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Assorted Asphalt Issues

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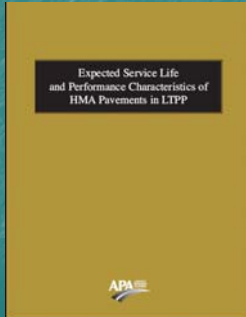
Topics:

- Asphalt pavement performance, PMA
- Binder supply
- Asphalt producer issues

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Asphalt Pavement Performance

- APA funded study of LTPP test sections
- Similar to FHWA study evaluating the performance of overlayed asphalt pavements
- Evaluated six distress types, estimated service life



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Results, Expected Service Life

Table 3. Expected Service Life Based on Different Levels and Magnitudes of Distress

Distress Type	Expected Service Life based on a 50% Probability of Occurrence, years	
	Low Distress Level	Moderate Distress Level
Fatigue Cracking	22	25
Longitudinal Cracking in Wheel Path	22	28
Transverse Cracking	19	22
Longitudinal Cracking Outside Wheel Path	18	22
Rutting	17	22
Roughness or IRI	20	22

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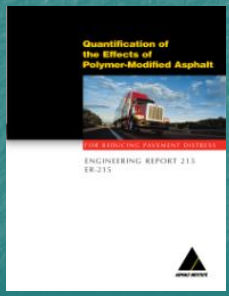
Main Conclusion

- Asphalt pavements last through their design life without requiring rehabilitation when designed and constructed properly
- Study did NOT account for:
 - Premature failures, pavements "designed with the pocketbook"
 - New technologies (Superpave/PG binders, PMA, SMA, MTV's, etc.)

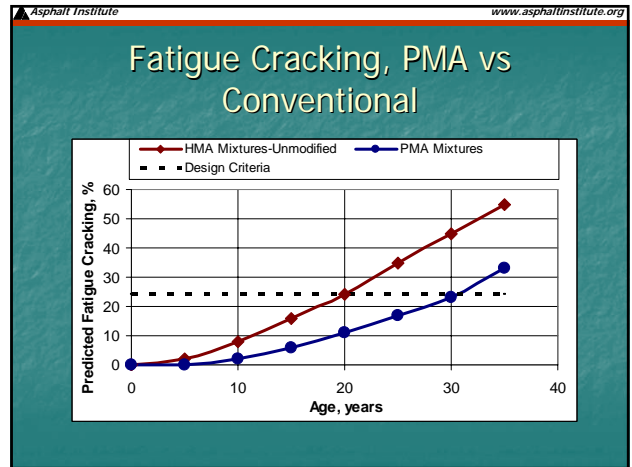
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Asphalt Institute ER-215

- Asphalt Institute Affiliate Committee/AMAP study of the performance of HMA pavements using polymer modified asphalt
- Used data from a variety of monitored projects where PMA and unmodified binders were used



Site Feature	Condition Description	Estimated Increase in Service Life, Years ⁽¹⁾
Foundation Soils	Non-Expansive Soils; Coarse-grained soils	5 - 10
	Expansive Soils; Moderately to Highly Plastic soils (PI>35)	2 - 5
	Frost Susceptible Soils in cold climates; Moderately to highly frost susceptible (Class 3 and 4) ⁽²⁾	2 - 5
Water/Table Depth	Deep	5 - 10
	Shallow; Adequate Drainage	5 - 8
Traffic	Stop & Go/Intersections	5 - 10
	Thoroughfares	3 - 6
	Heavy loads/Special Containers	5 - 10
	Moderate Volumes	5 - 10
Climate	Hot	5 - 10
	Mild	2 - 5
	Cold	3 - 6
Existing Pavement Condition	HMA Good Condition	5 - 10
	HMA Poor Condition; extensive cracking ⁽³⁾	1 - 3
Existing Pavement Condition	PCC/JPCP Good Condition ⁽³⁾	3 - 6
	PCC/JPCP Poor Condition; faulting & mid-panel cracking ⁽³⁾	0 - 2

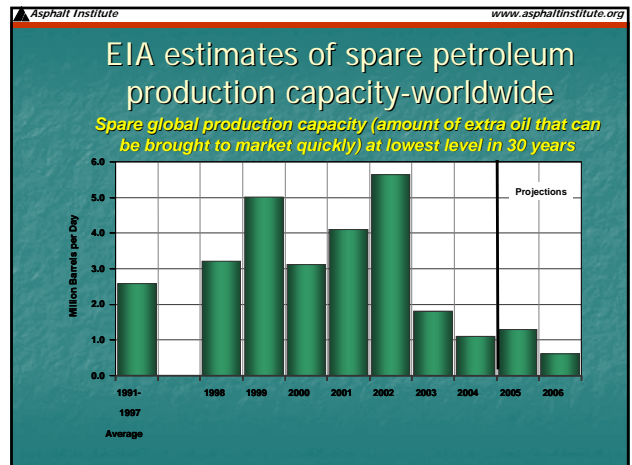
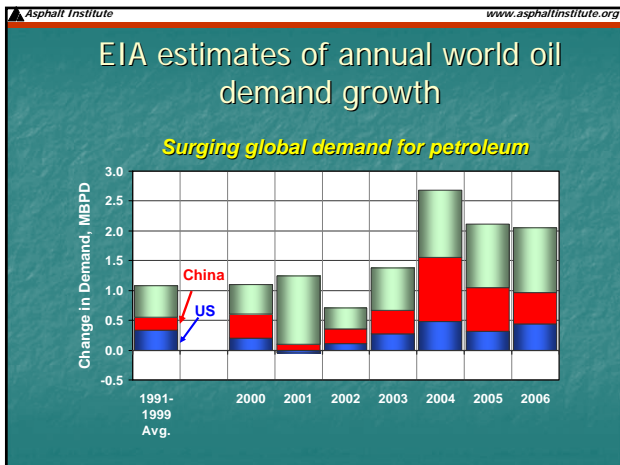


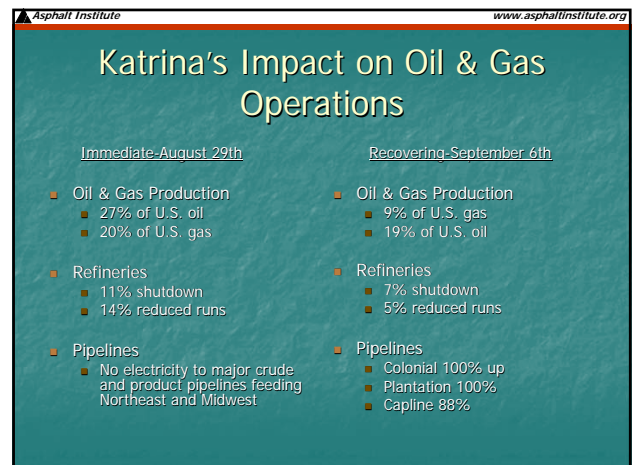
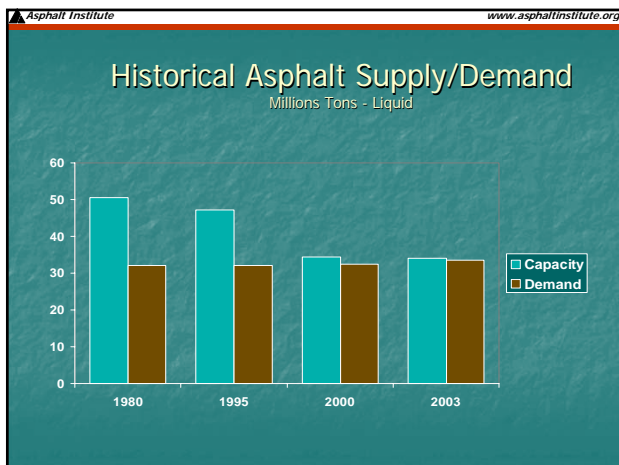
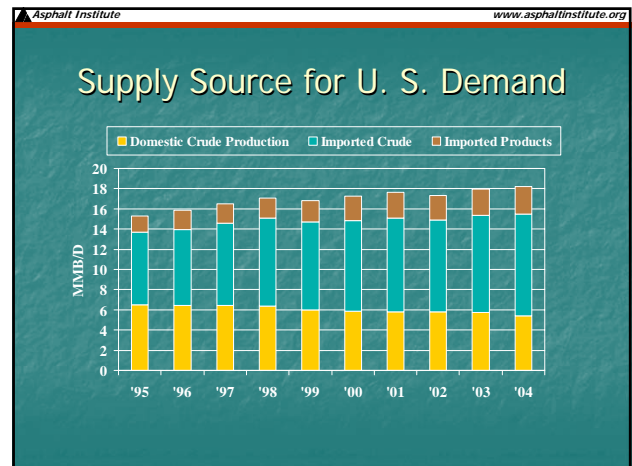
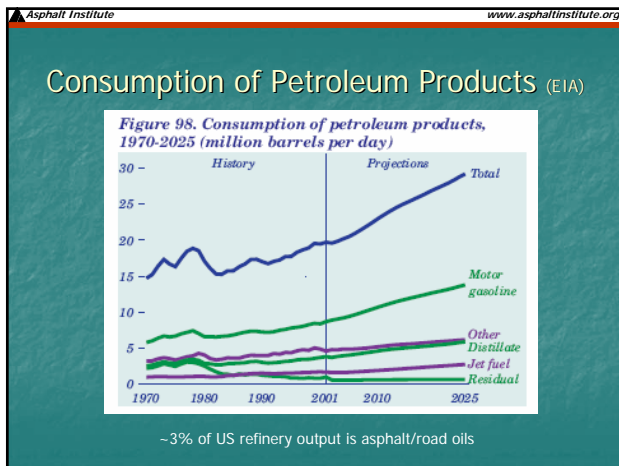
Conclusion and Comment

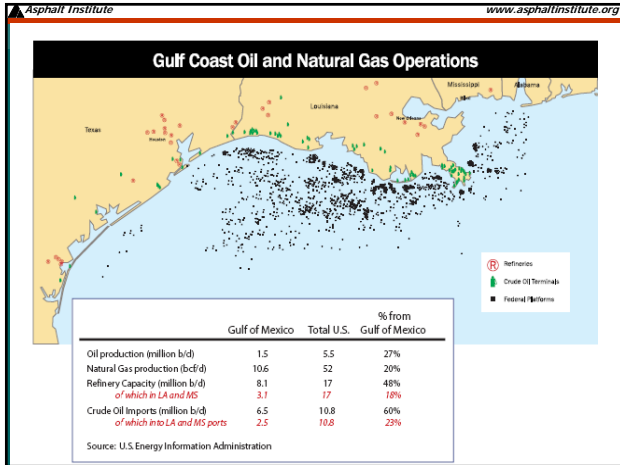
- PMA can significantly extend the service life of HMA pavements
 - May be able to assume a 25% extension in performance period compared to neat binders
- When developing local calibration for the MEPDG, agencies should segregate pavements with PMA within their performance database

Binder Supply Issues-Crude Oil

- Crude oil prices are set in the global marketplace by the forces of supply and demand
- Oil-producing nations are producing at near full capacity, leaving very little surplus (< 1% of oil demand)
 - 65.9% of US crude oil supply is imported (July 2005)
- Little "slack" means that the price of refined products is hypersensitive to changes in the production/refining/distribution chain

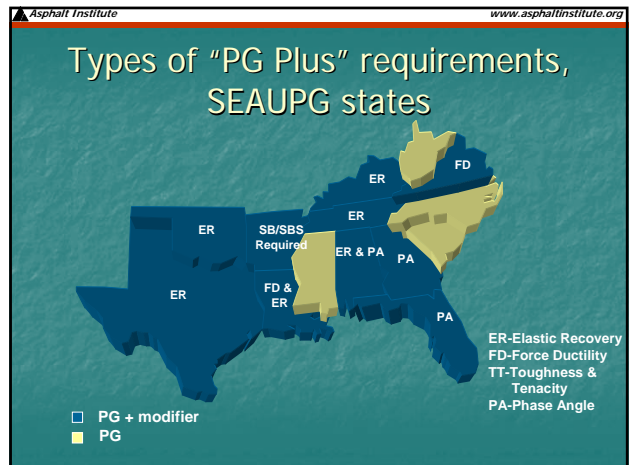
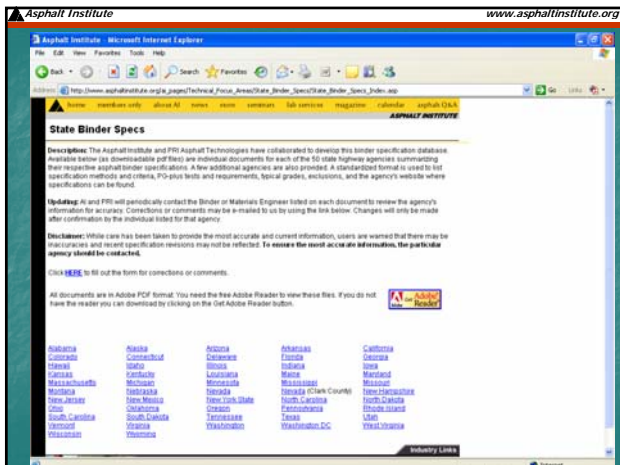
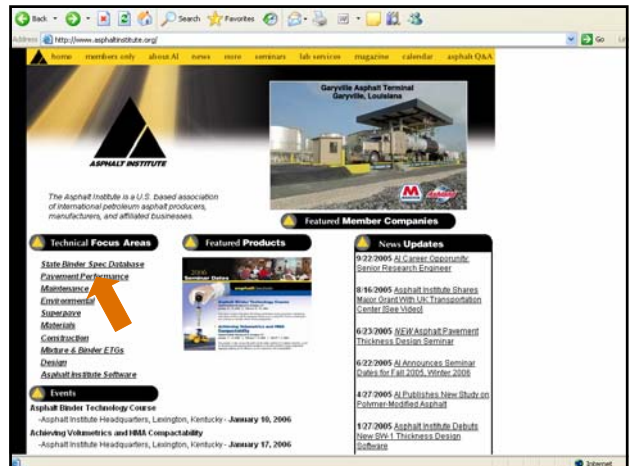






- ### Things that can affect regional asphalt binder supplies
- Ability to get crude into refinery
 - Ability to operate refinery
 - Power, nitrogen, gas
 - Are all areas of the refinery functional?
 - Ability to move asphalt from the refinery to terminals serving the HMA market
 - Terminal availability
 - Road/rail/port conditions
 - Specification differences (for multi-state suppliers)
 - PG+ (or is it X?), liquid anti-strip, silicones, spot test, etc.

- ### What can specifiers do to help?
- Establish common regional specifications & certification requirements
 - Agree on a single PG plus test
 - Elastic recovery (ideally, AASHTO T301 with defined test criteria)
 - DSR (looks promising)
 - Binder technician certification
 - Consistent binder certification requirements within the region

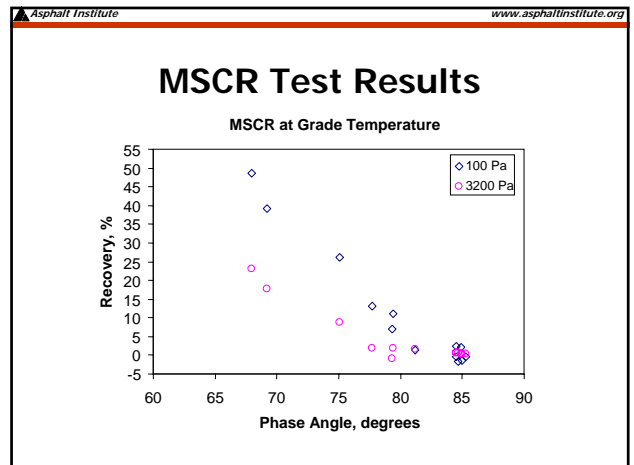
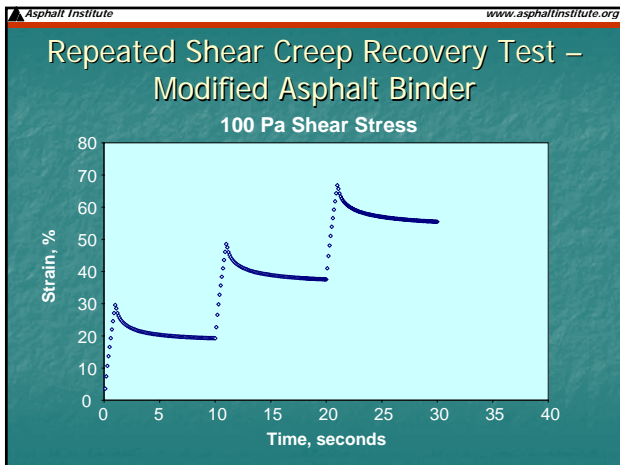
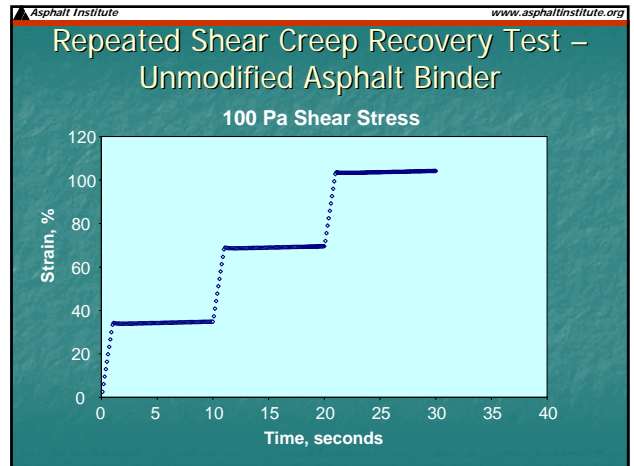
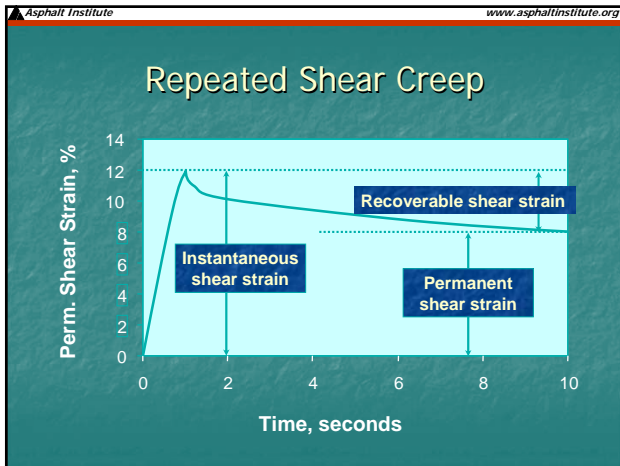


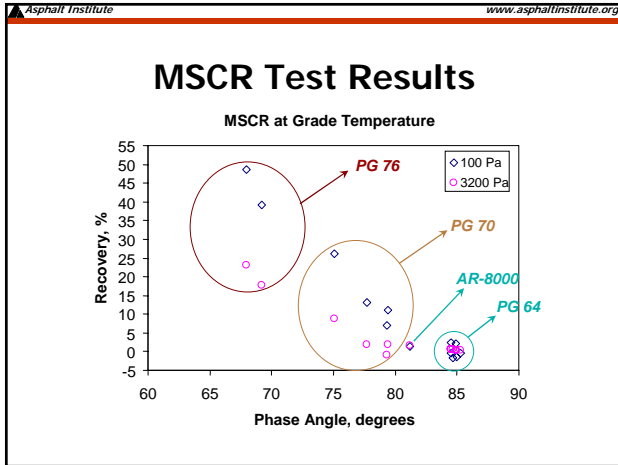
Potential Alternative to the Various PG-Plus Tests:

- Multiple Stress Creep Recovery (MSCR)
- Replace the Empirical PG-Plus Tests
 - Elastic Recovery
 - Ductility/ Force Ductility
 - Toughness and Tenacity
- Approach: Develop AASHTO/ASTM Standard Practice

Multiple Stress Creep Recovery Test

- DSR testing performed on RTFO-aged Binder
- 10 cycles per stress level
 - 1-second loading at specified shear stress
 - Within and outside of linear range (100, 3200 Pa)
 - 9-second rest period
- Calculate recovery for each cycle, stress
 - Difference between strain at end of recovery period and peak strain after creep loading





- ### Asphalt Institute Testing Plan
- MSCR Testing
 - Call for various grades, modification methods from AI Members
 - At a minimum, perform:
 - Original and RTFO DSR to establish grade
 - Elastic recovery (AASHTO T301) on RTFO-aged binders (original also?)
 - Other PG Plus tests identified by supplier
 - MSCR at 100, 3200 Pa
 - 1-2 quarts minimum
 - Prefer 4+ quarts to allow for potential mix testing

- ### Testing Plan, Continued
- Other Testing
 - Binder tests
 - Use of other intermediate stress levels
 - 300, 1000 Pa
 - RTFO vs. Original
 - Is the recovery relationship the same regardless of aging?
 - Mixture tests
 - Evaluate rutting of mixtures compared to binder parameters
 - Possible tests – RSCH, Flow Number, LWT

- ### Technician Certification
- Routine in many areas, especially for mixture QC testing
 - Potential cause for disputes, especially for modified asphalts
 - Should include sampling procedures along with PG and PG plus tests
 - NETTCP appears to be an example of what we can do in SEAUPG and elsewhere

New England Transportation Technician Certification Program

AASHTO	Process	Experience	Test
T 228	Specific Gravity Determination of Asphalt Binders by Pycnometer	Yes	W
ASTM D 3665	Standard Practice for Random Sampling of Construction Materials	No	W
T 40	Appropriate Method and Containers for Sampling PG Asphalt Binder	No	W
T 240	Temperature Measurements in Asphalt Binder Testing	No	W
T 240	Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin Film Oven Test)	Yes	W
R 28	Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)	Yes	W
T 316	Viscosity Determination of Asphalt Binder Using Rotational Viscometer	Yes	W
T 315	Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)	Yes	W, P
T 313	Rheural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR)	Yes	W, P
M 320	Standard Specification for Performance Graded Asphalt Binder	Yes	W
T 48	Flash and Fire Points by Cleveland Open Cup	No	W
R 29	Standard Practice for Grading or Verifying the Performance Grade of an Asphalt Binder	Yes	W
T 314	Determining the Fracture Properties of Asphalt Binder in Direct Tension (DT)	Yes	W, P

Asphalt Institute Website Screenshot

- Technical Focus Areas: State Binder Spec Database, Pavement Performance, Maintenance, Environmental, Superpave, Materials, Construction, Modifiers & Blends, ETGs, Design, Asphalt Institute Software
- Events: Asphalt Binder Technology Course, Achieving Volatilities and HMA Compactability
- News Updates: 9-22-2005 AI Career Cooperative Senior Research Engineer, 8-16-2005 Asphalt Institute Shares Major Contract with US Transportation Center, 6-23-2005 NEW Asphalt Pavement Thickness Design Seminar, 4-22-2005 AI Announces Seminar Dates for Fall 2005, 4-17-2005 AI Publishes New Blueton Polymer-Modified Asphalt

