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HEARING ON SCRAP TIRE MANAGEMENT AND RECYCLING OPPORTUNITIES
BEFORE THE
HOUSE COMMITTEE ON SMALL BUSINESS
SUBCOMMITTEE ON ENVIRONMENT AND LABOR
AND SUBCOMMITTEE ON REGULATION, BUSINESS OPPORTUNITIES AND ENERGY

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Mr. Chairman and Members of the Committee; thank you for providing the Federal Highway Administration (FHWA) the opportunity to testify before your Committees on an area in which we have been involved for some years.

The issue of scrap tires and their potential use as an additive for asphalt paving products has technical, economic, and environmental implications. Even though the technology exists to incorporate scrap tire rubber into asphalt paving products, there are still some long term effects from using this recycled product, which have not been adequately addressed. My testimony provides an overview of the Federal Highway Administration's background on these matters, a summary of the state-of-the-practice, a discussion of our long term concerns, a picture of the present and projected costs, and our proposed future program in this area.

BACKGROUND

FHWA has been involved with the use of crumb rubber since the early 1970's. In 1976, an FHWA Demonstration Project (Demo Project No. 37 "The Use of Discarded Tires in Highway Construction") resulted in the construction of 40 projects using asphalt-rubber binder in a pavement surface treatment. In 1983, FHWA initiated Experimental Project No. 3 "Asphalt Additives." Projects using asphalt-rubber and rubber modified hot mix asphalt mixtures are being evaluated. We have co-sponsored three National Seminars on Asphalt-Rubber which provided industry, academia, and user agencies a forum to share this technology. Most recently, we have assigned a full time engineer in the Pavement Design and Rehabilitation Branch to examine and monitor the performance of asphalt mixes with crumb rubber.

STATE OF THE PRACTICE

"Crumb rubber additive" (CRA) is our generic term for the product from scrap tires which can be used in the asphalt products. It is the product from the ambient grinding of waste tires and from retread buffing waste. Tires can be ground by a cryogenic method, but the product is less suitable as CRA. The size (gradation) of the CRA is dependent on the process and application it will be used for. Typically, a fine ground CRA passes a No.20 Sieve (0.04 inches) and is retained on a No.50 Sieve (0.01 inches), similar to fine beach sand. A coarse ground CRA passes a No.4 Sieve (0.19 inches) and is retained on a No.20 Sieve (0.04 inches), like a coarse sand.

Adding CRA to asphalt paving products can be divided into two basic processes commonly described as the 'wet process' and the 'dry process.' The wet process blends CRA with hot asphalt cement and allows the rubber and asphalt to fully react in mixing tanks to produce an asphalt-rubber binder. This binder can contain as much as 30% CRA. Both the wet process and the products which use asphalt-rubber binder are protected by patents.

The dry process mixes CRA with the hot aggregate at the hot mix asphalt facility prior to adding the asphalt cement. Depending on the type of facility and the hot mix process, some degree of rubber/asphalt reaction takes place. This dry process produces a rubber modified hot mix asphalt mixture. These mixes can contain as much as 3% CRA by total weight of mix. "Plusride" is a patented product of the dry process, but the process itself, to the best of our knowledge, is in the public domain.

Laboratory test results show that adding CRA to asphalt paving products can improve the engineering characteristics of the asphalt binder. However, extrapolation of laboratory test results to field performance has not always provided reasonable correlations. The principle deterrent to using CRA has been cost. State and local agencies are reluctant to use paving materials which have a significantly higher cost and do not have equally higher performance records.

There are four general categories of asphalt paving products which use CRA. They are crack/joint sealants, surface treatments, hot mix asphalt mixtures with asphalt-rubber binder, and rubber modified hot mix asphalt mixtures. Crack/joint sealant is an asphalt-rubber product, blending 15 to 30% CRA with the asphalt cement. This product is routinely used in many States as a maintenance material and is covered in the American Society for Testing and Materials specifications (ASTM D3406).

Surface treatments also use an asphalt-rubber binder with a similar amount of CRA. The binder is applied to the roadway surface at 0.6 gallons per square yard, then covered with aggregate and seated with a roller. This application of CRA began in the late 1960's and was patented under the trade names SAM and SAMI (Stress Absorbing Membrane and Stress Absorbing Membrane Interlayer). Under FHWA Demonstration Project No. 37, 40 SAM and SAMI projects were constructed and evaluated. This technology has been proven and documented, but the cost is higher than conventional asphalt surface treatments.

By the late 1970's the producers of asphalt-rubber binder began experimenting with the use of asphalt-rubber binder in hot mix asphalt mixtures. Again, the amount of CRA added to the asphalt cement is generally 15 to 30%. The research has shown that the amount of binder required in the mixes will increase over conventional asphalt mixes. Unfortunately, there have not been

many controlled experimental projects of this material to evaluate its performance in comparison to conventional hot mix asphalt mixes.

The remaining category of asphalt paving products are the rubber modified hot mix asphalt mixtures. These products use the dry process to add 1 to 3% CRA to the total mix. This technology was developed in Sweden and introduced in the United States in the 1970's as the patented product, Plusride. FHWA Experimental Project No. 3 is evaluating projects constructed with this product. To date, the evaluations have observed both successes and failures. Examination of the dry process, outside of the patented Plusride technology, have just begun in several states. A number of years will be required to evaluate the performance of these new mixes before any performance history can be determined.

RESEARCH

Although the technology exists today to incorporate the rubber from scrap tires into asphalt paving products, a number of long term issues must be addressed before these products, particularly the hot mix asphalt products, can be considered technological and environmental advances. If the highway agencies were directed to use CRA today, and the products using CRA failed to satisfy these long term issues, we could be creating a problem many times greater than the problems we are trying to resolve.

From the FHWA perspective, we must evaluate the field performance of the various mixes to determine if they are cost effective to the highway community. Acceptance and use of these products by the State highway agencies will depend greatly on the life cycle cost effectiveness. Any increase in product cost must be offset by an equal or greater increase in pavement performance. There is very limited comparable data on the performance of hot mix asphalt mixtures using CRA. If the performance does not outweigh the additional cost, there is no economical benefit to the highway community.

The recycling of hot mix asphalt mixes has become a significant portion of the paving program in many states. The ability to recycle mixes which have CRA has never been evaluated and documented. If pavements with this additive cannot be recycled, we will have to deal with the disposal of these pavements. Even if we can successfully recycle the mix, we must also consider what effects the recycling process will have on the properties of the mix. This issue will require a combined effort of the highway community.

Our other long term concern with using CRA relates to the environment. Only a limited amount of testing has been performed to measure the emissions associated with processing asphalt paving products with CRA. The emissions from producing, placing, and recycling these mixes are regulated by federal, state, and local emission standards. We intend to comply with these standards on

federal-aid projects and feel that some additional testing, evaluation, and documentation is needed.

MATERIAL COST

There is an increased cost associated with using CRA over conventional asphalt products. Under present day budget constraints, if the paving product cost is 30% higher, then 30% less roadway can be paved. Surface treatments with asphalt-rubber binder have only been shown to be cost comparable to other pavement rehabilitation techniques in certain situations. There is only limited performance history on the use of CRA in hot mix asphalt mixtures. After the long term performance data is collected, the life cycle cost of these mixes can be better established. The use of CRA in asphalt pavements may prove to be cost effective once patent barriers are addressed and the long term performance evaluations are completed. In general, paving products with CRA presently cost 50 to 100% more than conventional asphalt products.

CONCLUSIONS

The use of crumb rubber additive (CRA) in asphalt paving products has the potential to enhance the pavement and to reduce an environmental problem. However, we must address several long term issues before the products will be acceptable to the user agencies. The present cost to use CRA is only representative of a

limited market. FHWA's preliminary projections indicate that the full production cost for asphalt-rubber and rubber modified mixes will be 20 to 30% higher than conventional asphalt mixes.

The paving industry presently consumes the rubber from one to two million scrap tires each year in the form of CRA. If these products can demonstrate cost effective performance and are environmentally acceptable, then CRA could become a significant alternative use for waste tires.

FHWA PROGRAM

FHWA continues to encourage the State highway agencies to evaluate asphalt additives, including CRA. Our engineering staff is available to assist State and local agencies in the development of asphalt paving products with CRA. We plan to continue to monitor the performance of CRA projects to establish its cost effectiveness and we will examine the recycling issue. We are presently developing our "Research And Technology Program 1992-1996". In the "Research and Development: Pavements and Structures Element" of this program, the "Materials to Strengthen and Enhance Performance Objective" includes enhancing the application of waste materials for use in highway construction.

Thank you for the opportunity to express the Federal Highway Administration's position on the use of crumb rubber additive for asphalt paving. I would be pleased to address any questions you may have.

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