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2005 Progress Report on Using Scrap Tires and Crumb Rubber in Texas Highway Construction Projects



Submitted Jointly by
The Texas Commission on Environmental Quality (TCEQ) and
The Texas Department of Transportation (TxDOT)
as required by House Bill 1, 78th Legislature
Article VI, TCEQ Rider 11,
Article VII, TxDOT Rider 37, and
Article VII, TxDOT Rider 43

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PREFACE

This report is being submitted as required by House Bill 1, Article VI, the Texas Commission on Environmental Quality Rider 11, and Article VII, the Texas Department of Transportation Riders 37 and 43, 78th Legislature:

Agency Coordination. The Texas Department of Transportation and the Texas Commission on Environmental Quality shall coordinate their efforts on the acquisition and potential uses of crumb rubber and shredded tire pieces in the various phases of highway construction. The Texas Department of Transportation and the Texas Commission on Environmental Quality shall provide to the appropriate Legislative Committees a report on their progress by January 1 of each fiscal year.

Waste Tire Recycling. It is the intent of the Legislature that the Texas Department of Transportation communicate and work with industries in all counties to maximize the use of tire recycling projects including but not limited to, civil engineering, highway construction, and land reclamation projects.

The department shall evaluate its progress and report to the Legislature and the Legislative Budget Board by January 1, 2005.

EXECUTIVE SUMMARY

This is the sixth annual Progress Report on Using Scrap Tires and Crumb Rubber in Texas Highway Construction Projects. This report represents the cooperative effort between the Texas Commission on Environmental Quality (TCEQ) and the Texas Department of Transportation (TxDOT) to assess the scrap tire situation in Texas and identify beneficial uses of tires, including highway construction.

During calendar years 2003 and 2004, both TCEQ and TxDOT oversaw significant progress in the state's scrap tire situation. Major developments include the following:

- More Texas scrap tires were disposed of or used beneficially than were generated in calendar year 2003. The number of scrap tires disposed of or recycled was 24.3 million scrap tire units (STUs) in 2003, which was 300,000 more than were generated.
- The volume of scrap tire material stockpiled at previously registered scrap tire storage sites was reduced through industry and TCEQ efforts by approximately 15.2 million STUs during 2003 and an estimated 10.5 million STUs during 2004, representing a 41.5 percent reduction in state stockpile volumes since 2002.
- An existing cement kiln located near Abilene retrofit its facility to use tire-derived fuel (TDF) and initiated tire burning operations. This facility is expected to consume from one to two million scrap tires as TDF annually.
- A new crumb rubber processing facility initiated operations in Denver City, Texas and is expected to increase the number of Texas scrap tires processed into crumb rubber.
- The number of scrap tires used for the manufacture of crumb rubber products increased by 1.1 million tires between 2002 and 2003.

TCEQ Progress

- TCEQ used funds appropriated by the 77th Legislature to contract for cleanup of the two largest scrap tire stockpiles in the state. These cleanups reduced the number of scrap tires stockpiled in Texas by 13.7 million in 2003 and an estimated 10 million scrap tires in 2004.
- TCEQ also used funds appropriated by the 77th Legislature to award grants to two cement kilns for retrofit of their facilities to use TDF. One of the two cement kilns completed the retrofit and burned a total of 1.4 million whole scrap tires in 2003 and an estimated 2.5 million whole scrap tires in 2004. The second cement kiln is anticipated to complete its facility retrofit and initiate TDF burning operations by mid-2005. The facilities should consume a combined total of three to five million whole scrap tires as TDF annually.
- TCEQ contracts resulted in the removal of approximately 240,000 scrap tires from an abandoned tire site in Pasadena during 2003 and 2004.

- In 2004, TCEQ entered into a cleanup agreement for removal of 800,000 scrap tires from an abandoned site in San Antonio. Approximately 265,000 tires were removed during 2004 under this agreement.

TxDOT Progress

- In FY04, TxDOT increased its consumption to 20,600 tons of tire rubber in asphalt, crack sealer, and other paving products, spending \$90.7 million on those products.
- The Rubber Paving Association recognized TxDOT districts and their successful projects using crumb rubber.
- TxDOT continues to evaluate and demonstrate innovative uses for transportation-related tire-rubber products, including tire bales for slope repair and for embankment construction and vegetation-control mats for use around sign posts and guardrail posts.

Trends and Continuing Issues

Several significant developments during 2003 and 2004 are improving the scrap tire situation in Texas:

- Remediation efforts at the two largest Texas scrap-tire sites, Stamford and Atlanta, have reached 87 percent and 50 percent completion.
- Cleanup projects were begun in Pasadena and San Antonio.
- Cement kilns and paper and pulp mills increased TDF use.
- Consumption of scrap tires for the manufacture of crumb-rubber products increased 336 percent.
- Use of scrap-tire materials in roadway construction and maintenance and other transportation-related products continues to grow.
- Education and outreach events are encouraging other innovative uses for scrap tires and tire-rubber material at both the state and local level.

Although TCEQ and TxDOT continue to reduce and prevent stockpiles and use products with tire rubber, three primary issues persist.

- Illegal scrap tire dumping is likely to continue in areas of the state that have few end users or disposal facilities.
- Demand for scrap-tire products is not strong enough to clean up existing illegal dumpsites.
- TCEQ funding is insufficient to clean up remaining scrap-tire stockpiles.

When funds appropriated for cleanup of the two largest scrap-tire stockpiles have been exhausted, very limited funding will be available for the maintenance or cleanup of the remaining stockpiles. Consequently, tire fires and the breeding of mosquitoes that can transmit West Nile and other viruses will continue to be risks to the environment and human health.

Conclusions

While significant challenges remain, TCEQ and TxDOT made significant progress addressing scrap tires during 2003 and 2004. TCEQ continues to ensure that scrap-tire handlers comply with all applicable regulations and, in conjunction with TxDOT, to develop additional scrap-tire markets and products. As the volume of crumb rubber and other scrap-tire rubber material processed in the state increases, the potential for productive use grows.

Despite this progress, ongoing challenges for future progress include:

- funding cleanup efforts
- developing new markets and end users where needed
- minimizing illegal dumping of scrap tires

OVERVIEW OF TEXAS SCRAP TIRE MANAGEMENT

Scrap tire management continues to present a worldwide challenge, with more than 290 million scrap tires generated in the United States in 2003. Of that number, approximately 233 million were used and 27 million disposed of, leaving the remainder to be added to the growing accumulation. At least 275 million may be stockpiled nationwide, according to the Rubber Manufacturers Association.¹

Texas Compared to Other States' Tire Management Systems

Although one of only seven states that phased out its state-mandated tire-collection fee, Texas still regulates the management and disposal of scrap tires. The state requires registration for tire collection, transport, processing, and storage. The state is also actively working to clean up all stockpiled tires in Texas.

Texas is one of the states fitting the following scrap-tire management categories²:

- 41 states allow cut or shredded tires in landfills.
- 37 prohibit landfilling whole scrap tires.
- 36 require tire collectors, processors, or both to be registered or permitted.
- 36 have stockpile cleanup programs.
- 29 do not have dedicated scrap-tire funds.
- 31 do not have market development incentives.
- 15 states do not collect fees for scrap tire management, including those that discontinued the fee.

Scrap Tire Availability in Texas

Based on industry estimates, Texans generate 24 million scrap tires each year—more than one tire for every person residing in the state. In addition, at the end of calendar year 2003, the equivalent of approximately 43.4 million scrap tires lay on the ground in Texas. (See Table 1, below.)

¹ U.S. Scrap Tire Markets, 2003 Edition, July 2004. Rubber Manufacturers Association Web site, www.rma.org/scrap_tires

² State Legislation – Scrap Tire Disposal. Edited and updated by M. Blumenthal/J. Falardeau, September 2003. Rubber Manufacturers Association Web site

Table 1. Texas Scrap Tire Stockpiles, End of Calendar Year 2004

Type of Site	No. of Sites	Quantity (STUs*)	Form of Material
Formerly Registered Facilities (see Appendix A)	11	36.2 million	Mainly tire shreds; some tire pieces; few whole tires
Known Illegal Dumps	approx 150	4.5 million	Mainly whole tires
Registered Facilities (see Appendix B)	11	2.7 million	Varies
Total	approx 170	43.4 million	All

* Scrap tire unit. 1 STU = 20 pounds of scrap tire material. This unit of measurement is used because scrap tire material can take many different forms. For large volumes, it is helpful to note that 1 million STUs equal 10,000 tons of scrap tire material.

This accumulation of shredded tires is primarily a carryover from the state's Waste Tire Recycling Program which operated from 1992 through 1997. A brief history of the scrap tire program can be found in the 2003 report (SFR-069/03), along with diagrams illustrating scrap tires' routes from discard to final disposal or usage.

Scrap Tire Usage and Landfill Disposal in Texas

Texas scrap tire transporters and end users reported beneficially using or legally placing in landfills 24.4 million scrap tires during 2003. This amount slightly exceeded the 24 million scrap tires assumed to be generated annually with approximately 23.2 million STUs consumed by end users and 1.2 million legally placed in landfills as waste. The number of scrap tires reported as beneficially used decreased slightly from 25 million in 2002 versus 23.2 million scrap tires in 2003. The number of scrap tires legally placed in landfills slightly increased from 1 million in 2002 to 1.2 million scrap tires in 2003. The decrease of 1.8 million fewer scrap tires reported as beneficially used may be from less use in specific civil engineering, septic system, and land reclamation projects.

Demand for scrap tires increased for TDF and crumb rubber applications and decreased for civil engineering projects, septic systems, and land

reclamation projects during 2003. The end-use and disposal categories are explained below. Table 2, below, presents each category's consumption of scrap tire material in the years 2000 to 2003 and their changes from 2002 to 2003.

Table 2. Texas Scrap Tire Usage and Landfill Disposal, 2000 to 2003

Category	Consumption (Scrap Tire Units*)				Change from 2002 to 2003
	2000	2001	2002	2003	
End Uses					
Tire-Derived Fuel	9,022,566	11,179,401	11,632,968	12,068,845	+4%
LRPUT**	2,621,779	4,639,575	7,847,146	6,696,538	-15%
Civil Engineering Projects	4,990,474	5,019,091	3,810,200	1,748,156	-54%
Crumb Rubber Products	2,232	7,485	340,573	1,484,920	+336%
On-Site Septic Systems	756,019	672,146	504,426	213,118	-58%
Other End Uses	1,400,338	1,592,197	827,392	966,028	+17%
End Uses Subtotal	18,793,408	23,109,895	24,962,705	23,177,605	-7%
Landfill Disposal	3,393,679	2,338,574	1,037,834	1,201,929	+15.8%
TOTAL	22,187,087	25,448,469	26,000,539	24,379,534	-6%

* Scrap tire unit. 1 STU = 20 pounds of scrap tire material. This unit of measurement is used because scrap tire material can take many different forms.

** LRPUT – Land Reclamation Project Using Tires

Tire-Derived Fuel (TDF)

The largest single use for scrap tires in Texas is TDF. Whole and shredded scrap tires have been used as a fuel source by industries in the United States, Europe, and Asia for a number of years. Due to their intensive fuel requirements, cement kilns, electric utilities, and pulp and paper mills have been the main users of TDF. Use in Texas has increased steadily since 1995, growing four percent from 2002 to 2003. This use accounted for approximately 49.5 percent (12.1 million STUs) of the scrap tires consumed in 2003. Appendix C lists facilities that use Texas TDF.

TCEQ used funds appropriated by the 77th Legislature to award grants during 2002 to retrofit a cement kiln in New Braunfels and another in Midlothian that had not previously used scrap tires as fuel to utilize TDF. The cement kiln located in New Braunfels completed its retrofit and consumed a total of 1.4 million whole scrap tires in 2003 and an estimated 2.5 million whole scrap tires in 2004. The cement kiln located in Midlothian is anticipated to complete its facility retrofit and initiate TDF burning operations by mid-2005. The facilities should consume a combined total of three to five million whole scrap tires as TDF annually.

Additionally, an existing cement kiln located near Abilene retrofit its facility to use TDF and initiated tire burning operations in 2004. This facility is expected to consume from one to two million scrap tires as TDF annually.

The amount of TDF consumed by end users is projected to continue to increase from calendar year 2003 levels due to potential increased demand from existing and new TDF users. Because the demand for scrap tire material currently slightly exceeds scrap tire generation, the expected increase in TDF demand is expected to be obtained at the expense of other end use categories, from existing scrap tire stockpiles, or both.

Land Reclamation Projects Using Tires (LRPUTs)

The second largest use category for scrap tires in Texas is Land Reclamation Projects Using Tires (LRPUTs). Shredded scrap tires have routinely been used as fill material in civil engineering and reclamation projects for a number of years. In areas that have been strip mined or mined for sand and gravel, a 50:50 mixture of tire pieces and soil can be used as fill material to reclaim the mined area.

There are currently five LRPUTs operating in the state. The number of scrap tires consumed by these projects decreased 15 percent in 2003 due to redirection of a portion of their scrap tire stream to TDF end users. This category accounted for 6.7 million scrap tires, or 27.5 percent of those consumed in 2003. The amount of scrap tire material consumed by this category is expected to continue to decrease due to loss of volume to TDF users. In locations where LRPUTs and TDF are competing end uses, TDF is typically the economically favorable option.

Civil Engineering Projects in Landfills

The third largest use category for scrap tires in Texas is civil engineering applications in landfills. The vast majority of scrap tires used in landfill civil engineering projects were shredded to a size specification and used as drainage media in landfill leachate collection systems. Scrap tire shreds or chips³ were used in place of the gravel normally used in the leachate collection systems. Limited amounts of shredded or chipped scrap tire material were also used in landfill gas collection systems and for daily waste cover material in lieu of soil.

The consumption rate for this category decreased 54 percent from 2002 levels. The decrease resulted from fewer scheduled leachate collection system construction projects in 2003, difficulty in obtaining chips at competitive prices in certain areas, and the decision by several landfills to discontinue use of tire chips in collection systems due to fire concerns.

³ When tires are shredded, the resulting pieces range widely in size. Tire chips are produced under conditions to control the size of the final pieces, which are typically either 2" by 2" or 3" by 3".

Schedules for civil engineering projects in landfills are variable so annual usage for this category can vary significantly from year to year. In 2003, this use accounted for approximately seven percent (1.7 million) of the scrap tires consumed. It is expected the use levels will remain at current levels or increase slightly in 2004.

Crumb Rubber Products

Finely ground tire rubber can be used to modify asphalt or to manufacture traffic control devices, rubberized lumber, soft playground surfaces, running tracks, synthetic sports turf, rubber mats, and other rubber products.

Consumption in this category accounted for six percent (1,484,920) of the scrap tires that were consumed in Texas in 2003—a phenomenal 336 percent increase.

Crumb rubber production capacity increased significantly. During 2003, Recovery Technology Group (RTG) in Baytown increased production and Polymerix in Stamford began producing crumb rubber. Then in 2004, State Rubber & Environmental Solutions (SRES) in Denver City began making crumb rubber. At current capacity, SRES could consume 750,000 tires per year from a radius of 200 miles from its location southwest of Lubbock. With new processing capability and a growing level of use in roadway construction and maintenance and other applications, the amount of tire turned into crumb rubber is expected to continue to increase significantly.

On-Site Septic Systems

Tire shreds provide good filter material and can be used in place of gravel in drain fields of septic systems. This category accounted for approximately one percent (213,118) of the scrap tires consumed in Texas in 2003. Although having decreased 54 percent in 2003, the amount of scrap tire material consumed by this category is expected to remain constant or increase slightly by the end of 2004.

Other End Uses

Scrap whole tires and tire pieces are being put to a variety of other end uses. Texas manufacturers turn them into tires for agricultural trailers and tractors. Other companies make products for highway and road uses using tire sidewalls as weights for traffic-control barrels or bales to stabilize embankments. Other uses include artificial reefs and shooting berms at gun ranges.

This category accounted for approximately four percent (966,028) of the STUs consumed in calendar year 2003. Use in this category increased by 17 percent last year but it is expected to remain constant through the end of calendar year 2004.

Landfill Disposal

Scrap tires may be disposed of as waste in municipal solid waste landfills provided they are split, quartered, or shredded. Although disposal cannot be

considered a true end use, TCEQ believes disposal facilities provide a necessary scrap tire management option in areas where few end users exist.

This category accounted for approximately five percent (1.2 million) of the scrap tires reported as consumed in calendar year 2003. The amount of scrap tire material consumed by this category is expected to remain constant or decrease slightly through calendar year 2004 as scrap tire material is directed to recycling rather than disposal facilities.

Figure 1 illustrates the 2003 percentage for each of the end-use categories and landfill disposal discussed above. Figure 2 charts the annual quantities for each use and disposal from 2000 to 2003.

Figure 1. Percent Scrap Tire Usage and Disposal in Texas, 2003

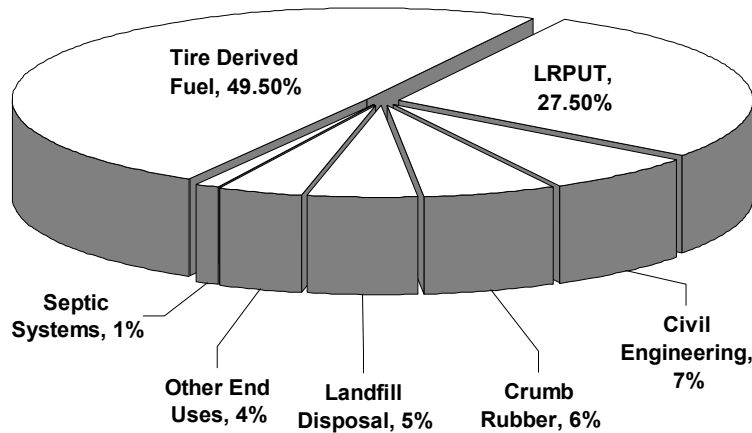
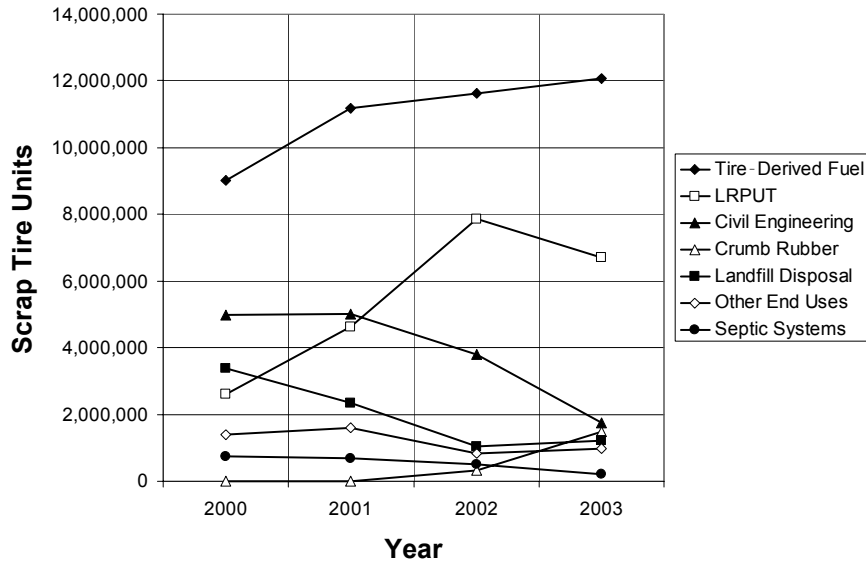


Figure 2. Scrap Tire Usage and Disposal in Texas, 2000-2003



TCEQ PROGRESS

Compliance

TCEQ has taken action to ensure that scrap tire generators, transporters, processors, and end users comply with all applicable regulations. These TCEQ actions include participation in numerous educational or outreach events, coordination with local governments, coordination with the Comptroller's Office regarding scrap tire facility audits⁴, development of guidance materials, and initiation of investigations and enforcement procedures.

Reduction of Scrap Tire Stockpiles

The volume of scrap tire material stockpiled at previously registered scrap tire storage sites was reduced through industry and TCEQ efforts by approximately 15.2 million STUs during 2003, and an estimated 10.5 million STUs during 2004. This 25.7 million scrap tire reduction represents a 41.5 percent decrease in state stockpile volumes since 2002.

Contracts for Cleaning Up Atlanta and Stamford Stockpiles

The 77th Legislature appropriated \$7.5 million through Senate Bill 1, Article VI, Rider 35, "Waste Tire Disposal Grants," to TCEQ to address scrap-tire stockpiles. In turn, TCEQ awarded contracts in March of 2003 for the remediation of the two largest scrap-tire stockpiles in the State – the Gibson Recycling, Inc. site in Atlanta and the ERRI/TCI site in Stamford. TCEQ awarded a contract to Merrick Construction Company to remediate the Gibson Recycling, Inc. site and to Silver Creek Materials, Inc. to remediate the ERRI/TCI site.

As of the end of 2004, approximately 12.7 million of the 14.5 million scrap tires originally stored on the ERRI/TCI site and 11 million of the 30 million scrap tires originally stored on the Gibson site had been remediated. By 2006, each cleanup project should be complete or nearing completion. Cleanup of these two sites will eliminate 44.5 million STUs from Texas stockpiles.

Clean Up of Other Non-Compliant Sites

The volume of scrap-tire material stockpiled at three formerly registered sites located in San Antonio, Cleveland, and Penwell was reduced by approximately 1.5 million STUs in 2003. This reduction was due to removal of scrap tire material from the sites to authorized end users by the site owner.

Additionally, TCEQ used financial assurance funds to contract for removal of 240,000 scrap tires from a formerly registered site in Pasadena, and for removal of 800,000 scrap tires from a formerly registered site in San Antonio. Removal of

⁴ For the complete audit report, see *Tracking the Fate of Scrap Tires in Texas: An Audit Report* (TCEQ publication SFR-078/02).

scrap tire material from the Pasadena site has been completed, and 265,000 STUs have been removed from the San Antonio site.

Cement Kiln Retrofits

In 2002, TCEQ used funding appropriated by the 77th Legislature to award grants to two cement kilns to retrofit them to burn scrap tires as fuel, which they had not used previously. One of the two cement kilns retrofit and burned a total of 1.4 million whole scrap tires in 2003, and an estimated 2.5 million whole scrap tires in 2004. The second cement kiln is working with TCEQ to amend its air quality permit to allow the use of TDF and could complete the permit activities and initiate TDF burning operations by mid-2005. The facilities should consume a combined total of three to five million whole scrap tires as TDF annually.

Development of End-Use Markets

TCEQ continues to track Texas-Mexico border waste tire issues. Several waste tire processing businesses visited the Texas-Mexico border area in 2004. Although no waste tire processing facility has been established on the Texas side, there are reports that several such businesses are focusing efforts on establishing a facility on the Mexico side.

A new tire-derived fuel project in the El Paso-Juárez area is estimated to consume approximately 500,000 scrap tires annually beginning in 2005. TCEQ participated in several fact-finding meetings and conducted a site-visit to a cement plant located in the Cd. Juárez area.

TCEQ encouraged Texas border communities to submit grant proposals to the U.S.-Mexico Border 2012 Environmental Program targeting scrap tire initiatives. In December of 2003, the City of Brownsville submitted a grant application for scrap tire end-use development, and the County of El Paso submitted an application for cleaning up abandoned scrap tire sites and developing end-uses. The City of Brownsville proposal was approved and will begin in FY 2005.

TCEQ is encouraging Texas counties along the Mexico border to participate in the Border Colonia Access Program (BCAP), a paving program funded by the State of Texas, using alternative pavements mixed with crumb rubber. Although anticipated EPA participation didn't materialize, TCEQ and TxDOT will continue to work on this type of initiative during the 2005 call for projects under the BCAP.

TCEQ has also worked closely with the Rubber Pavements Association (RPA) to promote the application of asphalt-rubber surface treatment to graded, but unpaved, roads in rural Texas areas. That and other topics will be discussed at RPA's Asphalt Rubber Conference in San Antonio, Texas in spring of 2005.

TxDOT PROGRESS

TxDOT continues to identify and develop viable uses for scrap tires and crumb rubber in roadway construction and maintenance projects. Each use must meet the department's stringent engineering and environmental standards and compete with traditional products and materials on a financial basis. Fortunately, many paving and rubber-content products meet TxDOT's needs and compete evenly with traditional products, some even performing better.

TxDOT's use of these products helps assure the department that non-disposal options exist for the scrap tires and tire pieces that TxDOT districts generate each year through vehicle maintenance and roadway cleanup. In FY04, TxDOT districts paid \$632,000 to handle 11,000 scrap tires that were unsuitable for retreading and 3,300 tons of scrap tire rubber that were recovered from roadway maintenance. These were processed under state contract for recycling and energy generation.

TxDOT's primary use for tires and rubber is asphalt paving, but its use of molded rubber products and tire bales continue to grow.

Asphalt-Rubber Paving

Constructing and maintaining pavements in FY04, TxDOT consumed about 2.1 million STUs or 20,600 tons of tire rubber—a 25 percent increase from FY03. With this increased use, the department increased its expenditures by \$25 million to \$90.7 million on chip seal applications, hot mix asphalt, and crack sealer that contained tire rubber.

Chip seals are one or more applications of an asphalt binder covered with a single layer of aggregate to provide a finished surface or a water-proof layer under the surface layer. Chip seals use five percent tire rubber in the asphalt binder.

Hot-mix asphalt, including Permeable Friction Course (PFC) pavement, is composed of a compacted mixture of aggregate and asphalt binder, which can contain 15 percent tire rubber or more.

TxDOT seals cracks in pavement with an asphalt-rubber product that contains 22 percent tire rubber.

Figure 3 presents the tons of tire rubber TxDOT used in FY04 for each of these applications and Figure 4 presents the amounts TxDOT spent on each application in FY04.

Figure 3. Tons of Tire Rubber in Products Used by TxDOT, FY04

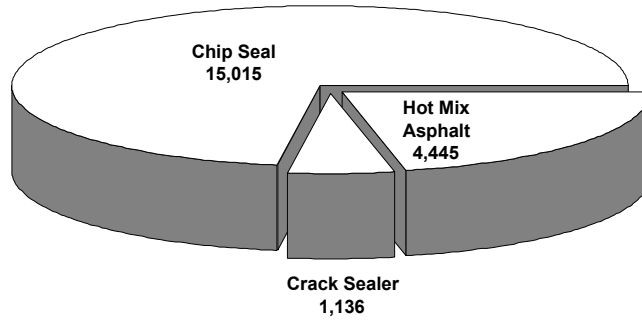


Figure 4. TxDOT Expenditures for Tire-Rubber Applications, FY04

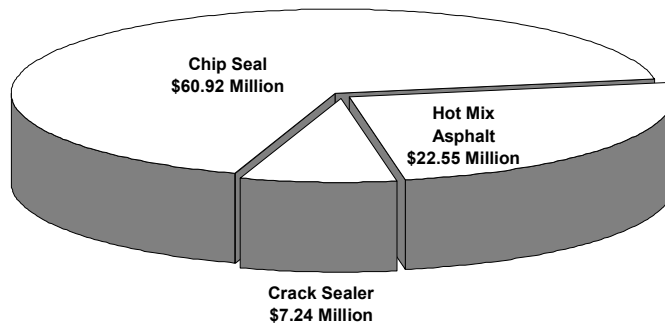
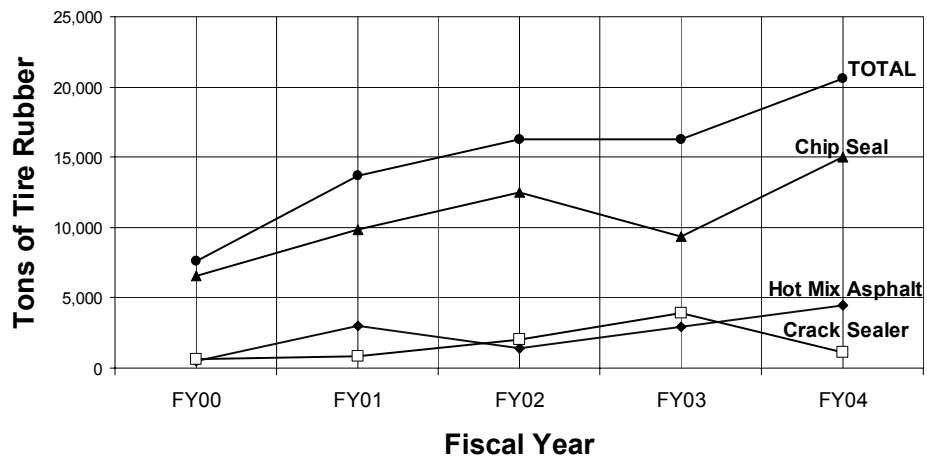


Figure 5 presents the tons of tire rubber TxDOT used in chip seal, hot-mix asphalt paving, and crack sealer for each of the last five fiscal years.

Figure 5. Annual TxDOT Tire Rubber Usage, FY00 to FY04



TxDOT's asphalt-rubber paving usage earned recognition again from the Rubber Pavement Association (RPA), based in Arizona. The RPA, headed by Sidney Cox, President of Cox Paving Co. in Blanco, Texas, encourages use of high quality, cost-effective asphalt pavement containing recycled tire rubber. Last year, the RPA recognized a Texas district and a Texas paving project:

- TxDOT Odessa District - President's Award for largest routine use of Asphalt-Rubber in Texas and its environmental awareness in using more than one million tires in a single year
- TxDOT San Antonio District – 2003 Outstanding Project Award for the IH-35 Asphalt-Rubber PFC project, which was discussed in the 2004 issue of this report

Benefits of PFC include reduced traffic noise and hydroplaning and improved skid resistance, visibility in wet weather, pavement durability, and ride quality.

Due in part to these benefits, TxDOT's use of asphalt rubber in paving is projected to continue growing. TxDOT's new 2004 TxDOT construction and maintenance standard specifications provide for expanded use of crumb-rubber modified asphalt over the 1993 specifications. In particular among the 2004 specifications, crumb-rubber modified asphalt is called for in Item 318, "Hot Asphalt-Rubber Surface Treatments" (chip seal applications) and is optional in two hot-mix asphalt applications—Item 342, "Permeable Friction Course" (PFC) and Item 346, "Stone-Matrix Asphalt."

TxDOT is pioneering and adopting many non-paving applications for tires and tire rubber as well.

Embankment Repair with Tire Bales

The TxDOT Fort Worth District repaired a failing embankment on IH-30 using scrap-tire bales in 2002. As discussed in previous reports, the district replaced poor soils with layers of tire bales. Based on the success of this project, the Fort Worth District is planning similar repairs to other failing slopes and is designing an embankment using scrap-tire bales which will support a ramp approach to a bridge. In preparation for the project, TxDOT contracted with the Center for Transportation Research at the University of Texas, Austin, to determine some of the engineering properties of tire bales and to produce design guidelines.

Tire-Rubber Molded Products

Although small compared to other uses, the use of new products containing scrap-tire rubber continues to grow.

Vegetation-control mats. Using federal funds administered by the Recycled Materials Resource Center at the University of New Hampshire, nine TxDOT districts installed vegetation-control mats around sign posts and guardrail posts to evaluate their ease of installation, costs, and effectiveness in

controlling vegetation around posts. These mats provide multiple benefits. Besides using recycled tire rubber, they reduce herbicide use and string trimming, which also cuts down on air emissions from power trimmers. Preliminary evaluation of these mats indicates that they can be cheaper than other vegetation control systems but determining their effectiveness requires observation during another growing season.

Delineator posts. Recycled delineator posts with 25 percent recycled tire rubber and 60 percent recycled high density polyethylene, were developed in partnership between the Pharr District, TxDOT's Traffic Operations Division, and CaminoVerde, a Brownwood-based manufacturer. This delineator post performs as well as, or better, than the designs it replaces, installs and is replaced more easily, and costs only a little more. Consequently, TxDOT purchases of this post helped develop a market for scrap tires while saving the department labor and product costs.

In FY04, TxDOT spent \$351,000 on 27,000 recycled rubber delineator posts.

Guardrail spacer blocks. TxDOT contractors can choose from several TxDOT-approved manufacturers' composite spacer blocks with crumb rubber content. Many contractors chose composite blocks because they are lighter and easier to install than timber blocks.

TRENDS AND CONTINUING ISSUES

Several significant developments during 2003 and 2004 are improving the scrap tire situation in Texas:

- Remediation efforts at the two largest Texas scrap-tire sites, Stamford and Atlanta, have reached 87 percent and 50 percent completion.
- Cleanup projects were begun in Pasadena and San Antonio.
- Cement kilns and paper and pulp mills increased TDF use.
- Consumption of scrap tires for the manufacture of crumb-rubber products increased 336 percent.
- Use of scrap-tire materials in roadway construction and maintenance and other transportation-related products continues to grow.
- Education and outreach events are encouraging other innovative uses for scrap tires and tire-rubber material at both the state and local level.

Although TCEQ and TxDOT continue to reduce and prevent stockpiles and use products with tire rubber, three primary issues persist.

- Illegal scrap tire dumping is likely to continue in areas of the state that have few end users or disposal facilities.

- Demand for scrap-tire products is not strong enough to clean up existing illegal dumpsites.
- TCEQ funding is insufficient to clean up remaining scrap-tire stockpiles.

When funds appropriated for cleanup of the two largest scrap-tire stockpiles have been exhausted, very limited funding will be available for the maintenance or cleanup of the remaining stockpiles. Consequently, tire fires and the breeding of mosquitoes that can transmit West Nile and other viruses will continue to be risks to the environment and human health.

CONCLUSIONS

While significant challenges remain, TCEQ and TxDOT made progress addressing scrap tires during 2003 and 2004. TCEQ continues to ensure that scrap-tire handlers comply with all applicable regulations and, in conjunction with TxDOT, to develop additional scrap-tire markets and products. As the volume of crumb rubber and other scrap-tire rubber material processed in the state increases, the potential for productive use grows.

Despite this progress, ongoing challenges that offer direction for future progress include:

- funding cleanup efforts
- developing new markets and end users where needed
- minimizing the illegal dumping of scrap tires

APPENDIX A. STOCKPILE VOLUMES AT FORMERLY REGISTERED FACILITIES, END OF CALENDAR YEAR 2004

Facility Name	City	County	TCEQ Reference Number	Stockpile Volume (in Scrap Tire Units*)		
				2002	2003	2004
ERRI/TCI**	Stamford	Haskell	44114 44150	14,500,000	2,899,520	1,830,070
Touche International**	Whitesboro	Grayson	–	300,000	300,000	300,000
Gibson Recycling, Inc.**	Atlanta	Cass	44072	29,823,360	27,740,530	18,869,510
Safe Tire Disposal Corp.	Penwell	Ector	44103	4,977,934	4,967,897	4,967,897
Gibson Recycling, Inc.	Beaumont	Jefferson	79508	2,048,100	2,048,100	2,048,100
Safe Tire Disposal Corp.	Cleveland	Liberty	44109	1,765,961	1,381,679	1,381,679
Scrap Tire Recycling, Inc.**	Pasadena	Harris	44096	2,040,000	2,025,000	1,800,000
Quantum Tech, Inc.**	Houston	Harris	44105	60,000	60,000	60,000
American Tire Recycling**	San Antonio	Bexar	79019	850,000	850,000	535,000
Safe Tire Disposal Corp.	San Antonio	Bexar	44107	4,472,724	3,402,456	3,402,456
World Tire Recycling**	Brownsville	Cameron	44147	1,000,000	1,000,000	1,000,000
Total				61,838,079	46,675,182	36,194,712

* One scrap tire unit equals 20 pounds of scrap tire material. 1 million STUs equal 10,000 tons of scrap tire material.

** TCEQ estimated the number of STUs in these stockpiles as of December 31, 2004. All other values were obtained from 2003 annual reports.

APPENDIX B. INVENTORIES AT REGISTERED FACILITIES, END OF CALENDAR YEAR 2003

Facility Name	City	County	TCEQ Reference No.	Inventory*, End of 2003
Tres Pesetas	Lubbock	Lubbock	79540	93,110
Safe Tire Disposal Corp.	Midlothian	Ellis	79504	1,126,891
Acme Tire	Atlanta	Cass	9539	32,400
Texas Lehigh Cement	Buda	Hays	76904	62
J & J Tires	Houston	Harris	6026754	1,000
Nathaniel Energy Corp.	Hutchins	Tarrant	6044115	1,409,389
Lone Star Disposal	Odessa	Ector	6200088	2,250
Rad Tec, Inc.	Corpus Christi	Nueces	6200155	2,693
North Texas Cement	Midlothian	Ellis	76905	32,304
Total				2,700,099

* In scrap tire units (STUs). One STU equals 20 pounds of scrap tire material.

APPENDIX C. FACILITIES THAT USE TEXAS TIRE DERIVED FUEL, CALENDAR YEAR 2003

The following table presents each facility's consumption of Texas TDF in 2003.

Facility	Product; Location	Quantity Burned (STUs)		
		in 2001	in 2002	in 2003
TDF Used in Texas				
Abitibi Consolidated	Paper/Pulp; Houston	1,221,552	0	0
Capital Cement*	Cement; San Antonio	1,123,795	696,069	263,053
Cemex*	Cement; New Braunfels	0	418,080	1,436,655
Cemex*	Cement; Odessa	131,962	293,783	105,082
Donohue	Paper/Pulp; Houston	1,571,200	0	0
Georgia Pacific	Paper/Pulp	19,627	0	0
Holcim	Cement; Midlothian	167,034	1,638,038	2,318,324
North Texas Cement*	Cement; Midlothian	3,826,785	3,746,509	3,964,572
Texas Lehigh Cement*	Cement; Buda	12,294	46,740	39,302
Texas Industries	Cement; New Braunfels	752,770	587,604	537,056
Texas TDF Sent Out of State				
International Paper	Paper & Pulp; Louisiana		2,121,47	3,404,801
Other Texas TDF Sent Out of State		1,547,945	0	0
Total Texas TDF		10,374,964	11,140,810	12,068,845

* These users burn whole tires. All others burn tire shreds.