

**Industry Roundtable Discussion Points
Thursday, Nov. 1, 2007**

AGENDA

Regulatory

- 1 How do deal with misperceptions on asbestos in material
- 2 Leaching issues of processed and unprocessed shingles
- 3 Stack emissions at HMA plants utilizing shingles

Standards/Specs

- 1 What are current specifications for the HMA market
- 2 What about contaminants such as tramp metal or clear plastic strip
- 3 How can private companies advocate for reasonable specifications for recycled shingles from state DOTs and AASHTO

Markets

- 1 What are some alternative markets for recycled shingles
- 2 What are the economics of those markets, such as fuel
- 3 What is the value of the final product once ground to spec
- 4 Best management practices for delivery of quality end product markets

Operations

- 1 Shingle grinding techniques
- 2 Agglomeration of processed piles of shingles
- 3 Methods of feeding shingles into hot mix plants
- 4 Screening and sorting techniques
- 5 Best management practices for processing shingles

NOTES

Regulatory

1 How to deal with misperceptions on asbestos in material

Background on findings (dan/UFI): over 27,000 samples analyzed, number of hits for asbestos was negligible. Occasionally there are hits. More frequent hits from tar paper, felt paper, mastic...very rarely from shingles themselves. Townsend's paper explains this.

Experience with issue: FL: asphalt company, asphalt plant questioning asbestos issue. GA: no test for tear off. Not an issue now. Bigger problem has been food particle contamination from households. WI: require testing from original shingle layer.

National roofing: asbestos in 1960s. none since then. Underlayment, felt may be, but not shingles.

Perception issue more than a reality.

CA comment: test is cheap on a large scale. So answer may be to tell regulators that you'll do the test. Use third party

MA comment: required to test often...50-60 samples a day. \$8.00/sample total of 100,000 samples have had a total of maybe 10 hits. Even though data shows unlikely, as long as hits, will require to test. Zero tolerance.

American roofing/recyclers: WA, test every 500 tons. Have never had a hit. Don't take shingles unless they are certified by roofers. Problem is that you have to isolate until test comes through. States could require certification of roofing material.

Each state is going to do something differently. NESHAP is federal, but states can vary. Have you had experience with a initial testing, baseline and with no hits...moving to less sampling required? Maine has done this. MO: county level rules. Year of testing on every shingle that came in no hits...now do annual, random. But any new program in MO would also have to do the one year in depth testing, then may get to lower testing. In MI, negotiating with DEQ on amount and frequency of samples. Take a sample of everything bring in, send to third party run tests. 100 tests so far, no positives.

Why not require roofing contractor do this? Protects their workers. Create an incentive for roofers to test before tear off. Response: roofing contractors can't test shingles. Homeowner calls many contractors.

Roofing contractor comment: Only shingles with asbestos from 40's-50's. If roof has only 1-2 layers, no asbestos, roofs with 4 layers of shingles may have asbestos.

Were shingles manufactured with asbestos region specific? On national scale could identify where they went. Prove to State EPA's that shingles wouldn't have asbestos. Response: Anything made after mid-late 50's no asbestos.

Average roof replaced every 15-20 years...not many roofs out there with older shingles.

How about only requiring testing if pre 60?

2 Leaching issues of processed and unprocessed shingles

Background: concern with leaching from stockpiles, run-off,. Many facilities in agricultural areas. Is there any experience with this? In FL had an old pile of shingles, required some testing, all came clean, nothing in the water run-off. Have 200-300 leach tests. Very low and in the acceptable range. Ran RAP too and RAP had many more volatiles in it. This question came up at NAPA mtg. Would be helpful to make the experience available on these historic tests. Don't see any problem with this, but need the data centralized to prove it.

3 Stack emissions at HMA plants utilizing shingles Background: TX is testing a plant due to concern that running shingles through the plant will raise stack emissions. Townsend has looked for other studies of this, but has not found testing. Anyone aware of testing? Response: some look at emissions from Tacoma Steel and it burned cleaner than coal. Would be useful to find the data from this. If they are bring used as a filler, shouldn't have any change in emissions. Environmental Agencies don't understand how an asphalt plant works. Never burning the shingles...heated in mix. So fumes are coming out of the dryer. Did testing before shingles and after and no difference.

Standards/Specs

1 What are current specifications for the HMA market

Background:

NAPA: higher percentages of RAP can go. May change grade of asphalt if go higher percentages. Most states are saying can go up to 5% shingles. Shingles have 20-30% asphalt in them. Very valuable. Liquid asphalt is the most expensive part of the mix.

Q: Heard older shingles have more asphalt and heard the opposite. Response: Older shingles asphalt is too hard..5% may be too high in mix. Some doubt about getting the asphalt out of the shingles with older tear offs. Have taken grindings and extracted them to get asphalt out...may take days compared to much quicker from RAP. Value in older shingles is lower.

In FL: found 38% AC content in tear-offs, mostly 20-30%. Won't get it all out...some is entrained.

Q: if grinding shingles is there a certain size that works best? Yes, bigger grind will lead to smoother end product like parking lot. Larger particle, harder to get liquid value out. 3/8 inch minus works well.

Q: Shipping to other states? Not so much due to cost.

Q: What are rules/regs for grinding shingles in IL? Response: IL fairly conservative ...need to follow-up with IL EPA. There is confusion regarding permitting.

Type of asphalt used in shingles: flux, roofers flux, oxidized...softening point 200 F, Some changes in the system under way..organic felt shingles are going out...probably had more asphalt in them...now, fiberglass-based products have nothing but oxidized asphalt.

MO: requires softer grade liquid asphalt if go over 2% shingles.

Any research on fiberglass mat as affect? Technical report online that indicates that there were no negative findings. 7% mix grade...report out of PA?.

Fiberglass problem with DEQ...saw particles floating in air, require workers to wear masks, etc.

2 What about contaminants such as tramp metal or clear plastic strip

How is everyone solving the issue of the clear plastic strip? Some responses: never see them. Never saw issue with them. Most don't do anything with them...they blow off. Always some contamination. What can you do? Probably solutions to dissolve the materials...but not sure if it would affect the HMA recipe. "Snowflake" effect. Keep low flow air across and send it into a hopper, torch it and it is gone. It is a nuisance due to light weight. Can deal with it with light flow of air.

Is the metal worth anything from the pile. Yes, can sell the metals. Nails, due to price of Fe are valuable.

Factory seconds that are wrapped. Anyone taking wrapped materials? What problems does that cause? PA requires to take wrapper off. Very labor intensive.

Is there an accepted content of material as it comes off roof? Roofers have said, can't come off clean enough, so don't do it. How much contamination? So much variation in the contractor work. Can recyclers handle all the contamination? Regulatory: MI says 95% of load has to be recyclable. Additional response from MA: must be 95% shingles by weight. Won't take the load if more than 5% contaminant (otherwise would be considered a solid waste processor and would violate permit).

95% seems to high to roofing contractors. Need to find a way to deal with contaminants. Roofers only have 2 days to finish a house. In Canada, removing plywood by hand, same for brick. Homeowners may also contaminate the bin.

Take it out of the waste definition and we'd solve the issue. Prove the materials are truly recyclable. There is a home for every element in the C&D stream. Is there a level to get to that a state would consider C&D as recyclable materials? States are willing to listen to the information from the industry. [see shinglerecycling.org for state contacts working on shingles recycling issues/decisions]

What % of shingles coming from landfills? In NC have many shingles in LFs. Can we harvest? [no responses]

All nails? How to remove them as a contaminant? Is it a problem?

3 How can private companies advocate for reasonable specifications for re. shingles from state DOTs and AASHTO

State specs are used for many local projects etc. Too different type of asphalt specs: permissive and method. Method specs are more difficult in terms of using shingles. Many states are going to more permissive specs...allow more innovation (performance standards). Shingles will probably always have max amount or require binder testing. FHWA promotes the use of more performance standards.

In Canada...test asphalt behind the paver. With shingles...have a change in results (missed the test name)...fail the specific tests.

Is there a blending of the asphalts? Be better to have a mix test (but they are expensive.)

In each state there is a chapter of NAPA...work on a regular basis commenting on specs. So work with chapters on new specs regarding shingles. Get to know your materials engineers at your DOTs.

Markets

1 What are some alternative markets for recycled shingles

Fuel markets.

Fiber is fuel. Fuel fiber same as coal..11,500 BTU. Also less sulfur than coal, no Hg, moisture is less than 3%. Same value as coal.

What is tonnage required? And what is the size? 60-65 megawatts taking 30%...50,000 tons/year. Need 125 tons of shingles. Fiber size...less than 1/2inch

minus. What % of total blend works best? Depends. There will be times when want to burn fiber due to sulfur content. East Coast where most of the opportunity is.

Granules in asphalt...about 18-20% asphalt. Asphalt is \$300-350/ton.

Selling the fuel to plants. Coal costs vary depending on where it comes from.

Are there drawbacks? No.

Experience in cement kilns? Canadian response: kiln that uses many alternative fuels, 35-50% coal replacement...wood, plastics, dried biomass. Considering using shingles...looking for information. LaFarge in Nova Scotia is supplying fiber fuel. Injecting fiber fuel with coal now and evaluating.

Two issues raised regarding kiln us: cement kilns often use tipping fees...so not receiving money for shingles. Also question about air permits and if it would affect them. In WI, at least 1 kiln has so much wood.. doesn't need anything else, know how wood works in permits and aren't open to other materials.

Kilns take low grade fuel and high grade fuel. High grade fuel includes plastics, low grade fuel is wood or dried biomass. Any new fuel will have to be demonstrated for air quality impacts.. Most of the time kilns get paid for taking alternative fuels.

Other Markets

50% of roads in US are unpaved. Porous asphalts developed using high % of shingles is another market. Have a number of mixes and can create in terms of uses. Have 100% recycled asphalt and shingle mixes.

Value of a ton of shingles is approx. \$70/ton in HMA. Use as much as possible in HMA. What can't be used in HMA, need to develop alternatives. Sell for less than \$70/ton for other uses. Can get high strength asphalts out of using shingles in cold mix.

Would it be beneficial to use higher% of shingles in cold mix...yes. Need aggregate, fill the voids with shingles

Dust control is another alternative use. One response was to use fines for dust control on gravel roads. Another response was to not use the fine fraction...use oversized pieces...can spread with a fertilizer distributor and apply ¼ inch. Do you do blending with crushed concrete as dust control? Yes. Heard that larger pieces may float off? Response: Fines wash out with aggregate. Larger pieces stay put. Use traffic roller on it, helps to bond back together.

This market may only be useful if have an abundance of shingles. Seems like an expensive dust control. Some disagreement on this...as it is a dust control method that works.

Company in MN uses a 50% shingles/50% RAP mixture for dust control.

Another market: underlain for road stabilization subgrade. Large size fractions can be used.

WA comment: There is an issue with any use that is open (like dust control). Regulatory agencies don't always allow this. Need to understand regulatory climate in your location.

There's been tests on use of shingles as mulch, livestock bedding. But may pose regulatory opposition. Need resolution of these issues! Another need to centralize data to make a stronger case on the use in these alternative markets.

2 What are the economics of those markets, such as fuel ...see notes above

3 What is the value of the final product once ground to spec...see notes above

4 Best management practices for delivery of quality end product markets...did not address

Operations

1 Shingle grinding techniques

Is horizontal grinder best way to do it? Response: Less messy...so it is #1 grinder. Depends on what you are going to use the material for..know your end market and select equipment according to need.

Other responses: Lower speed grinder is better. Horizontal grinders used to get the size you need and the speed you need.

Dust control during grinding: Will become an issue, especially if plant is near houses. Keep dust on site. Put additional nozzles on sprayers. Also looking into outside dust control.

In Canada temperature is an issue...if shingles are hot during grinding...it gets messy in grinder. Don't go further than 1 inch due to dust. Collect in summer, clean them up and grind in winter. Don't break down into small particles. When went ¼ inch, many were going into air. Can ship at 1 inch for dust control...mix with sand...50/50

Grinding in hot weather has not been an issue in FL. Water has been an issue...more water, more fines stuck to rollers. Will lead to broken belts. When wet it does grind better, but need to find a good balance.

How do you get rid of aluminum nails. Screens used to drop nails down. Two different ways...WMI uses a reverse magnet. Not sure if this is a problem with ¼ inch pieces.

How do you make it economical?

2 Agglomeration of processed piles of shingles

Tried putting sand or RAP with it...but too hard to control the mix for later end markets, later decided to cover shingle pile and now don't have trouble with agglomeration. Usually a problem in hot weather.

This is not an issue with tear offs...may be more of an issue with manufactured waste. New manufacturers scrap is softer. In tear offs, the material is stiffer. A key piece of info is not just the type of shingles, but also the asphalt content.

There is a company that blends in sand and puts under cover to prevent agglomeration. MN DOT prohibits pre-blending...so this method causes problems in meeting their specs.

3 Methods of feeding shingles into hot mix plants

2 bins...one for RAP, one for shingles and feed in with front end loader.

Q: When feeding in at 2-5%...how is it handled at plant? Response: Have a computer that tells how many tons/hour.

All goes in hot elevator (from RPA bin and shingle bin).

Feeding system will depend on type of asphalt plant.

Staples...are being used, but not recommended by many organizations.

Shingle application is evolving. Next problem is going to be underlayments being used. Synthetics are being used, getting away from organic felts. Synthetics are PP or PS. Might want to start thinking about these materials and how they may affect operations and markets

4 Screening and sorting techniques

Use grinder and trommel screen in together. This works well.

Vibratory screening...would like to find one screen that is multi use. Trommel screen makes sense...anyone else use vibratory?

Trommel with outside brush good way to go.

Screening guys will come in and do a demonstration for you. Bigger the better. Cost/ton/hour can be estimated.

Q: What is labor involved with cleaning tear offs? A lot! To get the product you want on the HMA side...need labor to clean it up.

What about roofing paper? Pull the big stuff out and can tolerate smaller stuff.

5 Best management practices for processing shingles

If tipping fees for disposal are low, hard to provide incentive to roofing contractors.

For plastic/paper contaminant...there's pneumatic technology to vacuum material up.

Ice shield on shingles? Can't get it off because it bonds to the roof during hot summer months. Contains rubber and other materials...so may be a positive, if can overcome the grinding and separation issue.

GBB: Over the years there is strength in numbers. Have all your data together and bring the data to decisionmakers via an organization that represents a broad cross section of stakeholders.