Florida Institute of Technology

Ground Tire Rubber (GTR) as a Stabilizer for Subgrade Soils

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August 16, 2012

Problem Statement

- GTR supplies may increase when not used in Hot Mix
- Are other highway applications possible?

Outline

- Objectives
- Task overview
- Progress

Objectives

- Determine the key pavement engineering properties (moisture-density and LBR) of GTR and stabilized Florida subgrade soil blends

Tasks

- Task 1 Literature Search
- Task 2 Determine GTR Sources
- Task 3 Determine Subgrade Sources
- Task 4 Test Program Development
- Task 5 Data Base Development
- Task 6 Testing Program Sampling
- Task 7 Testing
- Task 8 Data Reduction
- Task 9 Data Analysis
- Task 10 Technology Transfer

Literature Search

- Engstrom and Lamb. Using Shredded Waste Tires as a Lightweight Fill Material for Road Subgrades, 1994.
- Papp, Maher, Baker. Use of Shredded Tires in the Subbase Layer of Asphalt Pavements, 1997.
  - 0, 10, 20, 30, 40% GTR.
  - Sizes: 2 in, 1 in, 10 mm (3/8 in).
  - Soil: sand with gravel.
- Ngo and Valdez Creep of Sand-Rubber Mixture, 2007.

Literature (continued)

- Speir and Witczak. Use of Shredded Rubber in Unbound Granular Flexible Pavement Layers, 1996.
  - 0, 8, and 15% GTR
  - Size: nominal 3/8 in (60% - 70% retained)
  - Soil: sand and graded aggregate base (top size 1 inch).
- Shalaby and Khan Temperature Monitoring and Compressibility Measurement of a Tire Shred Embankment, 2002.

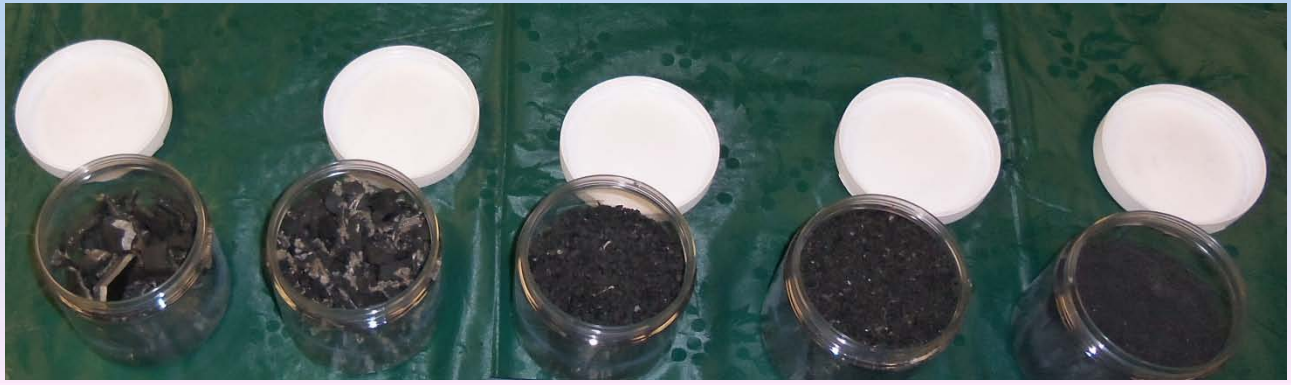
Literature (continued)

- Cetin, Fener and Gunaydin Geotechnical Properties of Tire - Cohesive Clayey Soil Mixtures as a Fill Material, 2006.
- Carraro et al. Beneficial Use of Scrap Tire Rubber in Low-Volume Road and Bridge Construction with Expansive Soils, 2008.

Preliminary Test Plan

- 3 soil types (FDOT selecting)
  - A-3
  - A-2-4
  - Borderline A-3/A-2-4
- 1 FDOT approved GTR supplier
  - 1 inch
  - 3/8 inch
  - #40

GTR Plant Site Visit



Tests

- Blend of: 0%, 2%, 4%, 8%, 12%, 16%, 24% GTR by volume
- LBR
- Permeability
- Consolidation
- Creep
  - Anticipate sands will show little to no creep, allowing short tests.
  - Not certain about higher fine content materials.

Tests (continued)

- Resilient modulus: 2 specimens of each soil/rubber combination, 60 total specimens

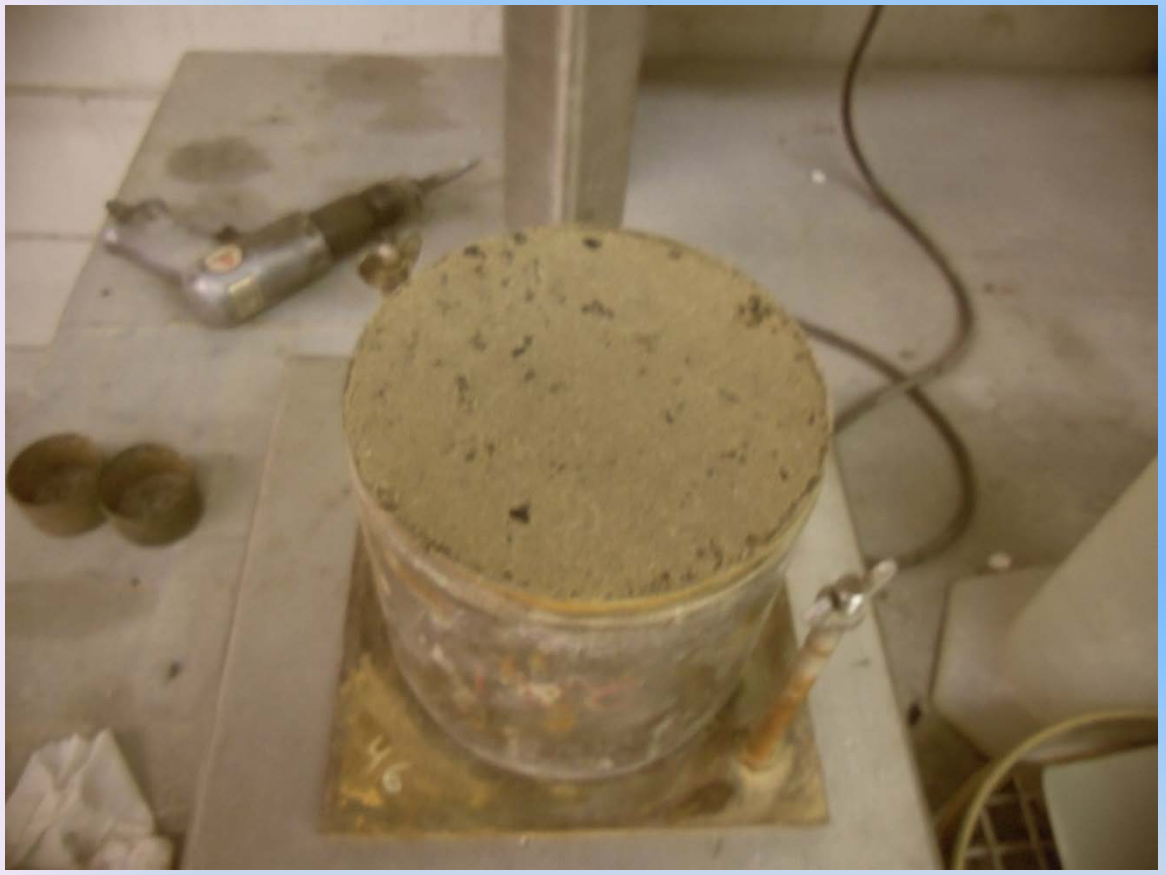
Preliminary Testing
#4 < GTR < 3/8”

Blending

90% A-3 Sand and 10% GTR
(moisture content =10 %)

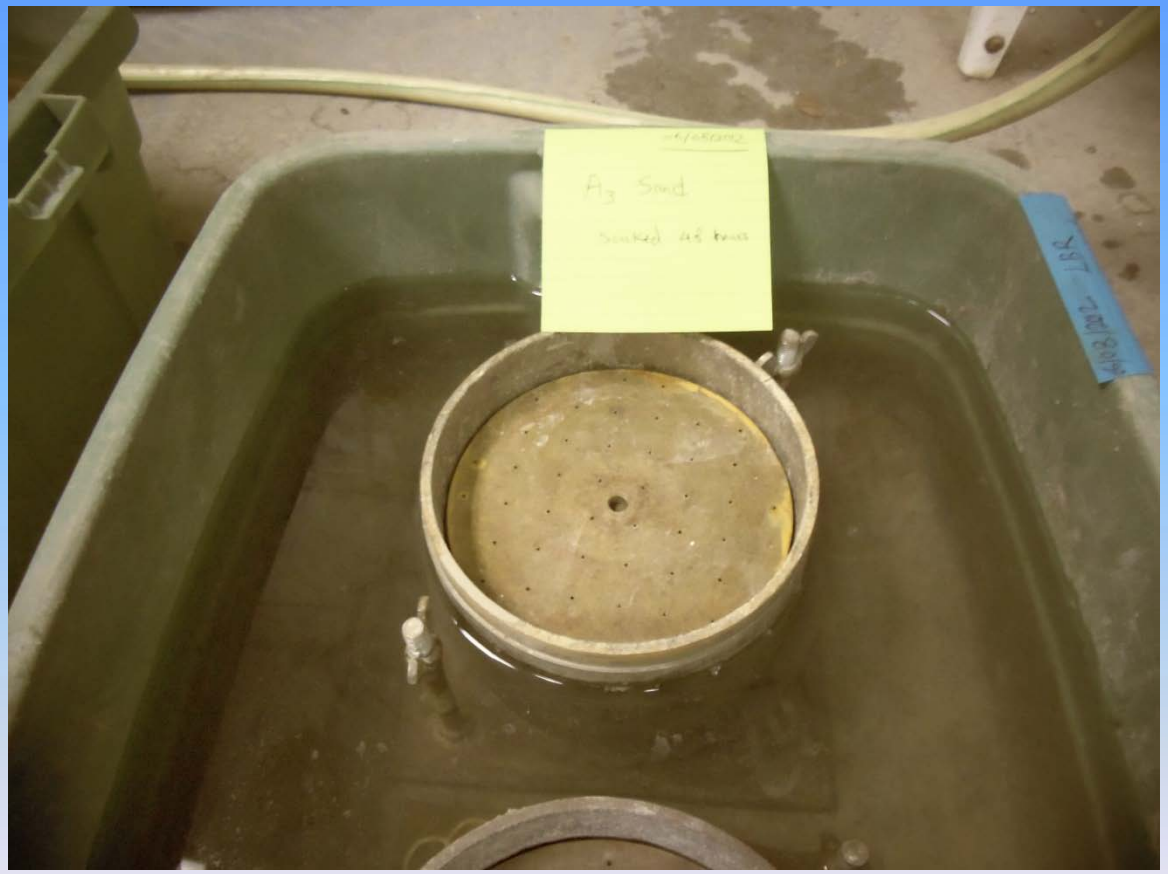
Modified Proctor Compaction

Compacted Specimen



90% A-3 sand/
10% GTR blend
(MC = 10%)

Soaked for 48 hours

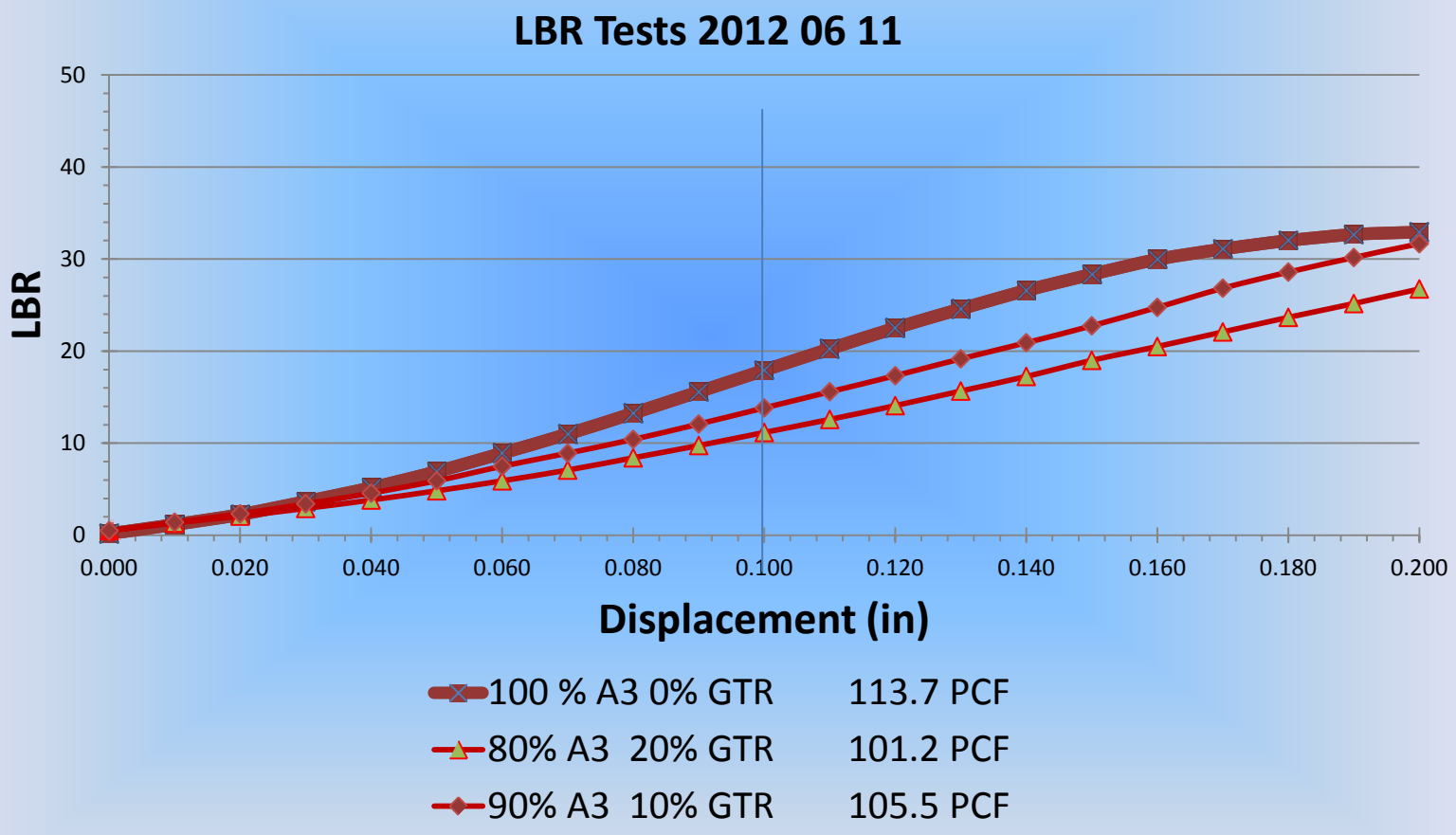


Performance Tests

- Limerock Bearing Ratio (LBR)
  - 15lb surcharge for subgrade

Specimens after LBR test (clockwise from top left 0%, 10%, 20% GTR)

Soaked LBR for A-3 Sand,10%/90% and 20%/80% Blends (GTR/Sand)



Densities and LBR

Material	Density (pcf)	LBR
100% A-3	113.7	18
90% A-3 10% GTR	105.5	14
80% A-3 20% GTR	101.2	11

Summary

- Objectives
- Task overview
- Progress
- Questions?