BARRIERS AND TECHNICAL ISSUES

October 9, 2008

Summit on Increasing RAP

National Center for Asphalt Technology

NAPA

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Have No Doubt. . .

Barriers must be removed!

Technical issues must be resolved!

We Must Do More to Control Our Destiny!

Natural Disasters

?

Unnatural Disasters

State-of-Recycling

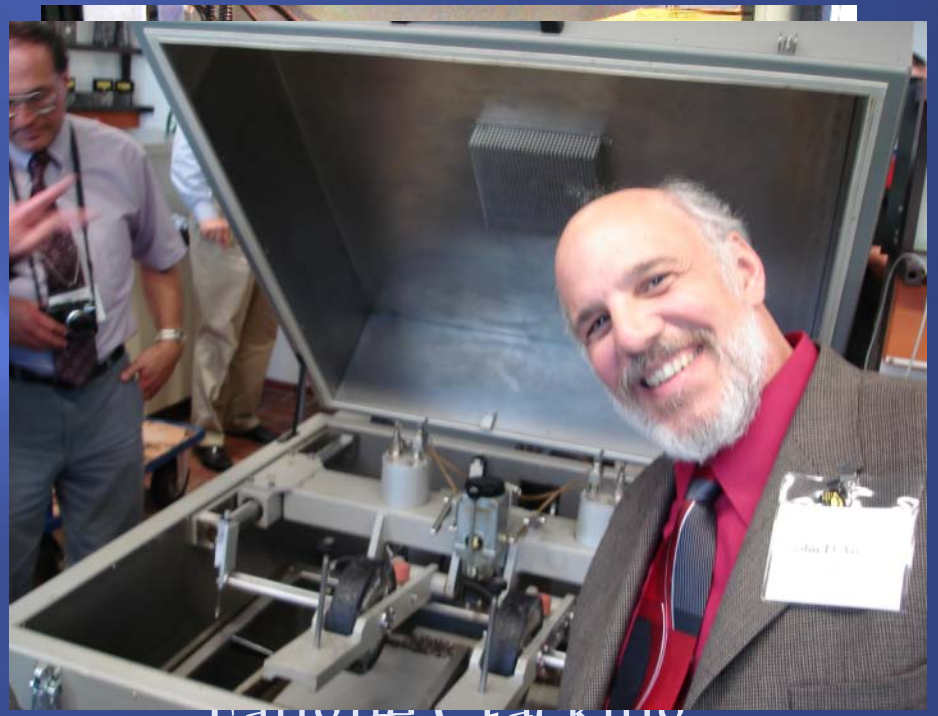
- Where we are:
  - Typically 10-15% in Surface
  - 10-20% in Binder
  - 10-30% in Base
- The majority of our materials are for surfacing
- We need to get to:
  - Typically 30-50% in all layers
  - Allowing up to 100% if feasible!

Barriers to Increasing RAP
(Pete Stephanos and Randy West)

- Mixture Quality Performance Test
- Use of Solvents in Extraction/Recovery
- Comingling of Aged and New Binders
- Need for Changing Binder Grade
- Laboratory Heating/Mixing Procedures
- RAP Availability
- Variability of RAP
- Establishment of Best Practices
- Documented Performance of high RAP Pavement
- Polymer Modified Binders and Asphalt-Rubber with RAP

Mixture Quality Performance Test

- A recipe doesn't tell you about taste!
- Current mix design procedures – a recipe to come up with a recipe.
- We need to assess the behavior of the mix under different conditions of traffic and climate.
- We need performance testing.



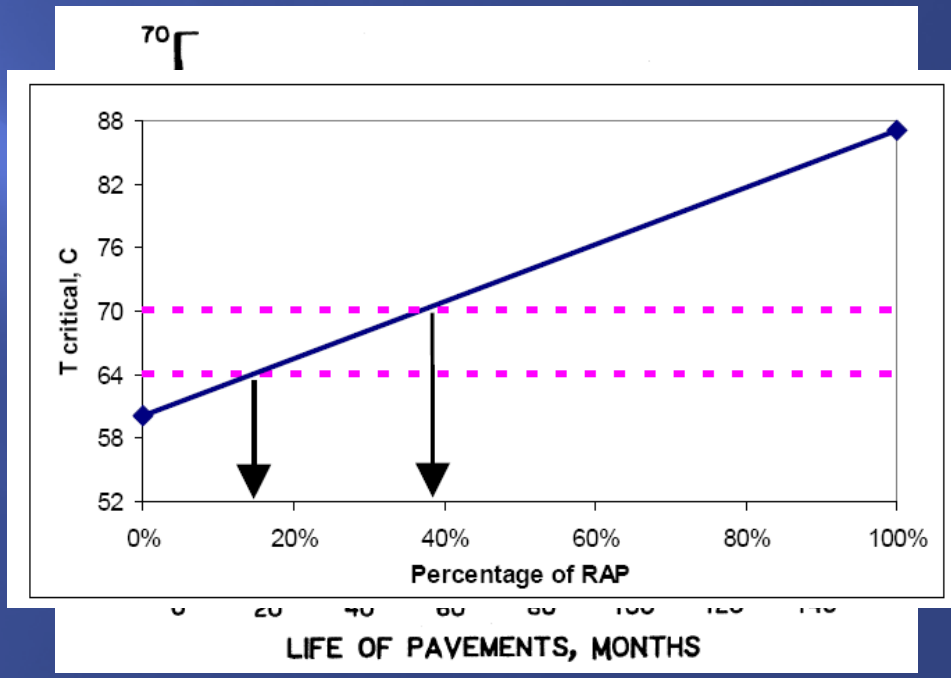
Fatigue Cracking

Cracking

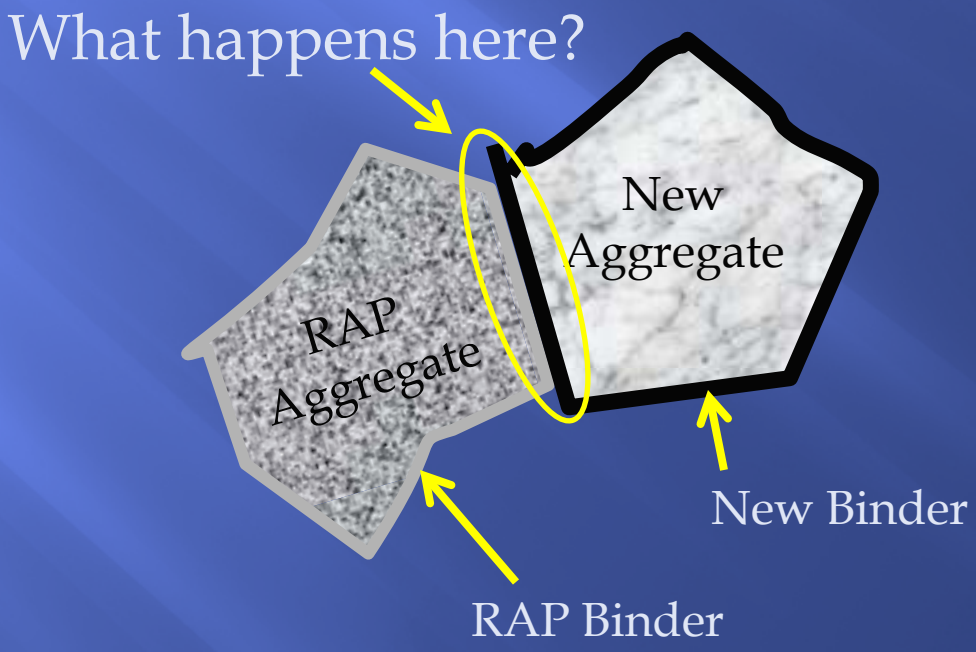
Rutting

Use of Solvents in Extraction/Recovery

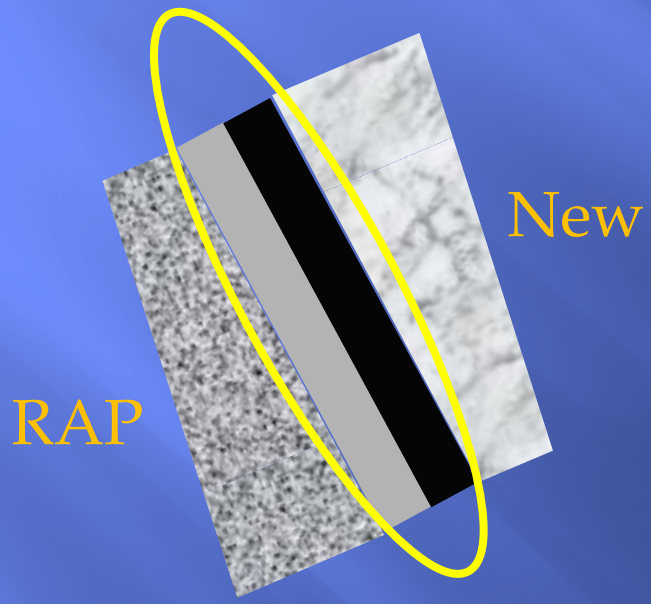
- Use of solvents in extraction and recovery of aged binders are environmentally harmful.
- Combining aged and virgin binders – is the same virgin binder grade what we really want?
- Need a new way to look at aged binders
  - Regional studies
  - New in-situ test methods



Comingling of Aged and New Binders

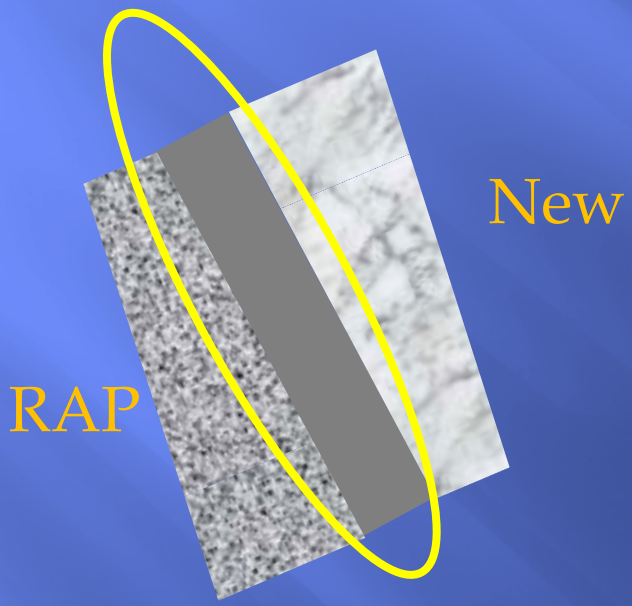


No Blending



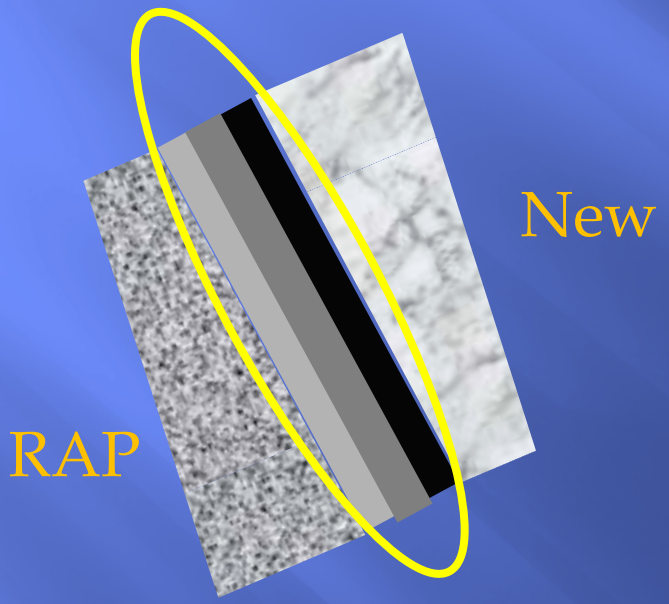
- No intermingling of RAP and new binder
- RAP is truly a black aggregate
- Volumetrics affected by volume of RAP binder
- No credit for properties of RAP binder

Complete Blending



- RAP and new binder completely mixed
- Volume of binder = RAP + new
- Binder property = f(%RAP)

Partial Blending



- Most likely
- Degree of blending
  - Chemistry
  - Temperature
  - Time
- Means
  - Old aggregate stays coated
  - New aggregate coated by new asphalt
  - Bonding occurs

Need for Changing Binder Grade

- Is matching virgin binder grade the issue?
- We are trying to solubilize the aged binder.
- Light or heavy virgin binder grade is not really the issue in how well the old and new asphalt blend.
- We need to rethink how we view blending and what we need for the mixture.

Laboratory Heating/Mixing Procedures

- We cannot completely replicate recycling in the lab!
- Can we even replicate virgin mix production in the lab?

Laboratory

- Heat aggregates in oven
- Heat RAP in oven
- Heat binder in can
- Combine in bakery mixer
- Leave in oven 1-2 hours
- Remove
- Compact in steel mold

11 lbs in 3-4 hours

Plant/Paving

- Heat aggregates in hot air stream
- Add RAP
- Heat binder in tank
- Combine in rotating drum
- Send up conveyor to silo
- Load truck and haul
- Put through paver
- Compact in mat

300 tons in 1 hour


HOBART


ASTEC


NAPA DIAMOND
ACHIEVEMENT COMMENDATION


FLAMMABLE
KEEP FIRE
AWAY


SAKA
2315
SAKAÏ

Mix Design is just a starting point!

Always need to adjust for field conditions.

RAP Availability

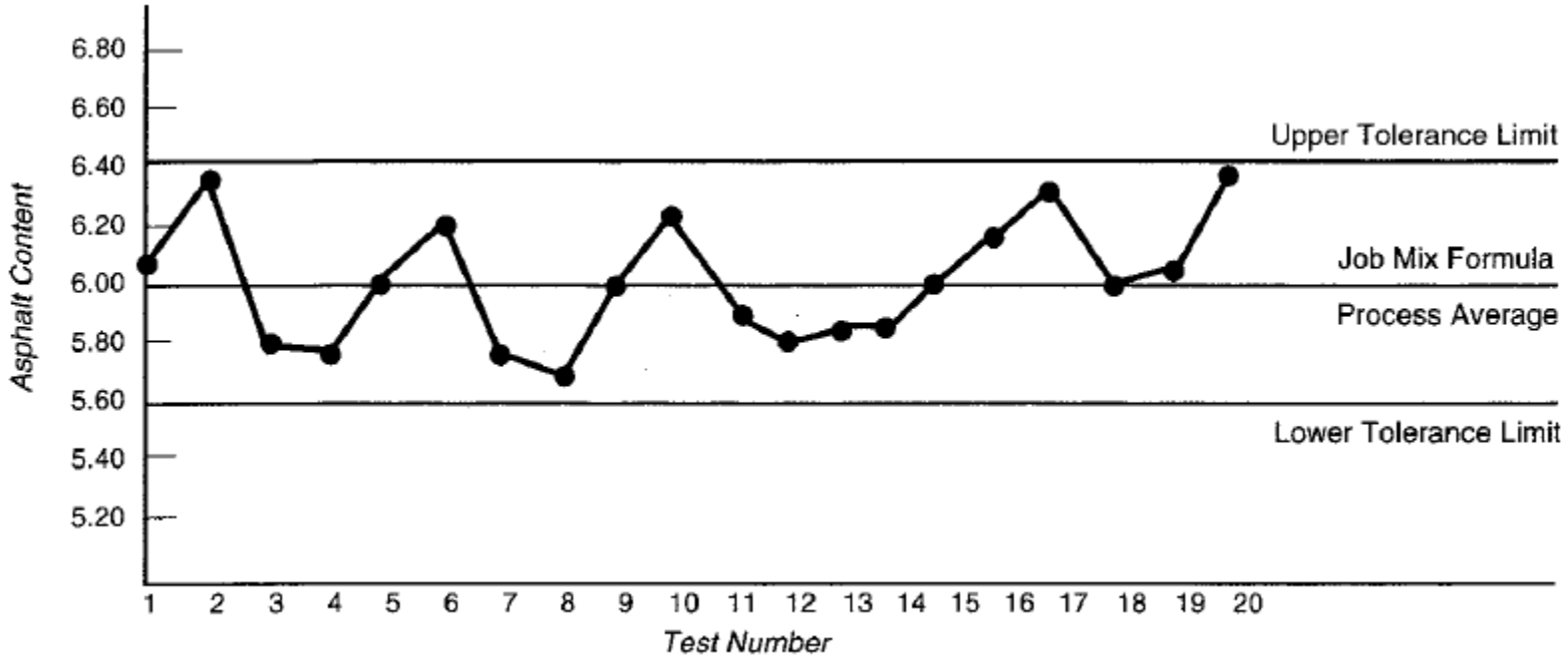
- Urban versus rural
  - Depletion of resources
  - Logistics
  - Transportation costs
- Milling on rural roads
  - Restore ride
  - Remove surface defects
  - Provide RAP

Variability of RAP

Variability of RAP

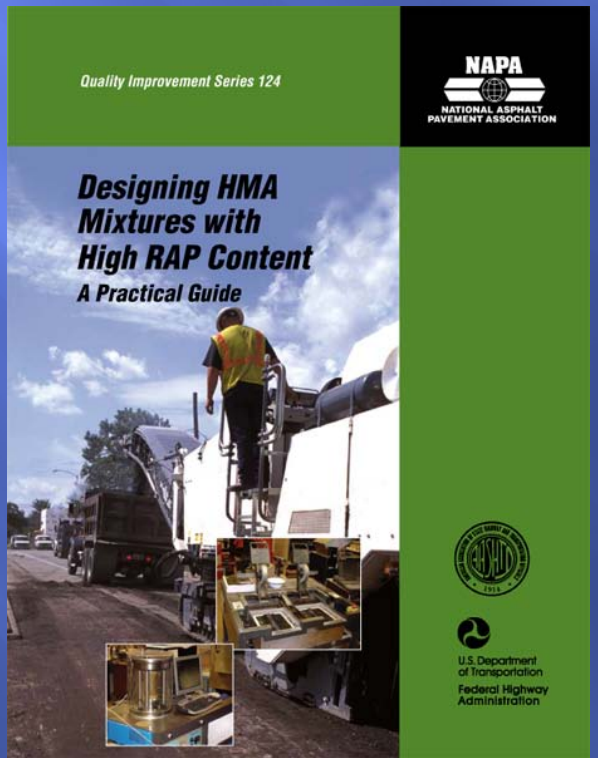
- Changing asphalt content
  - Shows up in QC/QA
    - Changes in AC content
- Changing gradation
  - Shows up in QC/QA
    - Changes in gradation after ignition oven
    - Changes in VMA and Voids
- Changing volumetrics
  - Shows up in QC/QA
    - Collapse of VMA or Voids

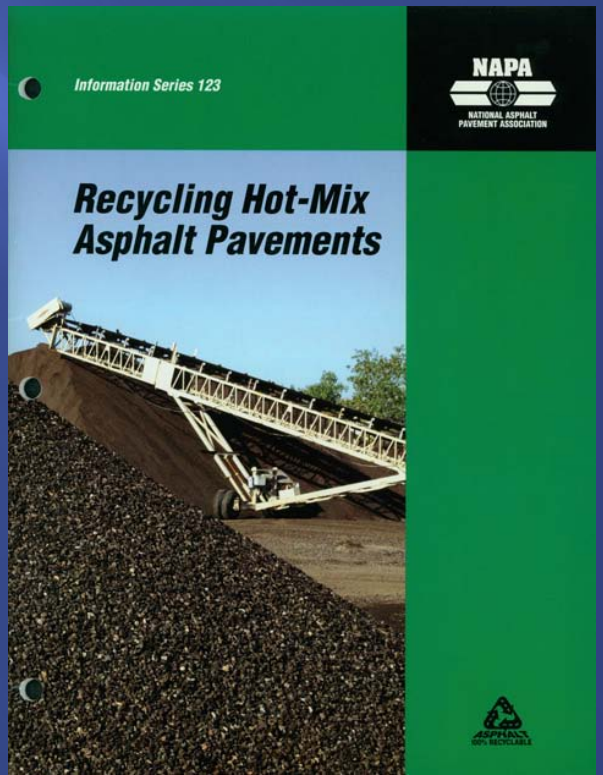
RAP Variability



Best Practices for RAP

- Joint FHWA-AASHTO-NAPA Publication on Mix Design
- NAPA Publication on RAP Processing





Aggregate Gradation

- Greater control on aggregate sizes going into the mix = more consistent mix gradation.
  - Superpave
  - SMA
- In high RAP content mixes, need same gradation control on RAP
- How can we preserve RAP gradation?

Polymer Modified Binders and Asphalt-Rubber with RAP

- Both have been successfully used with RAP
- Neither have been tried at very high RAP contents
- High-temperature end
  - Rutting not usually a problem in RAP mixes
- Need to watch mid- and low-temperatures
  - Stiffening effect of RAP
  - Stiffening effect of polymer
- More study need to get to high RAP contents
- Need a performance test!

Performance

- Randy West covered this topic.
- Limited current studies, although we know about our past successes and problems
  - Look to successful states
    - Minnesota
    - Virginia
    - Washington
  - Identify problems
    - Mix design
    - QC/QA
    - RAP processing
    - RAP quality

Priorities for Addressing Barriers

- Mixture Quality Performance Test - High
- Use of Solvents in Extraction/Recovery – Medium
- Comingling of Aged and New Binders - Medium
- Need for Changing Binder Grade - High
- Laboratory Heating/Mixing Procedures - Low
- RAP Availability - High
- Variability of RAP - Low
- Establishment of Best Practices - Done
- Documented Performance of high RAP Pavement – High
- Modified Binders and Asphalt-Rubber with RAP - High

WE MUST MOVE FORWARD TO ADDRESS ALL ISSUES AND CONCERNS WITH HIGH RAP CONTENT ASPHALT MIXES AND WE MUST REMOVE ALL BARRIERS.