RAP BEST PRACTICES
ASTEC INC.
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DETERIORATING HIGHWAYS AND TOO LITTLE MONEY

UNSTABLE CRUDE OIL AND ASPHALT PRICES

DEMINISHING HIGH QUALITY AGGREGATE SOURCES
AT THE SAME TIME, THERE IS A LOT OF LOW COST MATERIAL AVAILABLE THAT IS NOT BEING PUT TO GOOD USE.

PLANT RAP FRACTIONATION

RAP OFFERS ANSWERS:

HIGH QUALITY MATERIALS
LOW COST
AVAILABLE

MATERIAL IN THE RAP PILE IS OFTEN BETTER THAN VIRGIN MATERIALS. THE BEST MATERIALS ARE ON THE ROAD.

RAP is Worth the Virgin Material It Replaces

30,000 Tons of RAP

70 - 6,000 Gallon Transport Trailers and 28,200 Tons of Clean Aggregate
EXAMPLE – RAP VALUE

Aggregate Blend... $18.00/ton x 0.95 = $17.10
Asphalt............... $800.00/ton x 0.05 = $40.00

TOTAL MATERIALS ...................... $57.10

Crushing Cost ......................... ($3.00)

RAP VALUE .............................. $54.10

ANNUALIZED VALUES
10% RAP....... $5.41/ton x 200,000 tons = $1,082,000
20% RAP....... $10.82/ton x 200,000 tons = $2,164,000
50% RAP....... $27.05/ton x 200,000 tons = $5,410,000

BARRIERS TO INCREASING THE USE RAP:
- Fear of a bad result
- Availability of RAP
- Need to use softer virgin AC
- Plant limitations
- Meeting skid requirements
- Special mixes like SMA
- Superpave

THE STATE OF RAP

- EVERY STATE ALLOWS RAP USE IN AT LEAST BASE COURSES.
- 48 STATES ALLOW RAP IN INTERMEDIATE COURSES.
- 44 STATES ALLOW RAP IN SURFACE COURSES.
- IN MOST CASES, MORE RAP IS ALLOWED THAN IS ACTUALLY USED.

FEAR OF A BAD RESULT – PERPETUATING A PROBLEM

IF WE MILL UP A PROBLEM PAVEMENT AND PUT THE RAP BACK ON THE ROAD, WON’T WE JUST BE PUTTING THE PROBLEM BACK IN SERVICE AS WELL?

SO WHY DO WE, AGENCIES AND INDUSTRY TOGETHER, NOT USE MORE RAP?
THERE WERE SOME BAD RESULTS BUT EQUIPMENT AND KNOWLEDGE HAVE IMPROVED.

GRADATION CONTROL IS A KEY ISSUE.
1980-1990’s PLANT WITH SINGLE RAP BIN & LUMP BREAKER

THE USUAL APPROACH WAS TO INTRODUCE RAP VIA A SINGLE BIN WITHOUT A LOT OF ATTENTION TO CONTROLLING ITS GRADATION.

A SMALL HSI WITH SCREEN AND RETURN CONVEYOR WAS A GREAT IMPROVEMENT.

NOW WE KNOW WE NEED TO AND CAN TAKE THE RAP APART, BACK TO ITS ORIGINAL COMPONENTS.
WE CAN PROCESS THE RAP WITH ENOUGH ENERGY TO BREAK THE AC / STONE BONDS WITHOUT CRUSHING THE ROCK.

WE CAN PRODUCE THREE RAP PRODUCTS SIMULTANEOUSLY FROM A HIGH FREQ. SCREEN.

THIS PLANT FRACTIONATES RAP INTO TWO SIZED PRODUCTS WITHOUT MAKING A LOT OF FINES.

THEN WE HAVE DISTINCT MATERIAL SIZES THAT ARE JUST BLACK INSTEAD OF WHITE.
FEED Sized RAP INTO THE PROCESS FROM DIFFERENT BINS LIKE VIRGIN AGGREGATE.

SUPERPAVE MIX

SUPERPAVE VMA REQUIREMENTS ARE VERY “DOABLE”.

ONCE WE DO THIS, RAP GRADATION CONTROL IS NO LONGER AN ISSUE.

LOAD THE RAP BINS OUT OF SMALL WORKING PILES TO AVOID IT STICKING BACK TOGETHER.
HAVING CONTROL OF THE RAP GRADATION ALSO GIVES US GREATLY IMPROVED CONTROL OF THE AC CONTENT.

SUPERHEATED VIRGIN AGGREGATE MELTS AC ON RAP ON CONTACT. AC FROM RAP ADHERES TO AND PRECOATS VIRGIN.

GOOD MIXING IS CRITICAL TO PRODUCING GOOD MIXES WITH HIGH RAP CONTENT.

DYNAMIC MODULUS TESTING IS USEFUL IN GAUGING THE QUALITY OF MIXING.
HOW WILL RAP AFFECT PAVEMENT LIFE?

IF DONE RIGHT, IT WILL IMPROVE IT.

EVIDENCE?

NCAT PAVEMENT TEST TRACK

www.pavetrack.com

RAP WAS FRACTIONATED AND FED INTO THE PLANT BY SIZE.
TEST INDICATIONS

RAP MIXES ARE OBVIOUSLY PERFORMING BETTER IN RUTTING RESISTANCE THAN THE VIRGIN CONTROL MIX AND VERY WELL BY ANY STANDARD.

CRACKING IS MINIMAL.

SO FAR, RAP MIX PERFORMANCE IS SUPERIOR.

BENEFITS OF MAKING HIGH RAP% MIXES AS WARM MIX
With Warm Mix (hot foam), we can achieve density without changing AC grades at 50% RAP.

- Reduced viscosity enhances compaction.
- Lower temperature (270F vs. 300F+) results in less oxidation.
- Light oil remains in liquid.
- Steam produced from drying the RAP creates an inert atmosphere.
AVAILABILITY

MILLING PRACTICES CAN MAKE RAP AVAILABLE ALMOST EVERYWHERE.

No Shoulder or Guardrail Changes with Milling

RAP IS AVAILABLE AND IT IS TO EVERYONE’S ADVANTAGE TO OBTAIN AND USE IT.

BRIDGE CLEARANCES ARE RESTORED.
Rutting often occurs in overlay pavements.

Multiple Overlays Create Drainage Problems

Milling Leaves Utilities Unchanged

Milling Ensures Proper Water Drainage

Rutting often occurs in overlay pavements.
Overlays Can Experience Cracks and Re-Rutting

Overlays Create Inconsistent Pavement Densities

Milling and Inlays Prevent Re-Rutting

Milling Ensures Consistent Pavement Density
MILLING NOT ONLY SAVES MONEY BUT RESULTS IN A HIGHER QUALITY ROAD.

AGGREGATE SUPERHEAT TEMP.
VS. RAP PERCENTAGE

PLANT LIMITATIONS

HOT DRUM
HOT BAGHOUSE

HOW DO YOU STOCKPILE YOUR RAP?

RAP MOISTURE CONTENT AFFECTS PLANT CAPACITY AND LONGEVITY. HOW YOU STRUCTURE THE PILE AND HOW YOU FEED FROM IT HELP DETERMINE HOW MUCH WATER THE PLANT HAS TO DEAL WITH.

LOTS OF SUN SAYS MAXIMIZE THE PILE SURFACE AREA FOR NATURAL DRYING AND HAVE THE LOADER SKIMMING THE DRIEST MATERIAL TO GO TO THE PLANT.

IN WET AREAS, DON'T SPREAD IT OUT. REMOVE THE WET OUTER LAYER AND FEED THE PLANT THE DRIER INNER MATERIAL.

ASTEC DOUBLE BARREL
30% RAP
300 F MIX TEMPERATURE

• LOW SHELL LOSS
• LOW STACK LOSS
• MAX. RECORDED SHELL TEMP. 191 F
LOW VIRGIN MATERIAL RESIDENCE IN THE DRYER REDUCES SHOWERING AND CAUSES HIGH STACK TEMP.

MAKING IT GREEN REDUCES DRUM AND STACK TEMPERATURES.

IMPROVED FLIGHTS HELP CONTROL STACK TEMP. EXTREMES AND HEAT LOSSES.

LESS FUEL IS GREEN TOO. FUEL % REDUCTION = CO2 % REDUCTION.
HIGH RAP % MIXES

SAVES MONEY
MAKES MATERIAL AVAILABLE
SUSTAINABLE
GREEN

NO LONGER AN OPTION