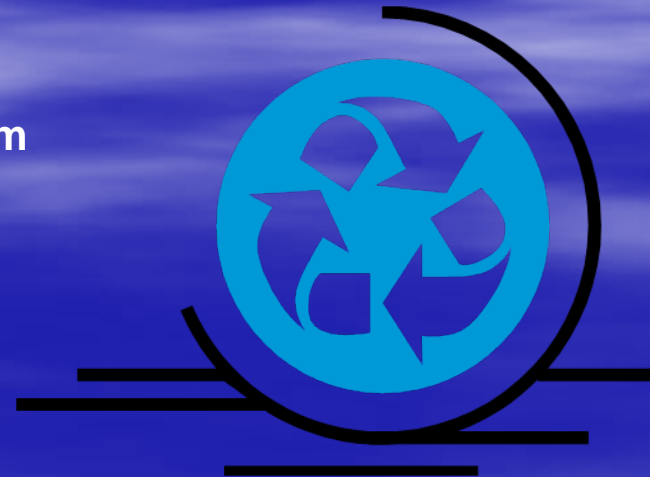


# NCAUPG 2009

## Hot Mix Asphalt Technical Conference

### Recycled Asphalt Shingles a Contractors Experience

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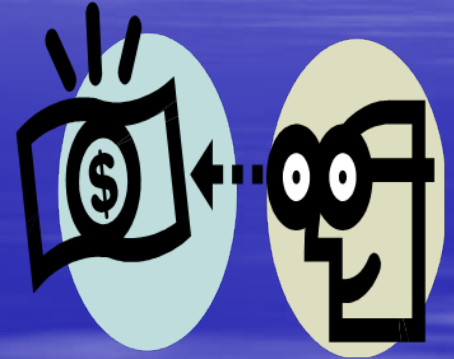
# Shingles Why Now

- Economics

- Reduced Virgin Binder Demand

- Quality of Pavement

- Improved Resistance to cold weather cracking due to reinforcement from fibers
- Reduced rutting and shear stress in pavements from stiffer binders
- Improved skid resistance from hard durable igneous aggregates contained in the shingle





# Challenges?





# Challenges Post Consumer



# Processing Post Consumer Shingles

- Cleaning and sorting shingles
  - Training
  - Asbestos Testing
  - Picking out Deleterious Materials and Metals
  - Getting the material clean and homogenous







L700

VOLVO



ROAD-DEPT. MACHINERY  
100 ALBANY AVENUE, N.Y.  
12242-4771

EXCEL











# Processing and Grinding

- Pre-Grinding
  - Picking Clean
  - Pre-Condition and Magnetic separator large metal
  - Shaker table aids in removing miscellaneous debris
- Various Equipment to Grind
  - Only one specifically designed for shingles
  - Shredding packages available
  - Biggest expense is typically teeth

# Processing and Grinding

- Key Components of Grinding
  - Particle Shape and Size Crucial
    - CLEAN MATERIAL
    - Grinder RPM's
    - Grinder "Screen" Size
    - Addition of water
    - Trummel Screen for oversize material
    - Material feed into grinder









EXCEL  
REG-GO-2-EXCEL  
WASTE DISPOSAL

THE

BEAR





# Typical RAS

- 25-30% Percent Asphalt Cement
- 40-60% Hard Rock “usually igneous stone”
  - Typical gradation of rock fraction contained on 30 and 60 sieve
- 3-12% Fiber



# Typical RAS

RAS
AGG #1
100.0
100.0
100.0
100.0
100.0
100.0
95.2
89.8
75.1
57.3
49.4
39.3
31.3

## BLEND PROPERTIES

CRUSH (1 FACE)

100.0

CRUSH (2 FACE)

100.0

F. A. VOIDS

42.3

SAND EQUIVALENT

0

ELONGATED (5/1)

0

AGG. SP. GR. (Gsb)

2.630

AGG. SP. GR. (Gsa)

2.737

ABSORPTION

1.5

% BINDER

20.0

# RAM

Coarse RAP

Fine RAP

RAS





# Wisconsin Specifications

## Allowable Combination Maximums

### Recycled Asphaltic

### Percent Binder Replacement

#### Material

#### Lower Layer

#### Upper Layer

RAS only

20

15

RAP only

35

20

FRAP only

35

25

RAS & RAP

30

20

RAS & FRAP

30

25

RAS & RAP & FRAP

30

25

# Shingle's Impact on Mix

- Approximately 100,000 ton of Mix Tested
- Percent RAS range from 4-7%
- Binder Grade Observations
  - High Temp grade Higher
  - Low Temp grade Higher
- Volumetrics
  - Lower effective binder content in the field than lab
  - Shingle mixes little more open slightly higher air voids



# Shingles Impact on Mix Performance

- Six superpave RAS mixes tested against control mix
  - E1-E10
  - APA Rut Testing
    - All designs with RAS had improved rut resistance
    - Average decrease in rut depth was 28%
  - Fatigue resistance and flexural strength
    - Average increase in fatigue resistance and flexural strength















19.50









# Field Production

- Plant Operations
  - Due to low percentage of RAS bin calibration crucial
  - Gravimetric feeder or volumetric system can aid in accuracy of adding RAS
  - Run at normal temperatures
- Paving Operations
  - No notable differences with control mixes at the paver
- Performance
  - Oldest pavement 2 years old
  - Designed with 7% RAS and 15% RAP
  - Recovered PG grade was 76-16
  - Pavement shows no signs of thermal cracking

Questions ?