

Innovative Asphalt Products




SEAUPG – Wilmington, NC
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Innovative Asphalt Products


- Fuel Resistant HMA
- Colorless Asphalt Pavement

Background




- Airports experience jet fuel spills on aprons and taxiways
- Fueling operations
- Aircraft sitting in queues
- Softens (weakens) asphalt
- Causes permanent deformations and failures

Fuel Resistant Pavement Sealers



- Coal tar sealers are most commonly used to protect Hot Mix Asphalt pavements from fuel damage
- Different coefficient of expansion for coal tar causes substantial alligator cracking within 2-3 years
- Cracking allows fuel penetration - short service life

Fuel Resistant Pavement Sealers




- Coal tar sealers are carcinogenic
 - MSDS – "Unusual Chronic Toxicity: May cause cancer of the skin, lungs, kidney and bladder."
 - Adding carcinogenic material to pavement that may be recycled – future exposure
- Austin, TX and United States Geological Survey Report
 - 90% of PAHs in waterways may come from runoff from coal tar sealed pavements
 - Austin has outlawed use
 - Coal Tar sealers are outlawed in California

Development of Fuel-Resistant PMA




- Kuala Lumpur Airport specified jet fuel resistant asphalt pavements for new construction in 1995
- Ooms Avenhorn Holding developed a Fuel-Resistant PMA for airport usage
- Objective – add fuel resistance to SBS PMA technology without sacrificing performance
- Contains no Coal Tar

Development of Fuel-Resistant PMA




- Specifications required compacted mix samples to be immersed in jet fuel for 24 hours.
- Average weight loss of the specimens must be less than 1.5%

Development of Fuel-Resistant PMA

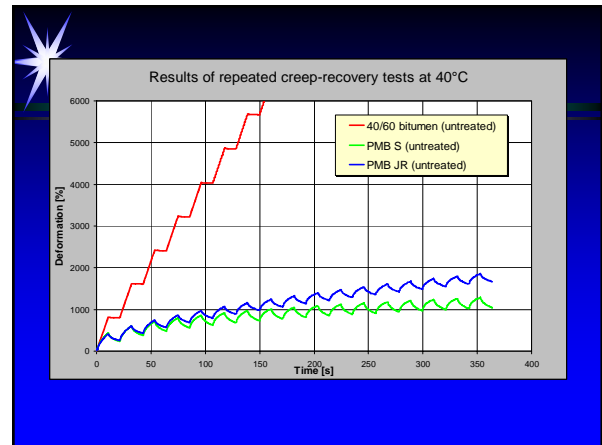


- Standard Hot Mix Asphalt mixture may lose up to 10% weight from 24 hour soak in jet fuel
- Standard Polymer Modified Asphalt (PG 76-22) may lose up to 5.0% weight after 24 soak in jet fuel
- Fuel Resistant PMA – typically lose less than 1.0% weight loss

Asphalt Binder Testing



- **Repeated Creep-Recovery Test**
 - Evaluate binder's resistance to rutting
 - Apply 10 kPa load for 11 seconds, followed by 11 second recovery period
 - 17 Creep-Recovery cycles were applied at 40°C
 - Deformation was continuously recorded

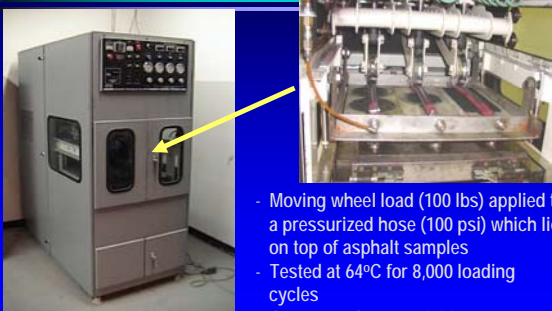


Laboratory Testing - Mixture

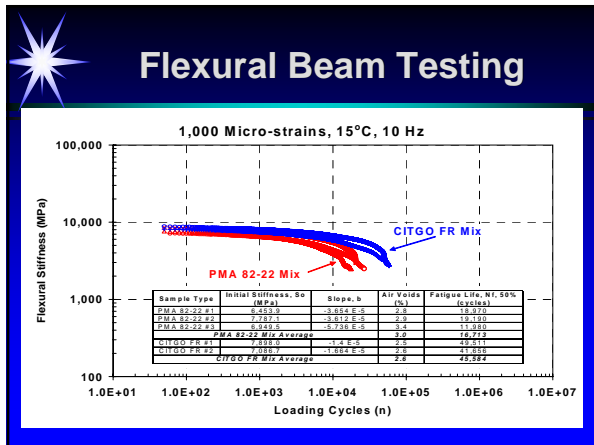
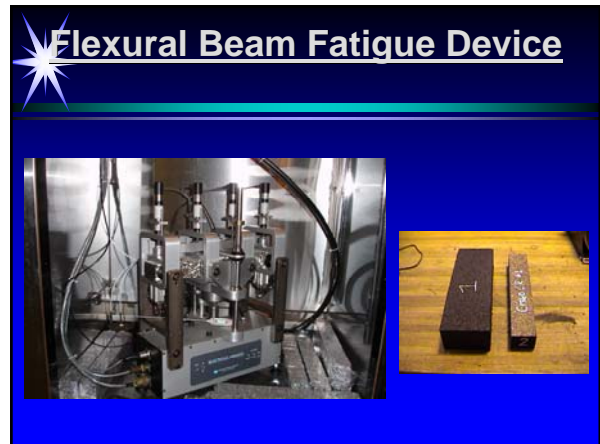
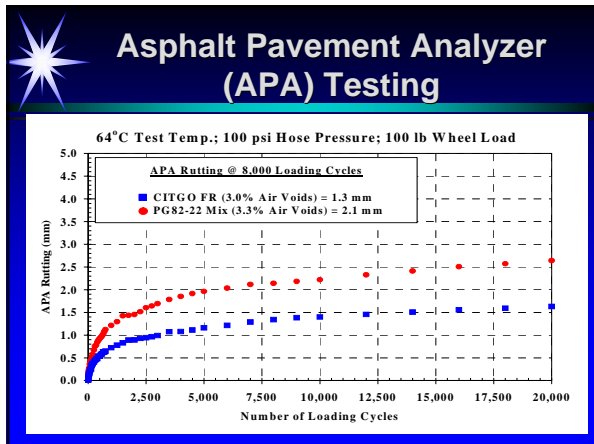


- Compared original hot mix asphalt (HMA) with mix submersed in jet fuel
- Compared unmodified PG 70-22 with PMA PG 76-22 and fuel resistant PMA
- Tested resistance to rutting and cracking

Asphalt Pavement Analyzer (APA) - Rutting Evaluation of HMA



- Moving wheel load (100 lbs) applied to a pressurized hose (100 psi) which lies on top of asphalt samples
- Tested at 64°C for 8,000 loading cycles
- Computer data acquisition system



Fuel-Resistant PMA Usage

- > Fuel Resistant PMA Airport Projects Around the World
 - > Cairo, Egypt Airport – Reconstruction of main runway – 1997 (220,000 tons)
 - > Aden, Yemen Airport – Reconstruction of main runway – 1999-2000 (40,000 tons)
 - > St Maarten Airport – Reconstruction of apron – 2001 (12,000 tons)
- > All projects report excellent performance to date


Fuel-Resistant PMA Usage

- > First Fuel Resistant PMA Construction Project in US – La Guardia Airport – 2002
 - > Test section on taxiway – 450 tons
 - > Problem with fuel contamination – 6 ins.
 - > Milled out bad material – replaced with PMA base and FR top

Fuel-Resistant PMA Usage – La Guardia


- > Placed Fuel Resistant PMA at La Guardia Airport August 2002
- > Graded as PG 94-22
- > Pumped into plant at 330°F
- > Produced mix at 340°F
- > Placed in silo for 4 hours

Fuel-Resistant PMA Usage – La Guardia




- > Paved at 330°F
- > No problems with placement
- > Handwork and longitudinal joints look good
- > Density achieved
- > Paving crew could not see a difference in Fuel Resistant PMA material from standard PMA

Fuel-Resistant PMA Usage – La Guardia




- > Inspected fuel resistant pavement in October 2003
- > Excellent condition
 - > No rutting
 - > No cracking
 - > No surface deterioration

Fuel-Resistant PMA Usage




- > Port Auth. airports, normally used coarse mixes to prevent rutting
 - > Low AC %
 - > Prone to segregate
 - > Durability
- > The 1 ½" wearing course with FR provided both fuel resistance and better surface characteristics
 - > Use ½" Max. P-401 mix
 - > Design at 2.5% air voids

Fuel-Resistant Usage – Logan Airport




- > In June 2004 - 1300 tons of fuel resistant mix was placed on Taxiway N and Runway 4L-22R at Logan Airport - Boston

Fuel-Resistant Usage – Logan Airport




- > FR Asphalt graded as PG 94-22
- > 1/2" P-401 mix designed at 2.5% air voids
- > 7% asphalt content design target
- > Lab rut testing at WPI showed 0.70mm rutting on this mix

Fuel-Resistant Usage – Logan Airport




- > Mix produced in drum plant at 340°F
- > Placed at 325°F without difficulty
- > Met density specification
- > Excellent surface appearance

Fuel-Resistant Usage – Logan Airport




- Revisited Logan in October 2004 & October 2005
- Previous HMA materials on this taxiway exhibited plastic flow (rutting and shoving) after one summer

Fuel-Resistant Usage – Logan Airport

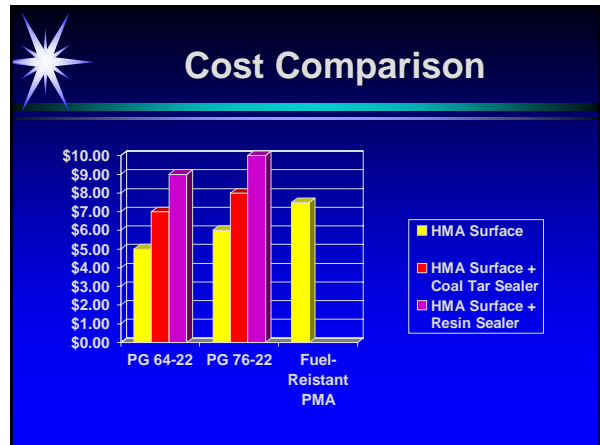


- October 2005 – after 2 summers
- No rutting
- No raveling
- No cracking
- “Grooving looks like the day we cut them”

Fuel-Resistant Usage – US - Projects



- Port Auth. NY&NJ - La Guardia Airport
- Boston, MA - Logan Airport
 - Alleyway Project – Summer 2006
- Charlotte, NC - Douglas International Airport
 - Taxiway Project – Summer 2006
- Florida DOT
 - I-95 Truck Inspection Station – Summer 2006




Cost Comparison

- Compared to surface treatment applications
 - FR mix is 1½” thick – much more durable
 - FR mix is part of the structural layer of the pavement
 - Surface Mix can be finer and more uniform and have a higher binder film thickness due to the properties of the FR binder

Other Applications – FR


- Truck stop fueling areas
- Highway weighing stations
- NYC restaurant district

Fuel-Resistant PMA Usage



- **Developed generic spec. for fuel resistant HMA**
 - **Minimum PG 82-22 PMA**
 - Min. 85% Elastic Recovery
 - Pass separation test
 - **Standard test method for mix fuel resistance**
 - **1/2" Max. mix**
 - 50 blow / gyration mix design
 - Design at 2.5% air voids
 - Pass mix fuel resistance test

Fuel Resistant PMA Summary



- FR mix provides excellent resistance to permanent deformation and cracking
- Workability allows contractors to use standard construction practices
- Can be very cost effective for certain applications

Questions?