A Survey of Transportation Agencies to Determine Uses of Ground Tire Rubber in Asphalt Pavement Applications

An internet survey was performed to evaluate the current state of practice with regards to the use of ground tire rubber (GTR) in asphalt pavements. This 17-question survey was developed to expand on information currently available in the literature and other sources. The survey was distributed via email to 152 industry professionals including members of each state transportation agency, the Federal Highway Administration (FHWA), and other government agencies. Of the 50 state agencies, 27 have responded to the survey as of the end of July 2012.

The majority of the 27 respondents (70%) indicated that their agency has previously used or is currently using GTR in asphalt pavements. About half of 27 respondents indicated that they have a specification for using GTR in asphalt pavements. Agencies have utilized GTR routinely for crack sealing (30%), chip seals (26%), dense graded hot mix asphalt (HMA) (15%), joint sealant (15%), SAMI (11%), and open graded friction course (11 %). On an experimental basis, agencies have utilized GTR for dense graded HMA (41%), SAMI (19%), open graded friction course (11%), and other gap graded mixtures (11%). As shown by Table 1, dense graded HMA and open graded friction courses have been the most widely utilized applications involving GTR in terms of the tonnage of GTR used and also lane miles of pavement.

Table 1. Pavement Applications Using GTR

Pavement Application Using GTR	Number of State Transportation Agencies Who Reported Using the Application			Quantities Used in the Past Year	
	Experimental	Routine	Combination of Both	Raw Rubber Used, Tons	Lane Miles of Pavement
Membrane	2	0	2	Not Available	6
Joint Sealant	1	4	1	Not Available	34
Crack Sealant	1	8	1	Not Available	325
Chip Seal (SAM)	1	7	1	Not Available	90
Interlayer (SAMI)	5	3	1	395	106
Dense Graded HMA	11	4	1	9081	1620
OGFC	3	3	1	5344	1558
SMA	1	0	2	0	0
Other	3	2	2	0	6
Totals				14,820	3745

Note: Because some state transportation agencies reported the tons of rubber but not the lane miles while others reported the lane miles but not the tons of rubber, there is not a direct one-to-one correspondence between the two quantities listed in the above table for each application.

Table 2 shows the technologies being used by state transportation agencies to incorporate GTR into their pavements. Fifteen agencies responded to this question.

Table 2. Technologies Used for Incorporating GTR into Pavements

	Number of Agencies
100% Terminal	6
100% Continuous	1
100% Generic Dry	0
95% Terminal and 5% Continuous	1
95% McDonald/Batch and 5% Terminal	1
90% Generic Dry and 10% Continuous	1
65% McDonald/Batch and 35% Terminal	1
50% Terminal and 50% Continuous	2
50% Terminal and 50% Generic Dry	1
50% Generic Dry and 50% McDonald/Batch	1
Total Number of Agencies	15

The percentages in table 2 were used to calculate the following average percentage of use for each technology.

Table 3. Average Percentage of Use

Terminal Blending	59%
Generic Dry	13%
Continuous Blending	14%
McDonald/Batch	14%

These percentages show that terminal blending is the predominate method currently being used by state transportation agencies to incorporate GTR into asphalt pavements. It is being chosen 59% of the time. It must be noted that these percentages do not account for the amount of GTR (tonnage) used by each agency. They are reflective of the decisions currently being made by them regardless of how much GTR they use. In the future, an analysis will be performed which accounts for the amount of GTR being used by each agency. What can be immediately concluded from the survey is that the largest amount of GTR is being incorporated into pavements using terminal blending.

Several other questions were asked by the survey. Only five of the 27 respondents indicated that the GTR is being treated before it was used in asphalt mixtures. No consensus existed amongst them on the type of pre-treatment utilized as many noted the treatments are proprietary to the supplier.

Only five of the 27 respondents indicated that their agency has some long term field performance data for pavements modified with GTR. Only seven indicated that mixtures incorporating both reclaimed asphalt pavement and GTR have been placed in their state. Only two have used warm mix asphalt technology with GTR.

The types of distresses to be mitigated or prevented through the use of GTR in asphalt mixture were noted by the respondents as: rutting, cracking in general, reflective cracking, low temperature cracking, and drain down. Some of the perceived benefits of GTR were: cost effectiveness, environmental benefits (recycling waste rubber), a less expensive alternative to polymer modified binders, increased flexibility, increased resistance to several distresses (cracking, rutting, drain down), increase in binder film thickness, decrease in road noise when used in open graded friction courses, and less maintenance required. The perceived drawbacks noted were: higher costs than conventional HMA, fatigue life reduction, lack of standardized GTR gradations, problems with blending and homogeneity, lack of standard asphalt binder grading protocol, and higher temperatures needed during production and placement leading to environmental concerns. Remaining concerns and issues with the use of GTR were a lack of available specification guidance, no standard test protocols for GTR modified binders, the availability of rubber, long-term performance, insufficient demand for the technology, environmental concerns, asphalt settlement issues, benefits that offset extra costs and difficulties during mixing and paving operations.