

Asphalt Pavement Industry Tops Charts As Recycling Leader

Recycling can be good economics, good engineering, and good for the environment

In this age of emphasis on recycling, few industries can measure up to the record of the Hot Mix Asphalt (HMA) industry. In fact, asphalt pavement is America's most recycled product.

Fully 80 percent of the asphalt pavement that's removed each year during widening and resurfacing projects is reused in pavements, shows a report by the Federal Highway Administration. That's a higher percentage than for newsprint, plastic jugs, aluminum cans, and magazines.



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Not only that, but the industry is a national leader in recycling four other industrial materials: rubber from used tires; slag from the steel-making process; roofing shingles; and sand from metal-casting foundries. Hot Mix Asphalt has been engineered to accept these recycled materials. In some cases, they can actually enhance Hot Mix Asphalt pavements.

Asphalt rubber

An example is asphalt rubber. The product blends between 15 percent and 20 percent rubber — from ground-up rubber tires — with liquid asphalt cement to make an asphalt binder. When the binder is mixed with aggregates, asphalt rubber becomes a very versatile product.

"Asphalt rubber mixes are effective at combating cracking in pavement systems when they are properly specified, designed, and constructed," says David Newcomb, vice president, research and technology at the National Asphalt Pavement Association.

Asphalt rubber mixes offer several advantages, says Mark Belshe, P.E., asphalt rubber manager, FNF Construction Co. and president of the Rubber Pavements Association. Following are just a few of asphalt rubber's advantages:

- Durability is improved because binder contents are higher than for non-rubberized Hot Mix.
- Oxidation is reduced.
- Asphalt rubber mixtures have improved resistance to reflective cracking.
- Traffic noise is lowered.
- The pavements are more resistant to abrasion and fatigue.

Slag from steel production

When slag, a by-product of steel production, is crushed and processed like conventional construction aggregates, the resulting product, slag aggregate, can become valuable for use in Hot Mix Asphalt.

Selling slag aggregates from steel production is big business. Last year some 20.5 million tons of slag aggregate were sold in the United States. Illinois, Indiana, Michigan and other states either require or allow slag for use in high-volume pavements.

Because slag improves skid resistance, applications requiring high friction form a major market for slag aggregates. Well-known racetracks with pavements that incorporate slag include the Indianapolis Motor Speedway and racetracks in Michigan, Las Vegas, and Fontana, California.

Blast furnace slag and to a lesser extent, steel furnace slag have been used extensively to make Superpave mixtures. Slag aggregates have very angular, irregularly-shaped particles, so they help generate higher voids-in-mineral-aggregate (VMA) and increased stability in Superpave mixtures.



And slag sand can help Superpave mixtures meet fine aggregate angularity (FAA) specifications. Superpave mixes made for high volume pavements are required to have an FAA value of 45 or higher for the fine aggregate portion of the mix. That is no problem for slag sand; typical FAA values are 48 and above.

What's more, steel furnace slag has been used successfully as coarse aggregate in stone matrix asphalt (SMA) mixtures. Such aggregate must be extremely durable and strong to form the stone-on-stone "frame" within SMA — and slag aggregate fills the bill.

For example, one intersection in northern Illinois had a major durability problem. Some of its reconstructions had not lasted more than six months, mostly because of a high volume of heavy truck traffic.

The upshot was that a contractor constructed a full-depth SMA asphalt pavement at the intersection, using an SMA binder with 2 inches of SMA surface mix. The result: the pavement has stood up to the heavy truck loadings for two years with no major deterioration.

As a result of that success with SMA, contractors went on to pave with SMA on Interstate 94, which is a major truck artery into Chicago, and on I-55, which runs southwest of Chicago.



Roofing shingles

More than ever, interest in recycling roofing shingles into Hot Mix is gaining momentum across the nation. In Raleigh, North Carolina, a group called Partners in Progress has collaborated to form a successful shingle recycling operation. The group is composed of three companies: Mangum Asphalt Services, a contractor; Certainteed, a roofing manufacturer; and Ross and Associates, a local consultant.

From start-up in 1994 as just an idea, the group has gained complete approval of the North Carolina DOT to use roofing shingles in any mix, surface or binder course, on any state project. As well, the state environmental agency approves of the process developed by the group, says Michael Mangum, chairman of The Mangum Group, Mangum Asphalt Services' parent company.

Mangum Asphalt Services receives 12,000 to 15,000 tons of waste shingles per year from Certainteed and recycles them back into HMA for state and local highways. The shingles are factory rejects and the company is paid a fee for hauling them away. (No used shingles coming from roofs are recycled.)

Mangum says potential savings, compared to conventional Hot Mix, range from \$1 per ton up; savings are relative, and depend on the price of liquid asphalt cement. "If the price of liquid AC is high, and you've got shingles, and if you can incorporate them in your mixes, you might have a competitive advantage," says Mangum. "But if the price of AC is low, you're not going to save nearly as much."

Mangum can cite several pavements that incorporated shingles into their Hot Mix, and they're all performing well. "One of our first projects, a cross-town highway in Raleigh, gets pretty heavy traffic loads," says Mangum. "Built in 1995, it was the first shingle recycling project that the North Carolina DOT put in place, and it's performing quite well."

Another shingle recycling project was the Interstate 440 Raleigh Beltline project. A heavily traveled route, it's performing quite well, Mangum reports. The company also has used shingles in the Hot Mix for a number of industrial and commercial parking lots — with considerable success.

Foundry sand

Just as with asphalt rubber, slag, and shingles, the recycling of foundry sand from the metals casting industry is a high-volume business. Last year, one eastern Pennsylvania company named Process Recovery Corp. sold about 70,000 tons of processed foundry sand for use in Hot Mix Asphalt. This year, the company expects to boost that total to 100,000 tons of sand going to asphalt producers.

What's the reason for the jump? Process Recovery expects to add two new Hot Mix producers to its list of six customers, which have 19 asphalt plants. Based in Sinking Spring, Pa., Process Recovery is a company owned by a consortium of 33 foundries. The company exists for the purpose of recycling excess foundry sand from its member companies. Last year, Process Recovery took in about 180,000 tons of sand from 55 foundries.

Hot Mix Asphalt producers like foundry sand because it saves them \$3 to \$4 per ton of sand, says Thomas Hartman, president of Process Recovery. Quarry sand might cost \$8 or \$9 per ton, but foundry sand costs a Hot Mix producer an average of \$5 per ton. And Process Recovery's foundry sand is sold ready for use in Hot Mix Asphalt — it is screened and blended and needs no further processing.

Hot Mix Asphalt made with these recycled products — tire rubber, slag aggregates, roofing shingles and foundry sand — makes use of proven, engineered mix designs to create the best pavement possible for the traveling public. By incorporating both reclaimed asphalt pavement (RAP) and waste streams from other industries into new pavements, the asphalt pavement industry is conserving precious natural resources, saving landfill space, and enhancing our environment.

Recycling is one more reason that Hot Mix Asphalt is the best buy all of the time.

(Editor's note: For more information about the 73 million tons of reclaimed asphalt pavement (RAP) used every year in the U.S., see Best Buy number 11 "Take the RAP: It Saves Money and the Environment," also available from NAPA.)



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