

2008 Annual Report to the Legislature and the California Integrated Waste Management Board - Senate Bill 876 - Waste and Used Tires

Purpose

This report was prepared in accordance with Section 20 of Chapter 838, Statutes of 1999 (Senate Bill (SB) 876, Escutia), which amends and adds numerous sections to the Public Resources Code, including Section 42889.3, which states:

“On or before January 1 of each year, the Department of Transportation shall report to the Legislature and the board on the use of waste tires in transportation and civil engineering projects during the previous five years, including, but not limited to, the approximate number of tires used every year, and the types and location of these projects.”

Background

According to the California Integrated Waste Management Board (Board), California generated 40.8 million waste tires in the year 2005. Of these tires, 30.6 million were diverted from landfills through recycling, reusing, retreading, and as tire-derived fuel. For the approximate 10.2 million tires that did not have an established secondary use, the expansion of the existing markets for waste tire usage such as Rubber Hot Mix Asphalt (RHMA)¹, playground mats or other surfacing, civil engineering applications, and tire-derived fuels will assist in addressing potential tire stock pile issues and their associated environmental impacts.

Department’s Efforts

The California Department of Transportation (Department) has established a variety of uses for recycled content tire products for civil engineering applications in transportation projects. The Department is committed to helping reduce the number of waste tires entering California’s landfills by aggressively pursuing innovative uses for these tires. Although RHMA is viewed by many as the main avenue to aid in this effort, the Department is additionally pursuing other uses that can potentially consume larger quantities of waste tires. “Shredded waste tires,” also known as Tire-Derived Aggregate (TDA), consume large quantities of tires when installed as lightweight fill material in the Department’s engineering applications. The Department also utilizes waste tires in other asphalt applications and in other innovative products.

¹The terms Rubber Hot Mix Asphalt (RHMA) and Hot Mix Asphalt (HMA) supersede the Rubberized Asphalt Concrete (RAC) and asphalt concrete (AC) terms used in previous reports. The RHMA and HMA terms are consistent with accepted industry and academia references and will now be the exclusive terms used for this topic.

The Department uses RHMA as an alternative to Hot Mix Asphalt (HMA). RHMA is similar to HMA with the exception that it includes crumb rubber generated from waste tires. The Department has seen a steady increase in projects using RHMA and attributes this to the continual promotion of RHMA, the development of the Asphalt Rubber Usage Guide, and to making RHMA the strategy of choice when evaluating flexible pavement alternatives for the Department's projects. In 2007, 29.2 percent of all flexible pavements, by weight, were constructed with RHMA. A complete list of the Department's RHMA projects is included in Appendix 1. To further enhance efforts to reduce waste tire stock piles in this country, the Department has revised its project specifications to limit the crumb rubber used in the Department's RHMA projects to material that is produced in the United States from waste tires taken from vehicles owned and operated in the United States. Imported crumb rubber will not be allowed.

The Department and the Board, through an inter-agency agreement, conducted research to look for opportunities to broaden the use of RHMA in the Department's projects. This research helped to confirm the cost-effectiveness of the Department's strategies for RHMA, confirmed the feasibility of recycling reclaimed RHMA for use

Waste Tires Used in Department of Transportation Projects					
Year	Number of Tires Used in RHMA Projects¹	Number of Tires Used as TDF³	Number of Tires Used as TDA¹	Number of Tires Used in Other Applications^{1,5}	Totals
2004	1,788,945	127,300		100,997	2,017,242
2005	2,387,356	140,600		190,714	2,718,670
2006	3,343,533	199,800	131,500 ⁴	105,339	3,780,172
2007	3,140,808	199,800		86,699	3,427,307
2008 ²	3,500,000	199,800	177,000 ⁴	81,512	3,958,312
Subtotal	14,160,642	867,300	308,500	565,261	15,901,703

¹ Based on projects listed in Appendix 1. Formula for conversion of RHMA tonnage to number of waste tires consumed is 2.72 tires/RHMA metric ton or 2.47 tires/RHMA U.S. Customary ton.

² Actual quantity through second quarter is 2,615,138 tires with an estimated amount of 3,500,000 tires projected through the end of the calendar year.

³ Based on the Board's California Waste Tire Generation, Diversion, and Disposal Reports which state that the total number of tires used as Tire Derived Fuel (TDF) in cement kilns in California is as follows: 2004 – 6.7 million tires; 2005 -7.4 million tires, 2006 and 2007 – 7.4 million tires (projected). These values were then multiplied by the Department's 1.9 percent share of the market in years 2004 and 2005, 2.7 percent share in 2006, and 2.7 percent share in 2007 (projected) to determine the number of tires used as TDF.

⁴ Amount represents TDA utilized as lightweight fill material. If experimental installations continue to perform as anticipated, this use can be adopted as a standard application. Additional pilot projects are being aggressively pursued.

⁵ Other applications include waste tires used in asphalt – rubber binder material for chip seal projects. In 2008, this totaled 81,512 waste tires for chip seal projects.

in new pavements, and established the core elements for product deployment through statewide training and partnerships with industry. This coming year, the Department will use the remaining funds from this inter-agency agreement to develop an on-line training course.

The increased use of the RHMA comes with opportunities to test the limits of the product and placement. The successful construction of RHMA is dependent on many factors, with the most critical ones being related to temperature. RHMA is produced at a higher temperature than HMA and must also be placed at a hotter temperature. The ambient air temperature of the construction site at the time of material placement plays a key role in compacting the material for good durability. Forensics for three construction projects where the Department experienced failures of RHMA pavements was attributed to installations outside the acceptable temperature range. All three projects were constructed in the fall season, during night work, where temperatures dropped dramatically.

The Department has also worked in partnership with the Board on projects that promote the innovative use of shredded waste tires in highway construction. In 2006, the Department piloted the use of TDA as backfill material behind a retaining wall on State Route (SR) 215 in Riverside County. This retaining wall pilot allowed the Department to construct a full-scale, fully instrumented test installation of lightweight TDA that consumed approximately 131,500 waste tires. The Department continues to monitor this installation for reduced retaining wall pressures as verification of such reduced pressures may allow for a significant reduction in retaining wall mass in future designs and ultimately reduce the costs for such structures. More recently, TDA was used in the Confusion Hill Realignment Project, which will bypass a significant landslide area on U.S. Highway 101 in Mendocino County. Here, lightweight fill material was placed above an arch culvert which is approximately 90 feet below the roadway. The light weight characteristic of TDA was a key consideration in selecting this fill material since it is necessary to minimize soil loads on the existing arch culvert. Construction of Stage 1 of the project has been completed using approximately 177,000 waste tires. Stages 2 and 3 will begin next year where nearly 200,000 more waste tires are expected to be used.

The Department considers TDA as the first option whenever lightweight fill is required for a project. To support the Department's consideration of project specific TDA uses, the Board has provided the Department with access to industry experts to supplement education to the Department's technical staff on potential applications of TDA.

In addition to RHMA and TDA, the use of tires as a fuel supplement in cement kilns and cogeneration facilities constitutes a large market for the consumption of waste tires. For example, of the estimated 40.8 million waste tires generated in California

in 2005, approximately 7.4 million were consumed as Tire Derived Fuel (TDF) in various cement kilns in California. These kilns produce cement used to create concrete the Department uses in many of its construction projects.

Other transportation applications that incorporate waste tires include asphalt rubber binder material used in chip seals and rubber mats. Asphalt rubber chip seal projects are used to correct surface deficiencies and to seal and protect the pavement against the intrusion of surface water. The Department also piloted the installation of rubber mats underneath guardrail as a method of vegetation control. This application continues to be evaluated in an effort to address the Department's historic maintenance need to suppress fire risk through weed control, while reducing herbicide usage and the exposure of maintenance staff to traffic and chemicals.

Although program funding limitations have restricted the Department's ability to construct all of the necessary improvements for both new highway construction and for the maintenance and rehabilitation of the existing facilities, the Department's recent focus on RHMA and TDA as strategies of choice has allowed the Department to surpass internal goals for waste tire usage. Appendix 2 compares the amount (by weight) of the various pavement types constructed by the Department each year. Appendix 3 shows the percent usage of RHMA when compared to all flexible pavement strategies.

Summary

The Department continues to help reduce the number of waste tires entering California's landfills. The Department has promoted the use of RHMA as a roadway pavement strategy and is continually looking for new and innovative uses of recycled waste tires for transportation projects.

The Department's use of RHMA is largely dependent upon the available funding in the State Highway Operational Protection Plan (SHOPP) for pavement projects. The Department anticipates the construction of additional Highway Maintenance and SHOPP Projects, which should include a significant number of RHMA projects.

It should also be noted that there is a substantial investment of State and Federal funds on local roads. Some of these investments are the local share of the State Transportation Improvement Program congestion relief programs, and gas tax revenue. Although the Department cannot accurately quantify the use of RHMA on local roads, it is a pavement strategy currently used by many local agencies.

The Department is dedicated to the stewardship of natural resources and will continue to look for opportunities for innovative uses of recycled products in transportation projects.