed Elastomeric Surface Treatment
  - Reconstruction

- We have developed a software that can determine pavement strategies based on triggers established using RI Pavement Management System.
Upcoming DOD Projects
Geogrid Reinforced Airfield Pavements

- Lab and full-scale accelerated pavement testing evaluation of the potential benefits for geogrids.
- Main usage: reinforcing material in heavily trafficked airfield flexible pavements.
Pavement Preservation Alternatives

- Determine the most optimal time at which pavement preservation treatments can be applied.
- Develop cost-effective and efficient pavement preservation methods and technologies
Sustainable Pavements Using RCA

- Develop pavements using RCA in Portland cement concrete.
- Use binary and ternary combinations of Portland cement and supplementary cementitious materials (SCM) and lowering of water-to-binder ratios (w/b).

Lead by: Dr. Gilson Lomboy and Dr. Douglas Cleary
Evaluation of Cold In-Place Recycling

- Cold In-Place Recycling (CIPR) technologies implemented by state Departments of Transportation (state DOTs).
- Conditions at which CIPR can be used.
- Laboratory and full-scale performance of selected CIPR material combinations.
Outreach and Workforce Development Programs
Certification Programs / Workshops

- Developing Laboratory and Field inspector Soil Certification Programs for consultants

- Pavement design and rehabilitation workshop for county engineers
National Summer Transportation Institute

- 25 High school students from
- Four weeks at CREATEs/Rowan (07/24-8/19)
- One week each on Air, Land, Maritime and Safety
- Hands-on experiments, talks from leaders, site visits to several places, such as PANYNJ, asphalt plant, FAA Tech Center, ACE Academy

For more information: www.rowan.edu/creates
CREATEs: Open Discussion
Ideas

- Research products valuable to different state agencies from lab/accelerated pavement tests
- Evaluation of specialty mixes through accelerated pavement testing
- Workforce development / outreach programs
Thank you from the CREATEs team

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