

Idaho's Recycling Initiative: *Moving Forward in Road Building, ITD Style.*

Several million tons of Hot Mix Asphalt (HMA) are made in Idaho each year. The state buys anywhere from 50 to 90 percent a year!



Timothy R. Murphy, P.E.
President
Murphy Pavement Technology, Inc.



Transportation Research Board's Report 202



“Asphalt, more than any other single product, sustains the nation's highway system and facilitates the flow of commerce.”

Review of RAP Materials

RAP is reclaimed asphalt pavement resulting from cold milling or crushing of an existing dense graded hot mix asphalt pavement.



Idaho Position Statement

There is a growth in the use of RAP in the USA and the ITD is committed to increasing the use of RAP successfully through proper engineering and production controls.



What Jeff Foxworthy might say...

“If you have large RAP stockpiles... You know you’re an ~~redneck~~ urbanite.”



100,000+ tons of ^ at various locations



Photo Dan Gallagher

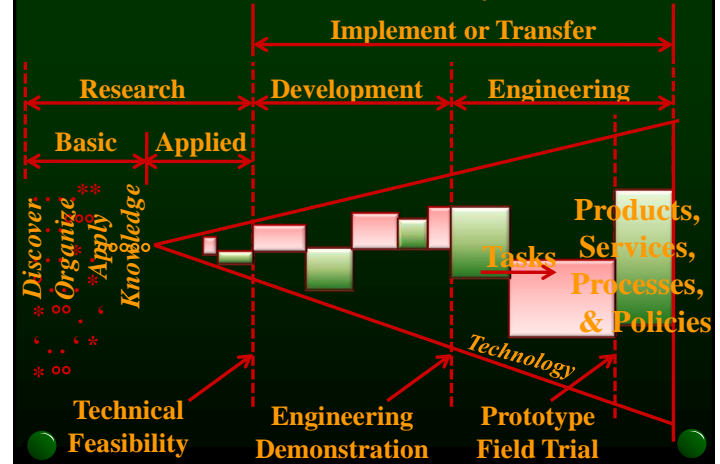
Asphalt plant quality inputs



Look at the Volumes!!!

MODEL OF DEVELOPMENT OF TECHNOLOGY

- Oujian and Carne, 1987



Idaho Research

ITD accomplished these goals by concentrating on the:

- Economics,
- Engineering,
- Supply, and
- Ingenuity

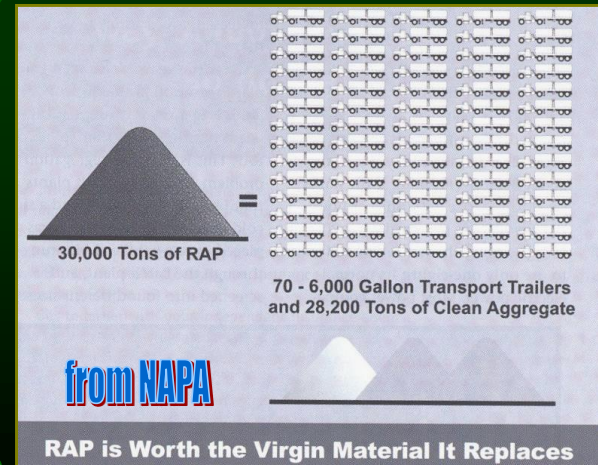
of the pavement structure and actively seeking input by the Idaho road building industry.

Idaho Research

We did a thorough review of existing state programs, selected acceptable practices, and modified these findings to meet Idaho needs.

Diminishing Resources Dictates That We Increase Recycling

With the costs of construction materials skyrocketing, ITD is committed to its efforts to maximize the use of RAP and is encouraging all to research upper potential.



How to Market Recycling of HMA Successfully

People Working Together to Form
Alliances in Action
Academia - Agency - Association - Consultant - Contractor - Supplier

Build a team to work through the details

Conferences

- Society of Professional Engineers
- American Public Works Association (APWA)
- Association of Asphalt Pavement Technologists (AAPT)
- National Asphalt Pavement Association (NAPA)
- Numerous State Agencies

Idaho Reclaimed Asphalt Pavement (RAP) Seminar

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The enhanced Superpave Special Provision roll-out meetings will occur statewide as follows:

- Monday, April 20 – Coeur d'Alene (District One office)
- Tuesday, April 21 – Boise (AGC office)
- Thursday, April 23 – Pocatello (District Five office)
(9 AM – Noon each day)

Contact: Mike Santi @ Mike.Santi@nd.idaho.gov

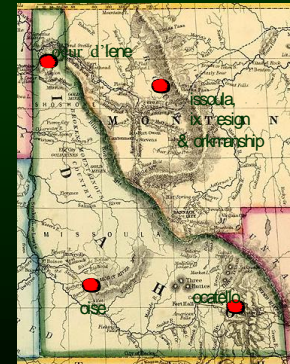
All agency, road builder, and consultant personnel are encouraged to attend one of these sessions.

With the cost of construction materials skyrocketing the Idaho Transportation Department is committed to its efforts of maximizing the use of RAP and is encouraging all to research upper potential.



Idaho Seminar Locations

- District One – Two
(Coeur d'Alene)
- District Three – Four
(Boise)
- District Five – Six
(Pocatello)



ITD calls this "outreach"

A Position to Stand For...

We must be promoting environmental services.



...ing the marketplace by use, and use of acts and

S = I - O



From Mike Santi, ITD
The Captain of our Ship

There are 3,000 Hot Mix Asphalt plants in operation today in the USA!

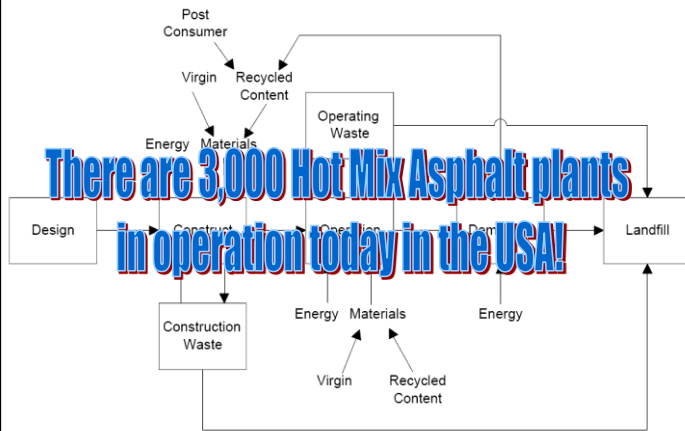
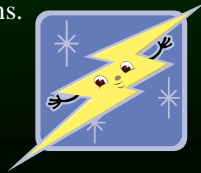


Photo courtesy of Gallagher Asphalt

Conservation of Energy

It is estimated that the usage of 1 ton of HMA containing RAP @ 20% conserves 350,000 BTU's of energy

- Less aggregate to mine, process & deliver,
- Less asphalt to refine & deliver,
- Less trucking & lower emissions.



Recycling Usage = f (Quality, Quantity)

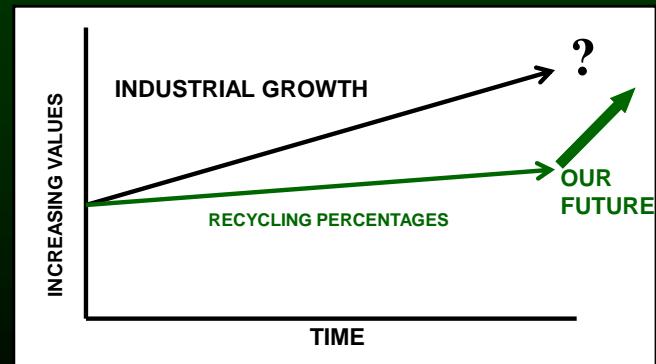
Quality = How good it is.

Quantity = How much we have.

The Essentials to Our Success

1. Create and sustain a breakthrough value proposition. [The Past]
2. Cultivate inner networks. [Today]
3. Customer centric. [The User]
4. Adaptability or finding a better way. [Research]
5. Opportunity focused. [The Specification]
6. Pack your board with industry experts. [The Doers]
7. Use blue-chip customers to gain credibility. [The Future]

Growth vs. Recycling over Time



Performance really is very important for virgin as well as recycled roadways



In Idaho we have been successful up to now;
how will we continue to be successful?

QC / QA
Research
Training

QC / QA and
Coarse Aggregate Quality

**Nothing has changed and
all products are assured
through ITD OVER-SITE!**

Example

Extended Life Pavement Interstates around the
nation (total reconstruction)

**Can 100% re-use of
old pavement occur?**

X-Section

- Aggregate Sub-grade, 12",
- Stabilized Sub-base,
- Pavement.



On-site Excavation



Trucking to recycling facility



Raw feed



Crushing & screening feed



Finished product

- Rework stockpile to mitigate segregation and improve consistency.
- Pay special attention to head pulley.



Steel recycling

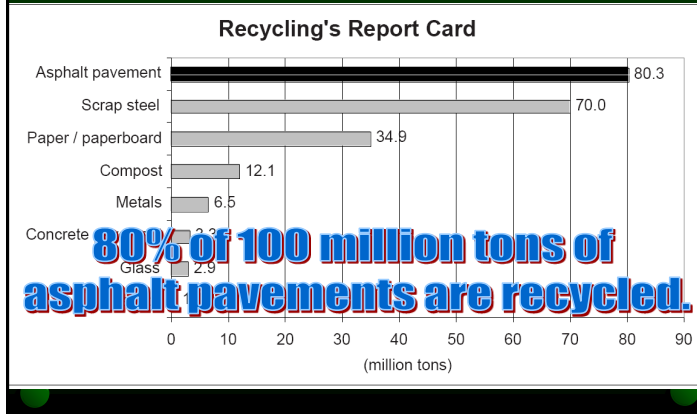


Recycling is all around us

However, asphalt is the most recycled product in the world!



FHWA Recycling Report Card



Resourcefulness in action:
Recycling of asphalt pavements
benefits everyone!

- Maintains high quality
- Reduces taxpayer cost
- Rewards good environmental stewardship

Design Air Voids – No Change

- Target & trend Air Voids to 4.0%,
- Linked to Voids in the Mineral Aggregate (VMA),
- Related to in-place density.

Voids was and still is a very important volumetric property.

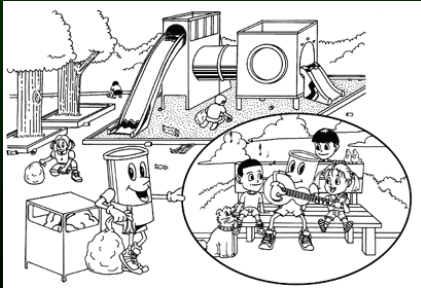
HMA without Volumetric's is NOT a Mechanistic Material

- No VMA Criteria,
- Voids @ variable,
- High RAP,
- Lowest Quality Aggregate, and
- Hard AC.



Recycling

The driving force behind any resource recovery operation is economics.



Economics are many things

Financially impacted items are:

- Production,
- Trucking,
- Diminishing resources.

Energy costs are climbing rapidly. Why?
Will they ever decrease?!

Savings per ton of Hot Mix using RAP

-Dr. Brock

Aggregate Cost - \$7.00/ton x 0.94 = \$6.58

Asphalt Cost - \$150.00/ton x 0.06 = 9.00

TOTAL VIRGIN MATERIAL COST \$15.58

*Based on \$7.00 Aggregate, and \$150.00 Asphalt
 Costs of RAP (Milling, trucking, screening) **5.00**

Savings per ton of Hot Mix for... **10.58**

In layman terms this equals \$0.70 per gal.
 30% RAP.....\$ 3.17

Pre-2000

Potential Savings, 2003

Rock (\$10/ton)	New Asphalt (\$175/ton)	RAP w/5% AC (\$5/ton)	Mix
94% = \$9.40	6% = \$10.50		Cost = \$19.90
75% = \$7.50	5% = \$8.75	20% = \$1.00	Cost = \$17.25
Total Savings			\$1.32 @ 10% \$2.65 @ 20%

If placed cost /ton = \$50.00
this represents a 5% savings.

Potential Savings, 2009

Rock (\$10/ton)	New Asphalt (\$410/ton)	RAP w/5% AC (\$6/ton)	Mix
94% = \$9.40	6% = \$24.60		Cost = \$34.00
75% = \$7.50	5% = \$20.50	20% = \$1.00	Cost = \$29.20
Total Savings			\$2.40 @ 10% \$4.80 @ 20%

**If placed cost /ton = \$50.00
this represents a 10% savings.**

Governor, we need to talk...

What we know:

4% RAP costs approximately \$5.00/sq more than a 20% RAP mixture.
50-miles @ 4" = \$1M

Question: What can you pave?
25-miles @ 8" = \$1M

Asphalt density = [112 lb./sq.yd./in.] / [2,000 lb./ton]
 So, yds. = $15,280 \text{ ft.} / 4 \text{ mile} \times 30 \text{ ft.} = 17,600$
16.6 miles @ 12" = \$1M

Tons = $17,600 \text{ sq. yds.} \times 4 \text{ ft.} \times \text{Asphalt density} = 3,942$

Opportunity Focused Specification

Opportunity is from Agency knowledge on measuring performance and from Contractor knowledge of their operations.

RAP Categories

Category 1:

- RAP from an agency project with a letter of certification in a closed stockpile.
- Tested RAP – asphalt material from Category 2 that has been tested and conforms to aggregate quality requirements verified by ITD.

RAP Categories

Category 2:

- RAP from Production Returns and Random RAP from private paving projects and / or unmarked routes.
- Category 2 RAP will be considered for use if the Contractor performs testing and supplies ITD with test results and materials to test that meet the requirements of Section 703 and S405.

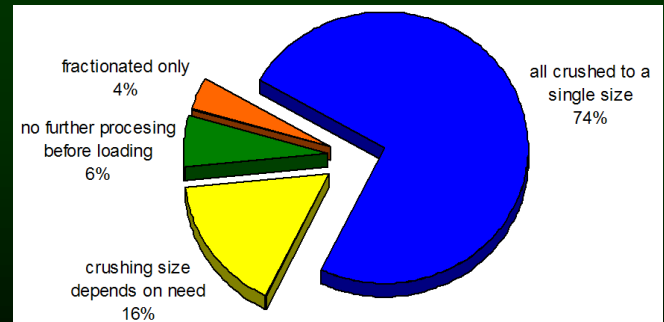
Additional testing of Cat. 2 RAP

- AASHTO T 96
- Idaho IT-15
- Tests for Aggregate properties as specified in Table 2

Contractor Equipment Solution, Asphalt



Fold 'n Go
Photo from Astec



Coarse vs. Fine RAP



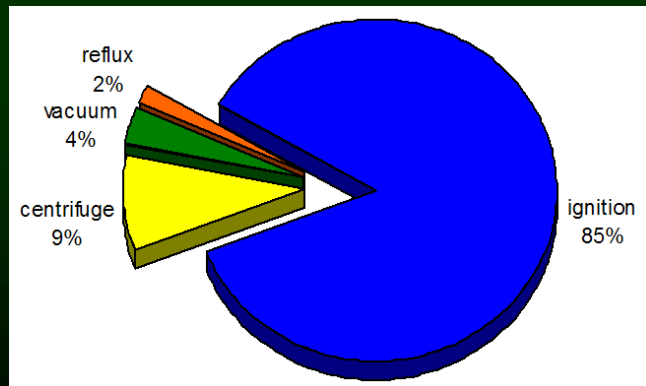
RAP Characterization



Testing of RAP

- All RAP: Asphalt Content and Gradation
- Maximum Theoretical Specific Gravity to calculate G_{se} and then G_{sb} . (VMA item)
 - 1 / 500 tons for first 2,000 tons.
 - 1 / 1,000 tons thereafter.
 - Min. 6 / 4,000 tons.

This is a consistency rewarding specification.



RAP Sampling



Virgin Aggregate Sampling



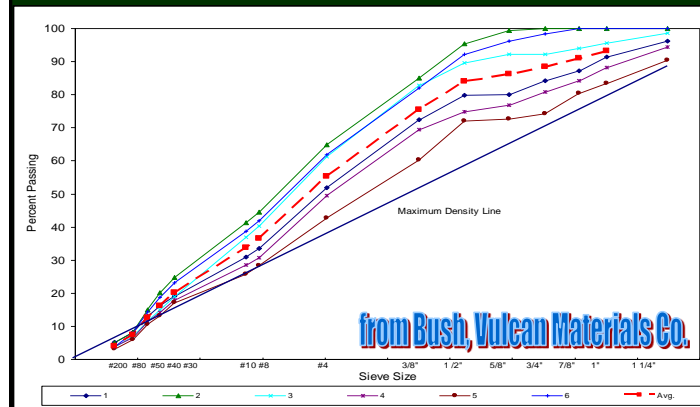
Why Process RAP ?

- Uniformity
- Consistency
- Quality



**Out with the old,
In with the new...**

Unprocessed RAP can be Variable



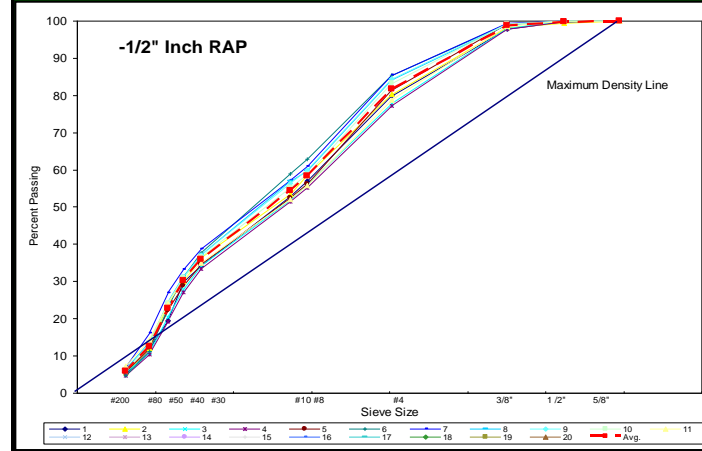
Processed RAP

- Uniform
- Consistent
- **QUALITY**
- And you can **USE MORE**, more dependably!



**Out with the old,
In with the new...**

-1/2" RAP Uniform & Consistent



New Maximum RAP in HMA

- Category 1 & tested Category 2; unlimited.
- Category 2; 10% top lift, 30% all other.

**Processed RAP,
crushed and screened over 5/8" screen**

New Maximum RAP in HMA

- Category 1; Limited to 17% in surface, 30% in all other courses.
- Category 2; 0% in surface, 17% in all other courses.

**Un-Processed RAP,
5/8" top-size**

Liquid Binder

The method for determining the binder grade adjustment in HMA mixtures incorporating RAP is divided into three categories:

- Level 1; < 17% RAP AC / Total AC,
- Level 2; > 17% - 30% RAP AC / Total AC, and
- Level 3; > 30% RAP AC / Total AC.

$$\text{RAP AC} = \% \text{ RAP} \times \% \text{ AC IN RAP}$$

The Doers Charge – from Jeff Miles

- Retain quality & performance
- Strive for highest value use
- Create policies that have economic sustainability
- Protect the environment
- Identify short and long term issues
 - Specification changes
 - Research topics (Binder, Volumetric's, LCCA)

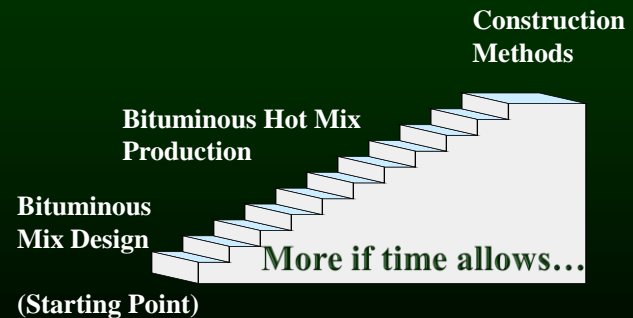
The Idaho Approach [Today, Tomorrow, and The Future]

Active promotion of recycling technology by providing:

1. Needed specifications,
2. Best practices,
3. Design guidance, and
4. Continuing research;

to overcome barriers.

Well Designed Asphalt Mixtures



500-TPH

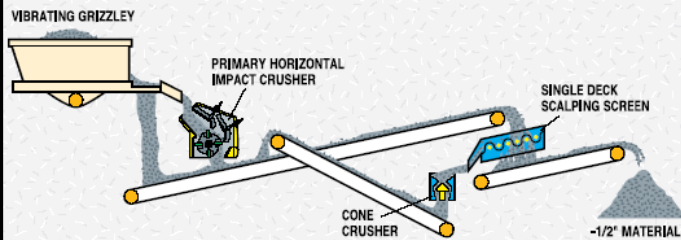


Needs assessment...



Crushing and Screening

- Dr. Brock



Two-Stage RAP Crusher Circuit Producing One Product

Store RAP in a cool dry place



Calibrate RAP Belt



In-Line Scalper Before Drum



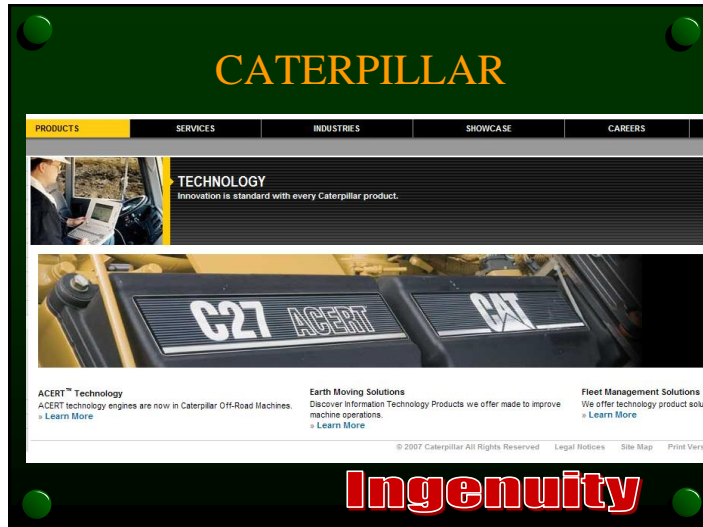
HMA Return and Blue Smoke Mitigation



Flighting

- Combustion,
- Dryer flights,
- RAP protection vane.





High RAP Mixtures – Who’s Involved?

- Effect on asphalt characteristics and material supply – Asphalt Institute and Liquid Suppliers,
- Coating all particles – increased temps. for drying, heating, and mixing – equipment manufacturers,
- Stripping – visual strip rating – ITD Boise,
- Loss of any performance measure that we deem to be valuable – ITD led Academia,
- Production – Idaho AGC HMA Members.



What will you *really* remember most about today?

- RAP is an excellent resource that must be properly managed.
- RAP percentages will continue to increase through:
 - Contractor ingenuity,
 - Equipment manufacturer's ability, &
 - Agency flexibility.
- In Idaho, AGC Contractor's did this with ITD.



Questions?

Thoughts on the future...

Shall we make a list together on how to increase RAP usage or do you want me to pontificate? Use:

- Make ¼" clear stone to ↑ VMA and ↓ dust.
- Maintain VMA minimums.
- Encourage ingenuity; see ITD and AGC.

