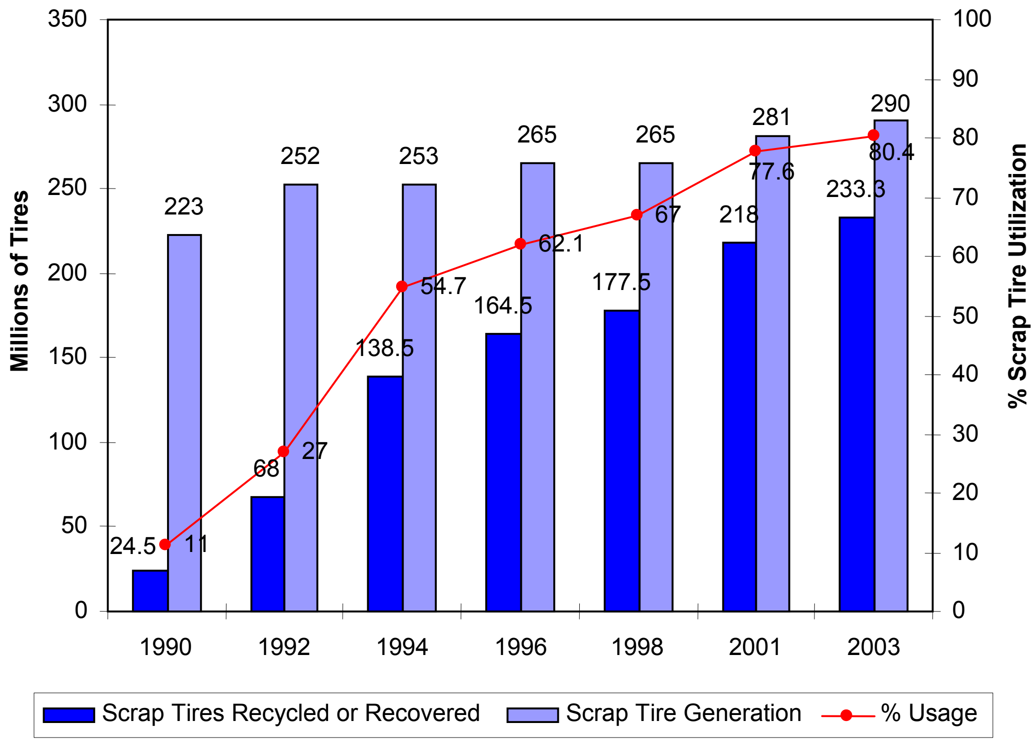
U.S. SCRAP TIRE MARKETS 2003 EDITION

July 2004



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About the Rubber Manufacturers Association

The Rubber Manufacturers Association (RMA) is the national trade association in the U.S. for the rubber products manufacturing industry. The RMA is the national trade association representing more than 100 companies that manufacture various rubber products. These member companies include every major domestic tire manufacturer including: Bridgestone/Firestone Americas Holding, Inc., Continental Tire N.A.; Cooper Tire & Rubber Company; The Goodyear Tire and Rubber Company; Michelin North America, Inc.; Pirelli Tire North America; and Yokohama Tire Corporation.

In 1989, the RMA member tire manufacturers created the Scrap Tire Management Council (STMC), a non-profit advocacy organization that operated as part of RMA. In October 2001, RMA realigned management of its activities. Today, RMA scrap tire-related activities are directed by the RMA Scrap Tire Committee, comprised of representatives of the seven major tire manufacturers, and managed by the RMA Environment and Resource Recovery Department.

The RMA Scrap Tire Committee provides policy direction and guidance for RMA activities regarding scrap tire management. The Committee's mission is to promote the environmentally and economically sound management and use of scrap tires. The Committee's strategic goals are to promote the elimination of all scrap tire piles; promote sound management of all annually-generated scrap tires; seek public awareness of scrap tire management successes; and advocate for a legislative and regulatory environment that is conducive and supportive of its mission.

The tire industry is sensitive to the need to assist in promoting environmentally and economically sound end-of-life management, reutilization and disposal practices for its products. The industry continues to promote the development of appropriate markets for scrap tires, provide technical and policy information regarding several areas of scrap tire management, host national, international and regional scrap tire conferences for state and federal regulators, and advocate for sound state programs to address scrap tire issues. RMA does not represent nor have any vested interest in the processing of scrap tires or in any product derived from scrap tires. RMA promotes the concept that scrap tires are a resource that can be used in a wide array of applications.

Executive Summary

The U.S. Scrap Tire Markets 2003 Edition is the seventh in a series of biennial reports authored by or on behalf of the Rubber Manufacturers Association (RMA), a trade association representing the U.S. interests of the tire manufacturing industry, as part of the tire industry's continued commitment to the concept of shared responsibility for the disposition of its products.

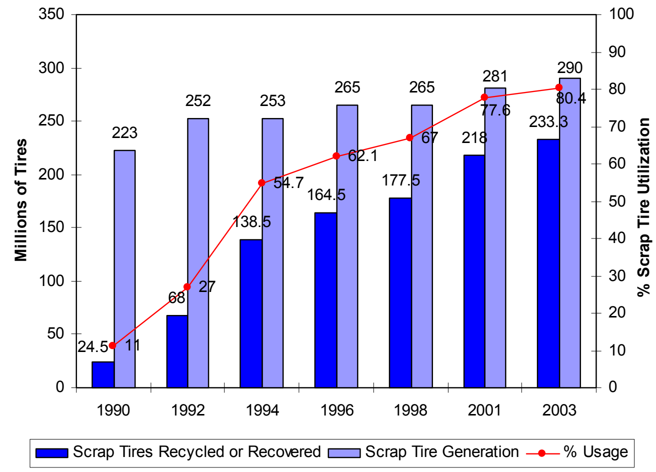
This report presents U.S. scrap tire market data for 2003, analyzes the various scrap tire U.S. markets, discusses the history and current trends in U.S. scrap tire management and presents data quantifying the number of scrap tires in stockpiles in the U.S. RMA is recognized for its expertise and leadership in the scrap tire management field.

This report is the most comprehensive compilation of U.S. scrap tire management information available. The data represented in this report are a culmination of questionnaires completed by state scrap tire regulators and extensive phone interviews.

Market Overview

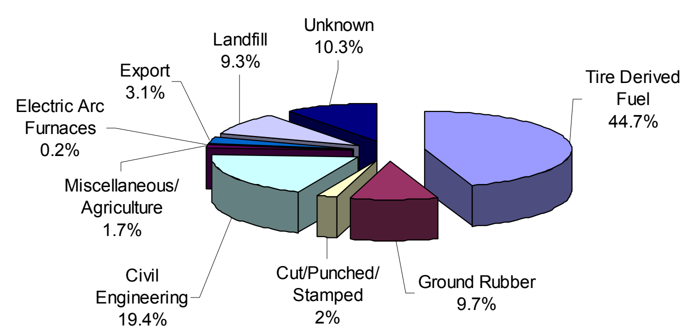
In 2003, approximately four out of five scrap tires in the U.S. were consumed in end-use markets. The total number of scrap tires consumed in end-use markets in the U.S. reached approximately 233 million tires. RMA estimates that about 290 million tires were generated in the U.S. in 2003. This represents a nearly 8-fold increase in scrap tires going into markets annually since 1990. Figure 1 shows the trends in scrap tire management from 1990 to 2003 and illustrates the progress achieved to date.

Figure 1: U.S. Scrap Tire Markets 1990 - 2003



Scrap tires were consumed by a variety of scrap tire markets (Figure 2). The major markets include tire-derived fuel, ground rubber applications and civil engineering applications.

Figure 2: U.S. Scrap Tire Disposition 2003



Of note, a new market entered the field in 2003 – for the first time in the U.S., tires were incorporated into electric arc furnaces in the production of high-carbon steel. This market is unique because the carbon and steel content in scrap tires can be recycled and used as raw materials to manufacture steel. Although this market is new, it is anticipated to expand in the next two years.

Tire-Derived Fuel (TDF). In this application, scrap tires are used as a cleaner and more economical alternative to coal in cement kilns, pulp and paper mills, and industrial and utility boilers. TDF consumed almost 130 million scrap tires in the U.S. in 2003, or nearly 45% of the total scrap tires generated. Due to increasing fuel prices and improvements in the quality and reliable delivery of TDF, this market is anticipated to experience modest growth in the 2003-2005 timeframe.

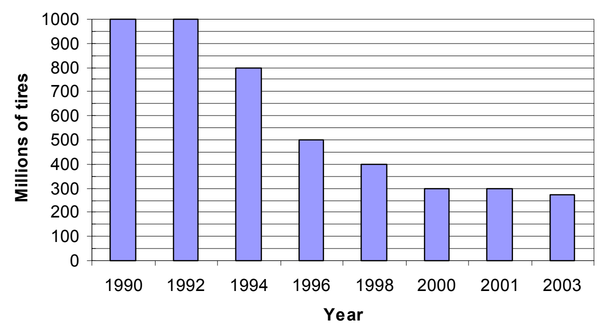
Civil Engineering. The civil engineering market consumed over 56 million tires in 2003, over 19% of the total tires to market, and consisted of tire shreds used in road and landfill construction, septic tank leach fields, and other construction applications. Tires add positive properties in these applications, such as vibration and sound control, lightweight alternatives to prevent erosion and landslides, and drainage in leachate systems. This market is gaining acceptance and is expected to experience continued growth in the future.

Ground Rubber Applications. This market consumed over 28 million tires in 2003, or nearly 10% of the scrap tires generated. Ground rubber applications include new products, playground and other sports surfacing and rubber-modified asphalt. The asphalt market uses ground rubber to modify the asphalt binder used in road paving, resulting in more durable roads. The ground rubber market is expected to continue to grow in the next two-year period.

Stockpile Abatement

In 2003, 275 million scrap tires remain in stockpiles in the U.S., a reduction of nearly 75% since 1990. RMA credits this progress to state efforts to abate stockpiled tires, develop sustainable scrap tire markets and enforce existing scrap tire laws and regulations. The remaining stockpiles are concentrated in 11 states: Alabama, Colorado, Connecticut, Michigan, New Jersey, New York, Ohio, Pennsylvania, Texas, Massachusetts and Washington. These states contain 91% of the scrap tires remaining in stockpiles. RMA continues to work with legislators and regulators in these states to develop and implement effective scrap tire programs to address these stockpiles. Figure 3 illustrates the reduction in the number of scrap tires in stockpiles since 1990.

Figure 3: Number of Scrap Tires in U.S. Stockpiles



Outlook

Scrap tire management in the U.S. has made considerable progress since 1990, when the RMA began to address the issue. In 2003, more scrap tires were consumed in a market than ever before, thus avoiding landfills and stockpiles.

The three major markets for scrap tires in the U.S. – TDF, civil engineering and ground rubber applications – are expected to expand in the 2003 – 2005 timeframe.

Scrap tires in stockpiles have been reduced by 73% since 1990. However, challenges remain. Several states still lack effective scrap tire programs. Some states with comprehensive programs are facing the loss of scrap tire funds, due to tight budget times. RMA will continue to work toward expanding markets and achieving effective regulatory programs in realization of its commitment to shared responsibility.

Methodology

This edition of the Report on the U.S. Scrap Tire Markets is the seventh biennial report on scrap tire markets researched and published by or on behalf of the RMA. This report, like all previous reports, provides a "snapshot in time" of the status, progress and challenges of the scrap tire industry in the United States (U.S.). The report offers commentary on the market and economic factors that have impacted, are impacting or could impact the markets and management of scrap tires.

Sources of Scrap Tires

This report addresses the two components of scrap tire management – the disposition of annually-generated scrap tires and scrap tires in legacy stockpiles. Both components pose distinct challenges and opportunities. Therefore, this report addresses them separately.

Specifically, a broad array of market opportunities are available for annually-generated tires, since these tires typically are relatively clean. Furthermore, the fees paid by consumers and retailers for disposal of these tires are available to fund proper processing. Due to the availability of markets and funds, annually-generated tires can be properly absorbed into the marketplace. On the other hand, tires abated from stockpiles can be dirty and difficult to process. If disposal fees were collected at the time a stockpiled tire was removed from service, the money usually has long since been spent. Accordingly, state funds often are necessary to abate stockpiles. Some markets are available to stockpiled tires, including some TDF and civil engineering applications. However, other markets are precluded by the condition of stockpiled tires.

Data Collection

The information provided in this report is based on several data collection efforts. RMA sent a questionnaire to all state scrap tire regulators, the responses to which provide the basis for the market and stockpile inventory data contained in this report. Additionally, RMA staff conducted an extensive telephone survey with state scrap tire regulators and industry sources, including scrap tire processors and end-users, to verify, and in some cases augment, the data supplied through the questionnaire. Particularly, in the case of tire-derived fuel markets (TDF), information collected through the phone survey was used to supply data regarding tires from one state used for TDF in another state. These data were not reflected in the state regulator questionnaire. The phone survey also was used to gain insight into certain aspects of the market dynamics and trends affecting scrap tire markets.

Scrap Tire Metrics

Within the scrap tire industry there has been a continuing discussion concerning the method of accounting of scrap tires. The RMA has always accounted for the number of total tires generated based on the number of units (tires) sold and imported into the U.S.

Each tire, regardless of its size or weight, was counted as one unit. Part of the rationale for using this method was the first report on scrap tires issued by the EPA used tire units in its accounting. Over time the number of scrap tires generated annually has risen, which has been a function of the number of tires sold and imported. In previous editions of this report the size of tire has been broken down by percentage: 84 percent of the tires generated are passenger and light truck; 15 percent are heavy truck and the remaining one percent represents all other tires. RMA new tire production data for 2003 indicate that passenger and light truck tires represent 93.5 percent of the market, while other truck tires represent the remaining 6.5 percent. However, scrap tire trends generally follow behind new tire trends by about three years.

In recent years, some scrap tire processing companies, end-users and state agencies have begun accounting for scrap tires using a weight-based system, also referred to passenger-tire equivalents (PTEs). The basis of this system is that a passenger car tire weighs 20 pounds, which equals one PTE. A truck tire weighing 120 pounds would constitute six PTEs. An earthmover tire weighing 10,000 pounds would be 500 PTEs. The rationale for using this accounting system is that it provides a more accurate representation of the percentage of scrap tire mass that is going to an end-use market. It also assists in determining which types of tires are not being utilized. The issue of weight versus units was discussed by the Resource Conservation Challenge (RCC)[1] task group that established the goals of the RCC Tires Partnership.

While some other groups use the weight-based accounting system, this report will present the data by unit. There are three reasons for this decision. First, the data collected were reported predominantly in tire units. Second, to be able to compare the progress of the marketplace all historical data would have to be translated into weight, a difficult exercise at best. Third, it would likely cause significant confusion among scrap tire regulators and industry if a change were made at this point in time, since previous data were represented in terms of tire units.

Scrap Tire Generation Rates

RMA estimates that over 290 million tires were discarded in 2003, based on U.S. Census population data, assuming one tire is discarded annually per person. RMA recently reaffirmed the validity of this ratio by adding the replacement tire shipments in all tire categories and the tires on scrapped vehicles and calculating the ratio of that sum to the total U.S. population. The calculations are shown in Table 1.

Tire data for 2003 were used in all situations except farm and industrial tire shipments, since RMA stopped collecting those data in 1995. The 2003 U.S. population estimate by the U.S. Census Bureau was used to reflect the total U.S. population. Table 1 illustrates that RMA has once again validated the estimate of one tire per person per year as the number of scrap tires generated annually in the U.S.

[1] The RCC is a voluntary program established by the U.S. Environmental Protection Agency in 2002 to develop new and flexible ways to address solid waste issues. Scrap tires are the focus of an RCC initiative, which is discussed in more detail later in this report.

In addition, in its scrap tire questionnaire sent to the states, for the first time, RMA asked states to report the number of scrap tires generated annually. The states reported a total of 290,190,000 tires generated annually, which aligns very closely with U.S. Census population data. Since RMA received actual reported data from respondent states for annual generation this year, these primary data were used.

Table 1: Annual Scrap Tire Generation as a function of U.S. Population (in 1000's*)

Passenger tire replacements**	**194,391**
Light truck tire replacements**	**34,264**
Medium, wide base, heavy & OTR replacement tires**	**15,715**
Farm tire replacements***	**2,461**
Industrial tire replacements***	**4,527**
Tires from scrapped vehicles****	**53,184**
Total scrapped tires	**300,015**
U.S. population – 2003 Census estimate	**290,810**
Number of tires scrapped per person	**1.03165**

* All units represented in table are in 1000's, except for the number of tires per person, which is in actual units.
** 2003 RMA Data Total Replacement Shipments
*** 1995 RMA Data - RMA stopped collecting data for these categories after 1995
**** 2003 data compiled by in the Ward's Motor Vehicle Fact Book reflecting the number of vehicle registrations not renewed. Includes car/light truck, truck and bus data. This is the same source as previous Census data. However, in the 2001 Statistical Abstract, the relevant table was deleted. In the 2000 Statistical Abstract, these data were cited from the Motor Vehicle Fact Book, then produced by the American Automobile Manufacturers Association, but now compiled by Ward's.

Retreaded and Used Tires

In Europe and Japan, retreading and the used tire market are included in scrap tire market estimates. However, RMA has always made a distinction among retreadable casings, used tires and scrap tires. All RMA reports have excluded retreading and used tires from estimates of scrap tire markets. In the U.S., used tires and retreadable casings usually are handled through the same collection system that collects all other worn tires when they are first removed from vehicles. Consequently, it is common for states and non-tire industry concerns to consider these tires as part of the "scrap tire" flow.

Since retreadable casings can still be used for their original intended purpose, RMA does not consider them scrap tires and does not include them in scrap tire estimates. RMA views retreading as a viable technology that prolongs tire life and makes a positive contribution toward decreasing scrap tire disposal. RMA estimates that 16.5 million retreadable tire casings were retreaded in the U.S. in 2003 and used by commercial aircraft, commercial trucks, school buses, and off-the-road vehicles such as industrial, agricultural and mining equipment. Very few passenger tires are retreaded in the U.S., due to economic factors.

RMA defines used tires as those tires that are still usable on vehicles after they are removed from initial service. Used tires are resold in the U.S. or exported for sale in other countries. While no extensive market data are available on the used tire market, it is not unreasonable to believe that the used tire market might be around 10 percent of the total number of worn tires initially removed from vehicles, or around 30 million units. RMA does not consider used tires that are resold in the U.S. in its scrap tire figures, since they are not disposed. As will be discussed later, about half of U.S. used tires are exported from the U.S. and are counted as a scrap tire market because they leave the U.S.

U.S. Scrap Tire Markets 2003 Edition

I. Scrap Tire Market Overview: 2001 – 2003

From 2001 through the end of 2003, the total number of scrap tires going to a market increased from 218 million tires (77.6 percent of the 281 million generated) to 233.3 million (80.4% of the 290.2 million generated). Figure 1 shows historical trends in the U.S. scrap tire markets, tracking scrap tire generation, utilization, and usage rates over time. The data in Figure 1 represent the historical data collected by RMA since the inception of its scrap tire activities.

Figure 1: U.S. Scrap Tire Markets 1990 - 2003

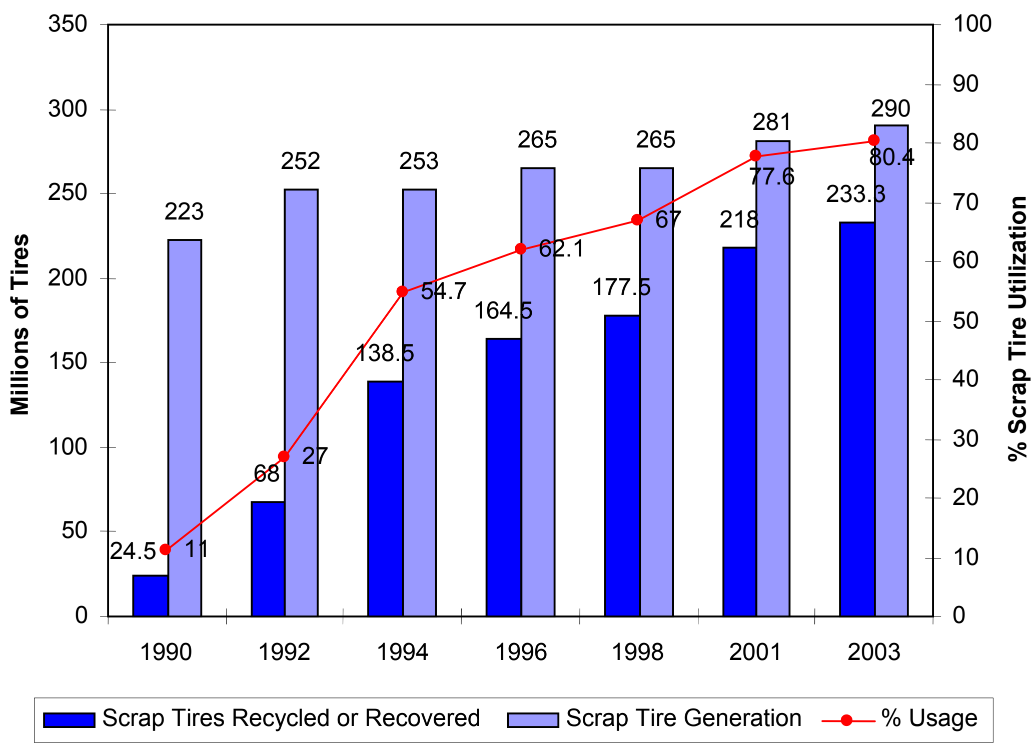


Table 2 below shows the estimated total U.S. scrap tire market for 2003. In addition, the data collected for each state are presented in Appendix C, which cumulatively comprise the numbers presented in Table 2.

Table 2: 2003 U.S. Scrap Tire Market Summary (in millions of tires)

Tire Derived Fuel (TDF)	
Cement kilns	53
Pulp/Paper mills	26
Electric Utilities	23.7
Dedicated Tires-to-Energy	10
Industrial boilers	17
Total Fuel Use	129.7
Products	
Ground Rubber	28.2
Cut/Punched/Stamped	6.5
Civil Engineering	56.4
Miscellaneous/Agriculture	3
Electric Arc Furnaces	0.5
Export	9
TOTAL USE	233.3
TOTAL GENERATION	290.2
Use as % of total generation	**80.4**

Figure 2 shows the disposition of scrap tires in the U.S. in 2003 and the relative percentages for each market or other disposition.

Figure 2: U.S. Scrap Tire Disposition 2003

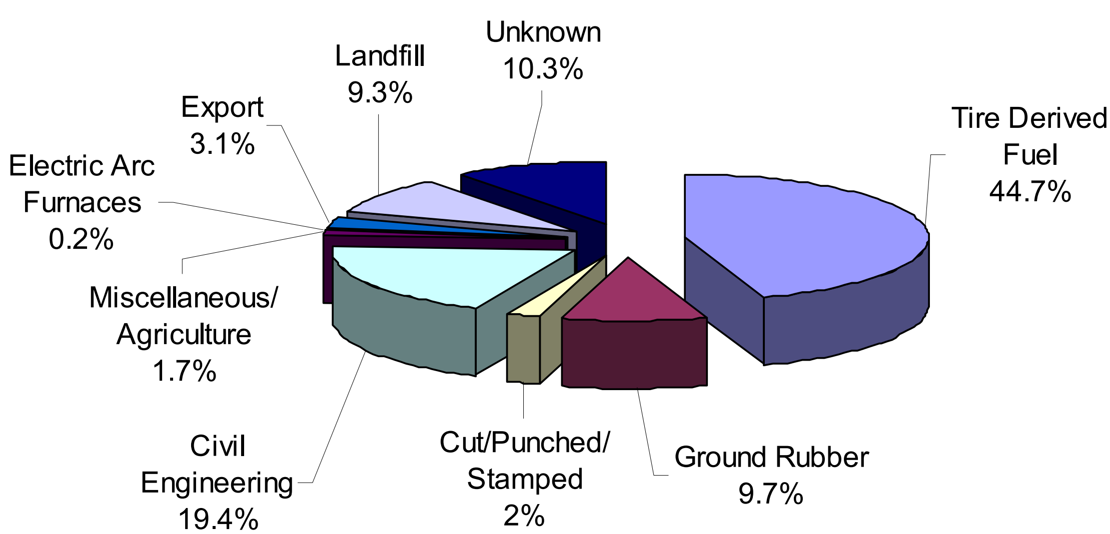
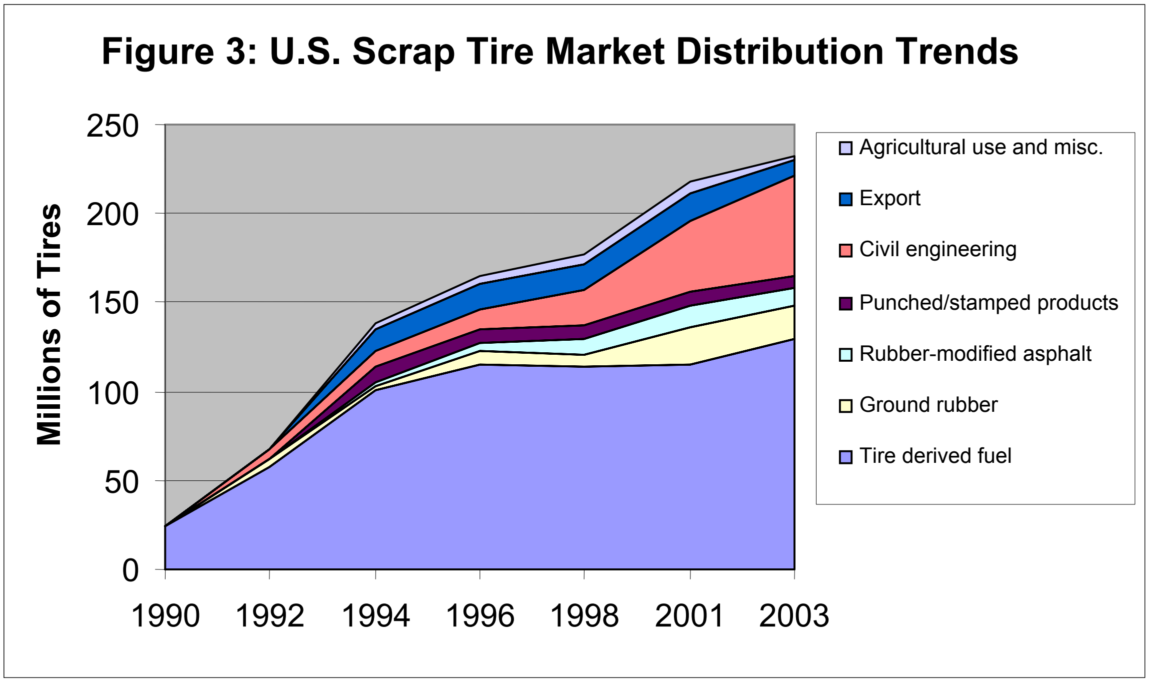


Figure 3 illustrates the historical trends of scrap tire market distribution since 1990, illustrating the increasing diversification of the scrap tire marketplace as it matures. The data used to create Figure 3 are presented at Appendix B.



In 2003, the market increases can be attributed to expanded markets for scrap tires for tire-derived fuel, civil engineering applications and coarse rubber applications. Appendix A outlines the factors impacting these major scrap tire markets. This period also saw the emergence of a new scrap tire market: electric arc furnaces producing high-carbon steel.

In the TDF market, the increase was a function of four factors: (1) reduced demand for cement; (2) increased demand for alternative fuels due to elevated energy prices; (3) continued improvement in the quality and consistency of TDF and (4) more reliable delivery of a consistent TDF product.

In the ground rubber market there are two classes of particle sizes: "ground" rubber (10 mesh and smaller) and "coarse" rubber (10 mesh and larger, with a maximum size of one-half inch). Each of these size ranges has distinct market applications. Over the last two years the greater growth in market share has been with the "coarse" sized particles. This particle range is used in playground surfacing, running track material, soil amendments and some bound rubber products. The smaller particle sizes are used for the more traditional applications (asphalt rubber and molded and extruded rubber products). From 2001 – 2003, the industry witnessed a decrease in the use of ground rubber as a modifier in asphalt, while the use of ground rubber in molded/extruded products increased.

The use of scrap tires in civil engineering applications did not demonstrate the same dramatic increase as in the 1998 – 2001 timeframe. Still, the 2003 data indicate that 56.4

million scrap tires were used in a variety of applications. This is a 25% increase in the use of tire shreds in civil engineering applications. The same three large-scale applications for tire shreds accounted for most of the markets: landfill construction applications, use as a septic system drain field medium and road construction. The increase in the civil engineering market remains a function of three factors: (1) cost competitiveness of tire shreds, compared to traditional construction materials, (2) increased acceptance by regulatory agencies and (3) increased recognition by scrap tire processors of market opportunities available in civil engineering applications.

Punched and stamped products were reported to be around 6.5 million tires. The export of tires was reported to be about 9 million tires. Agricultural and miscellaneous uses are estimated to be the same as has been reported in previous editions of this report, about 3 million tires.

In 2003, an important new market application for scrap tires began in the U.S. Scrap tires were used as a "charge" material in electric arc furnaces (EAFs). While only a relatively small number of tires were used in this manner in 2003, the potential as a large-scale use for tires in the future is significant.

A. Electric Arc Furnaces

In 2003, electric arc furnaces in the U.S. began to use scrap tires as a source of carbon and steel during the manufacture of high-carbon steel products. This process takes place inside an electric arc furnace (EAF) at temperatures exceeding 3,000 degrees Fahrenheit. Tires contain four beneficial resources for EAFs: (1) a source of carbon; (2) a source of high quality steel; (3) a source of energy and (4) cost savings. Scrap tires are also attractive to EAFs since tires can be used whole, and the facility receives a tip fee. Typically, EAFs can also accept larger-sized tires (e.g., mining, grader, earth mover, and farm tires) that have few, if any, other viable outlets.

In 2003, two companies, Nucor Steel (Auburn, NY) and IPSCO Steel (Mobile, AL), completed trials with and began using scrap tires in the steelmaking process. While some portion of the tire is used as a source of energy, carbon and steel components of tires are incorporated into a new product – high-carbon steel. This process approaches closed-loop recycling for a non-tire use of scrap tires.

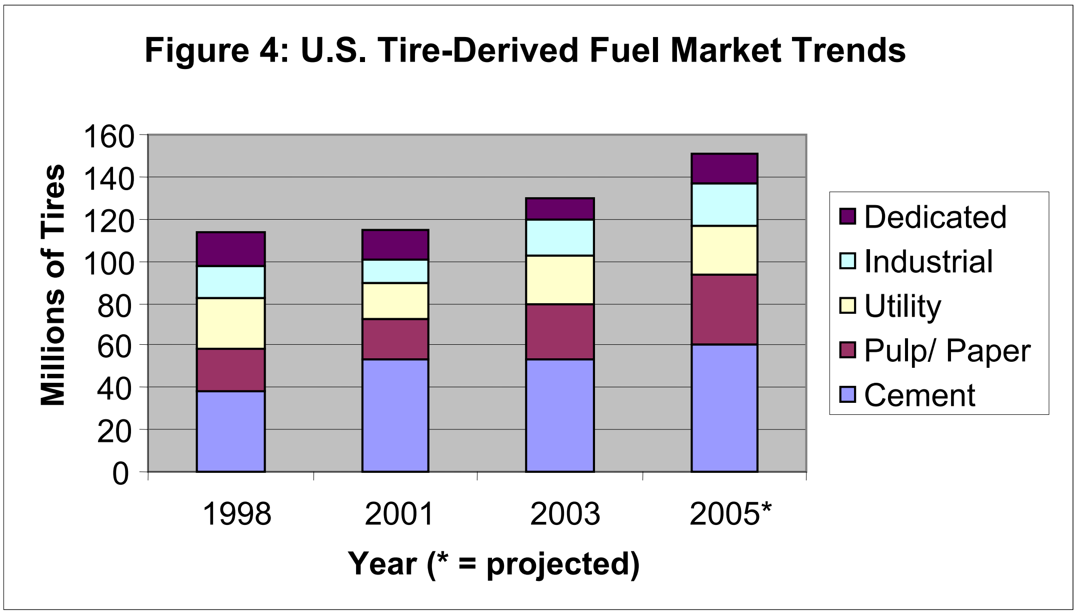
While use of tires in EAFs is a new market in the U.S., this practice was started in Japan in 1998 and in France in 2000. In Japan today, some 15 percent of all scrap tires are used by EAFs. EAFs are accustomed to using scrap steel and are one of the largest end markets for scrap steel in the U.S.

Since both EAFs mentioned above began scrap tire use during 2003, the number of tires used in this application in 2003 is relatively small – around 500,000. In 2004, that number is anticipated to increase to at least 2 million tires. At present, six U.S. EAFs are in the permitting or planning stages for implementing a scrap tire program. Another 10 EAFs in the U.S. could potentially use scrap tires as a charge material. Consequently, the market potential for EAFs ultimately could be 7 to 15 million tires a year.

Since the EAF market is new in the U.S., readers may be interested in the manufacturing processes followed at EAFs. For more information, please visit the American Iron and Steel Institute website at http://www.steel.org/.

B. Tire-Derived Fuel (TDF)

At the end of 2003, 89 separate facilities in the U.S. used TDF on a regular basis. The total annual consumption of TDF was approximately 129.7 million scrap tires. The permitted capacity of all facilities in 2003 was actually higher, but few facilities permitted to use TDF actually use the maximum permitted capacity and several permitted facilities did not use many, if any, scrap tires in 2003. Figure 4 shows the distribution of TDF usage across the various markets.



As reported in the last market survey, the end-use market for processed TDF (fuel chips) has changed over time. Facilities that once accepted two to three inch rubber chips have generally shifted to smaller, typically two by two inch, fuel chips. A number of companies are producing two inch minus chips, which typically are no larger than two inches by one and one half inches. These smaller fuel chips also contain less steel than larger fuel chips, which can reduce problems associated with handling and ash disposal. Production of fuel chips smaller than one and one half inch minus, while technologically feasible, is not economically viable, due to processing costs. In addition, several major TDF applications continue to use whole tires as TDF.

The development of ASTM International (ASTM) standards for TDF must be recognized as another step toward making tire-derived materials a commodity (ASTM Standard D-6700-01 “Standard Practice for Use of Scrap Tire-Derived Fuel). The great advantage in this effort is that end-users and potential end-users now have an industry-accepted standard against which to compare all tire chips. The other benefit to the industry is the development of a single sampling and testing protocol.

Overall, combustion industries will be facing a number of significant issues in the near term. A combination of a potential increase in energy costs, the implementation of new EPA air emission standards and an uncertain economy could cause significant changes. Whether these changes will have a positive or negative impact on alternative fuels programs remains to be seen. What follows is a discussion of each of the major market sectors for TDF – the cement industry, pulp and paper mills, utility boilers, industrial boilers, and dedicated scrap tire-to-energy facilities.

1. The Cement Industry

The use of TDF in this market sector remained stable. At the end of 1998, 30 facilities were using TDF, consuming 38 million tires. At the end of 2001, there were 39 facilities (62 kilns) using 53 million scrap tires. At the end of 2003, 43 facilities (65 kilns) were permitted to use TDF and consumed 53 million scrap tires. Appendix E lists the cement kilns in the U.S. that utilize scrap tires as fuel.

The stability of TDF consumption by the cement industry was due to several factors: (1) kilns operating at less than full capacity; (2) rising cost of energy; (3) favorable cost implications; (4) reduction of nitrogen oxide emissions as compared to other fuels and (5) the fact that TDF usage is starting to be considered a routine practice.

Another recurring trend in the cement industry was the continuation of mergers and acquisitions (M&A). As reported in 2001, Cementos Mexicanos (Cemex) purchased the assets of Southdown Corporation. Cemex now is the largest producer of cement in the U.S. Cemex has taken an aggressive approach to using TDF in its kilns, facilitated by the fact that several of the Southdown kilns were permitted to use tires.

In addition, Lafarge Cement bought Blue Circle Cement. Both companies were experienced with using TDF, and kilns now owned by Lafarge Cement continue to use and expand use of TDF. In the last two years, Lehigh Cement, Lafarge, Holcim and Ash Grove cement were all engaged in M&A activities. Of note, TDF use was unchanged during this period, suggesting that TDF is becoming better understood, accepted and highly transferable within the cement industry.

Environmental considerations continue to play a key role in the use of TDF in cement kilns. As reported before, the EPA issued a call for states to develop State Implementation Plans (SIPs) for the reduction of nitrogen oxides (NO_x) emissions from fuel combustion, which required some cement kilns to make significant NO_x reductions. The use of TDF is a low-cost NO_x reduction option, encouraging the use of TDF in the cement industry. Cement kilns also can receive tires from stockpile abatement projects, which is a beneficial use of scrap tires that would otherwise have few other market opportunities.

2. Pulp and Paper Mills

At the end of 2003, 17 pulp and paper mill boilers were consuming 26 million scrap tires, compared with 14 pulp and paper mill boilers consuming 19 million tires in 2001.

Several factors contributed to this dramatic increase. The continued elevated cost of energy is probably the first and most significant factor. TDF is an attractive alternative source of energy – TDF prices are a fraction of the cost of natural gas. However, if the quality of TDF is poor, pulp and paper mill operators will stop using this material, regardless of the price differential. Over the last four years, TDF quality has experienced significant and continuous improvement.

Additionally, the overall service (delivery) related to TDF supply has improved. Another major factor, especially for those mills that have been using TDF for several years is that the feeding systems have been amortized, adding to the cost benefits of TDF. In certain cases, the suppliers of TDF have installed TDF feeding systems for mill customers. This business arrangement has alleviated many problems with capital outlays from the mills, which are often in short supply. Appendix F lists the pulp and paper mills in the U.S. that utilized TDF in 2003.

In the 2001 – 2003 timeframe, this market sector saw several former end-users resume use of TDF, while several other mills significantly increased their use of TDF. It appears at this time that even if there is a drop in the price of natural gas that TDF will continue to be used at present levels. This is based on the understanding that TDF will remain a less expensive fuel even if other fuels come down in price. Another important factor is that the use of bark as a fuel has been decreasing over time. Bark, which was used in large quantities, is being diverted to the mulch market.

Air emissions issues are of interest with increased use of TDF. In spite of air emissions often being identified by TDF opponents as an issue, mills and state regulatory agencies have not reported any incidents where the use of TDF has caused a mill to exceed its permitted emission levels. Similarly, those mills that have tested TDF have done so successfully, as defined by compliance with the facility's air permit. However, the situation bears continued monitoring as mills begin to develop plans for compliance with the recently signed National Emission Standard for Hazardous Air Pollutants (NESHAP) for Industrial/Commercial/Institutional Boilers and Process Heaters. To date, this final rule has not been published in the Federal Register. However, the final rule is available on EPA's website at http://www.epa.gov/ttn/atw/boiler/boilerpg.html.

3. Utility Boilers

The use of TDF in electric utility boilers increased slightly relative to the rate of usage in 2001. At the end of 1998, there were 11 facilities using TDF, consuming 25 million tires. In 2001, nine utility boilers consumed approximately 18 million scrap tires. By the end of 2003, 13 utility boilers consumed 23.7 million scrap tires. Appendix F lists the utility boilers in the U.S. that utilized TDF in 2003.

While still a large-scale potential market opportunity, the situation in the utility industry suggests that it may take several more years before this market sector enters a period of stability that fosters realization of the full market potential. The trend toward deregulating the utility industry and potential federal air emission regulations are issues inhibiting more immediate market expansion.

As the industry reorganizes into a delivery side and a generation side in response to deregulation, many production facilities have been put up for sale. Many older, less efficient facilities have been closed. Older facilities, with less efficient power producing systems, have benefited most from the use of TDF. Newer utility boilers either use pulverized coal or have entered into long term contracts to purchase low sulfur coal. The use of TDF is incompatible with pulverized coal boilers due to the differences between the two fuels, both in terms of fuel size and in terms of the necessary residence time in the combustion zone. While the sulfur content of TDF is relatively low and stable, low sulfur coal contains less sulfur than TDF and typically is used to comply with stringent sulfur emission requirements. Few boilers will accept any fuel that contains more sulfur than contained in the fuel currently used.

Energy deregulation offers a possible opportunity for the TDF market. Once the buying and selling process subsides, the new owners of producing operations likely will seek ways to lower the costs of generating electricity. TDF, with its higher heating value, lower NO_x emissions and competitive cost as compared to coal, may see increased usage rates. The electricity supply concerns in California in 2001 and the surging energy prices suggest that the utility industry will seek a period of stability, which is likely to preclude switching to alternative fuels or reopening permits for review and modification.

4. Industrial Boilers

This market segment expanded its use of TDF over the last two years. In 1998, 19 facilities used TDF, consuming around 15 million scrap tires. By the end of 2001, 16 facilities consumed approximately 11 million tires. By the end of 2003, there were 15 industrial boilers using 17 million tires as TDF. Since industrial boilers are smaller than utility boilers, they can react more quickly to market changes and government incentives. These facilities use a variety of fuels, but typically not low sulfur coal. In the case of wood-fired boilers, TDF offers a significant increase in heating value and a reduction in moisture content and ash generation. The limiting factors, however, are sulfur and zinc. Each facility must evaluate the impact of TDF on emissions of sulfur oxides (SO_x) and ash disposal. If an evaluation of these impacts is favorable, then the use of TDF becomes a matter of the permitting process. Appendix F lists the industrial boilers in the U.S. that utilized TDF in 2003.

Most resource recovery facilities (solid waste combustion facilities) allow tires to be fired, although usually to a limited degree, which limits the impact on the end-use markets. In this market segment, the use of TDF primarily is a function of the amount of solid waste the facility consumes. In general, the use of TDF in resource recovery facilities still represents only two to five percent of a facility's fuel supply. This typically translates into the consumption of 500,000 tires per facility per year. When tires are allowed into a facility, the tip fee and heating value from TDF provide a net benefit.

5. Dedicated Scrap Tire-to-Energy Facilities

The use of whole and/or processed tires in dedicated scrap tire-to-energy facilities has decreased slightly over the past two years. In 1998 and 2001 reports, there were two such facilities using some 16 million scrap tires annually. At the end of 2003, there was only one dedicated tire-to-energy facility in operation consuming 10 million scrap tires. The cause for the decrease is the decreased number of tires consumed at the Illinois facility. The U.S. dedicated tire-to-energy facility that utilized TDF in 2003 is included in Appendix F.

The Modesto Energy Limited Partnership (MELP, Westley, California) closed in 1999, due to the change in rates the facility received for the power it generated. During the same period, the Ford Heights, Illinois facility reopened after Rubber Technology Group (RTG) purchased it. This plant was built by Browning-Ferris Industries in the mid-1990's, but was shut down soon after its completion due to the termination of the Illinois Retail Rate Law. The Retail Rate Law extended favorable rates for electricity to alternative fuel-fired utilities. This facility was not in operation for the balance of the year, although it is expected to be back online in the 2004 – 2005 timeframe.

The Exeter Energy Limited Partnership facility, located in Sterling, Connecticut, is a 25-megawatt electric generating facility. Built in 1991, Exeter consumes 10 to 11 million scrap tires a year, providing the only large-scale end-use market for scrap tires in the lower New England area. This facility also serves as a major market for scrap tires from New York and Northern New Jersey.

6. Tire-Derived Fuel: Market Outlook

a. Challenges to TDF Expansion

Overall, the market outlook for the TDF market remains optimistic over the next two years. However, the various market segments will face different market challenges and opportunities. Table 3 shows market trends for TDF in the U.S., projected through 2005.

Table 3: U.S. Tire-Derived Fuel Market Trends (millions of tires)

	Cement	*Pulp/ Paper*	*Utility*	*Industrial*	*Dedicated*	*TOTAL*
1998	38	20	25	15	16	114
2001	53	19	18	11	14	115
2003	53	26	23.7	17	10	129.7
2005*	60	34	23	20	14	151

* = Projected

The scrap tire industry in general, and the TDF marketplace in particular, face ever-present and increasing challenges from opponents. The opponents ("environmental" groups) can either be of local or national perspective. The use of tires as a source of energy is not well received by these groups for two basic reasons: the concern about potential emissions and the loss of a resource, based on the theory that use as a fuel takes tires from higher value-added markets. Over the course of the last two years, these groups, which have always been present and part of the permitting process, have become even more vocal and active. The result of this opposition is that there are five permitted facilities not using TDF and another four facilities that are embroiled in fiercely contested permitting processes. This opposition impedes the development of legitimate scrap tire markets that are more environmentally sound than existing alternatives.

The tire industry continues to provide information about air emissions issues related to the use of TDF. In reality, the addition of TDF typically decreases air emissions associated with the TDF user's manufacturing or combustion process, as compared to the solid fuels, namely coal, that TDF usually replaces. However, facts sometimes are not easily injected into an emotional debate.

The tire industry promotes all higher value-added markets for scrap tires. However, the industry recognizes the vital role TDF markets play in the U.S. scrap tire management system. As other markets are developed and have the capacity to consume greater numbers of scrap tires, TDF use may decline, since those markets will demand higher return for scrap tires. Yet, until that time, TDF diverts a large volume of scrap tires from landfills and illegal stockpiles and provides an inexpensive and environmentally sound source of energy for several types of combustion operations.

The other major obstacle to increasing the use of TDF is "institutional" barriers – government policies (federal, state or local) and regulations that delay or discourage the use of TDF. These obstacles take several forms, ranging from lengthy and difficult permitting processes to excessive regulatory governance to policies that simply keep potential end-users from ever submitting an application for a trial use.

For this reason, the EPA/RCC Tire Partnership described later in this report is of great importance. It is clear that the activities of individual companies or industry groups are not capable of effecting the changes needed to remove these barriers. These needed changes are more likely to be effected if and when state or federal officials speak among their peers and make these concerns known. Stakeholders participating in the RCC process, including state and local regulators, are committed to identifying and working to eliminate institutional barriers to the TDF market.

b. Cement Industry

In the cement industry, the use of TDF should continue to increase for three reasons. First, five kilns started to use TDF in late 2003. These kilns will be steadily increasing the number of tires consumed. Second, six additional kilns are actively seeking to implement the use of TDF in the next 12 months and another four to six additional kilns are likely to pursue TDF use in the next two years. Third, the continued importance of NO_x emission reductions will keep TDF usage constant once it is underway.

Given the present conditions in the cement industry, the use of TDF is expected to increase by 5 - 10 million scrap tires within the next year. Additional demand of 6 to 10 million scrap tires within three years is likely. By 2005, it is possible that 50 facilities (75 kilns) will be using TDF. While this would be considered extremely positive, it must also be recognized that this may be reaching the upper limit of the total potential demand in this market sector due to limitations in capacity.

c. Pulp and Paper Mills

In the pulp and paper industry, TDF consumption in mill boilers already using TDF appears to be reasonably stable, although some mills currently using TDF may increase the number of tires consumed. Further expansion of TDF use in this market sector will be a function of the additional mills that begin using TDF, the availability of high-quality TDF supply relative to the mill location and the cost of energy. While no further expansion in the use of TDF is expected in New England, the Mid-Atlantic States or the Northwest, some expansion may be possible in the Southeast, depending upon the factors mentioned above.

The price of TDF and the availability of other alternative fuels might continue to stimulate market growth in the pulp and paper market segment. The market value of bark, for example, a major fuel source for many mill boilers, has increased to a point where TDF is now competitive. Furthermore, the supply of bark that once was available on the open market is diminishing, due to increased demand and greater return on investments when selling bark into horticultural markets.

Consequently, it is projected that there should be continued growth in this market sector over the next two years. While it is possible that several mill boilers may begin or increase TDF use, it is equally possible that several mills could end-use of TDF.

d. Utility Boilers

In the utility industry, due to continued industry restructuring and uncertainty about upcoming air emission requirements, it appears that this market sector will not present many, if any, market opportunities within the next two years. Indications are that the majority of facilities using TDF will continue to do so, which should provide stability for the TDF producers that service these contracts.

In the industrial boiler market segment, a modest increase in the use of TDF is possible. Several industrial boilers in California have indicated interest in using TDF. One or more of these facilities could begin using TDF within the next 18 months. Issues that could delay these projects include the permitting process and obtaining an adequate supply and quality of TDF.

The continuation of the use of TDF in the Mid-Atlantic region will be a function of the continued scrap tire program in Virginia. As long as Virginia continues to abate stockpiled tires and provide a price subsidy for those tires, it is anticipated that the market expansion will continue. If and when the stockpile abatement program completes its mission and/or the amount of money paid by Virginia is decreased, or stopped, then it is anticipated that some of these TDF markets will dissipate.

e. Dedicated Scrap Tire-to-Energy Facilities

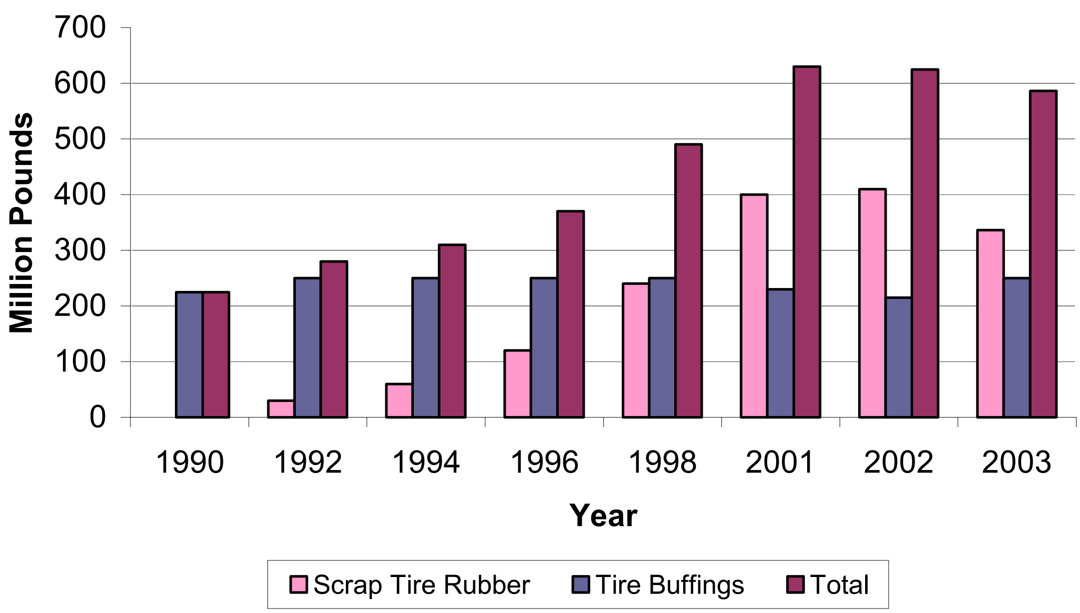
In the dedicated tire-to-energy market segment, it is anticipated that the Illinois facility will increase the number of tires consumed, resulting in a modest increase in this market sector. Given the history of this niche market, it is uncertain whether there will be any changes beyond the Illinois facility in the next two years.

C. Ground Rubber Applications

There are two sources for tire-derived ground rubber: tire buffings and processed whole scrap tires. Tire buffings are a by-product of the process that retreads tires. The estimated total supply of buffings available in the U.S. is 250 million pounds per year. These quantities have reached capacity, since the number of tires retreaded annually has declined. Until 1992, all of the ground rubber that was used came from tire buffings. In 2003, all demand for ground rubber above the 250 million pounds of buffings were supplied from scrap tire rubber.

Figure 5 shows the historical contributions of tire buffings and processed whole tires to the total U.S. ground rubber market. RMA estimates that 586 million pounds of ground rubber were sold in the U.S. in 2003 (336 million pounds from scrap tires and 250 from tire buffings), or the equivalent of approximately 28.2 million scrap tires. Of note, these numbers represent only the ground rubber that was sold, not the total number of scrap tires that were processed, nor do these numbers represent the total amount of ground rubber processing capacity in the U.S.

Figure 5: Sources of U.S. Ground Rubber Supply

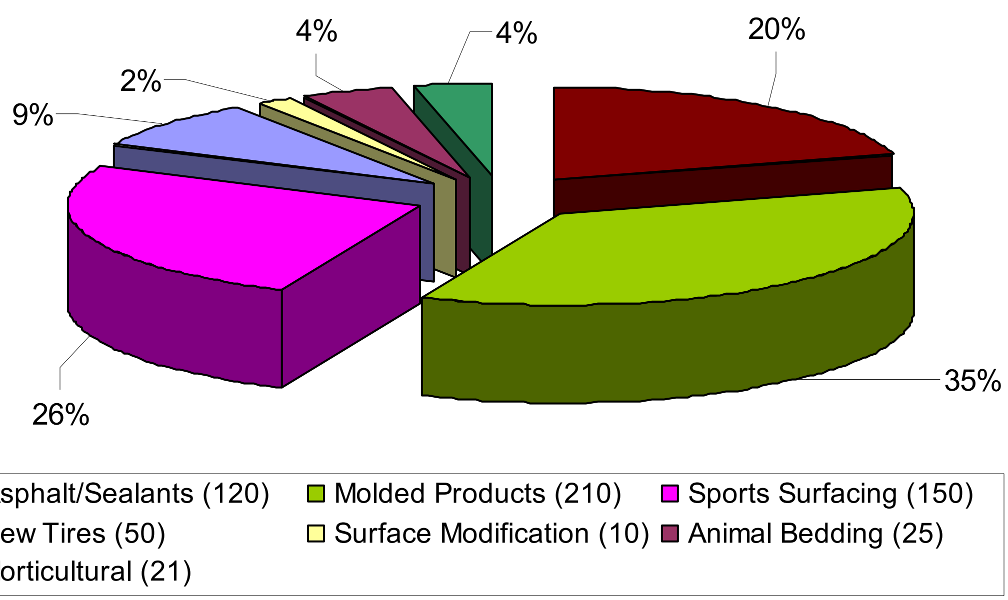


While the term "ground rubber" (or "crumb rubber") is defined by ASTM, there are several distinct and commonly-used terms used to describe the various sizes of tire rubber. For the smaller-sized particles the term "mesh" is used. Mesh sizing is defined by the number of holes on a one inch (liner) screen: the higher the number, the smaller the hole size. These terms are:

- Tire Buffings – by-product of the retreading industry
- Coarse Rubber – 1 inch to 4 mesh
- Ground Rubber – 10 – 80 mesh
- Fine Grind Rubber – 80 – 400 mesh

There are several distinct markets for scrap tire rubber. In an attempt to simplify the various end-uses for tire rubber, the markets are divided into seven categories: asphalts/sealants; molded/extruded products; sports surfacing; new tire manufacturing; surface modification; animal bedding and horticultural applications. Figure 6 shows the estimated distribution of ground rubber for 2003 among these various markets.

Figure 6: 2003 U.S. Ground Rubber Markets
(in millions of pounds; 586 total)



1. Rubber-Modified Asphalt

Ground rubber can be blended with asphalt to favorably modify the properties of the asphalt in highway construction. Ground scrap tire rubber can be used either as part of the asphalt rubber binder, seal coat, cap seal spray or joint and crack sealant, or as an aggregate substitution. Currently, there appears to be an increasing interest in the benefits of rubber-modified asphalt, not only in the fairly limited range of states currently using a significant amount of it – California, Arizona, Florida and South Carolina – but also in several other states. Rubber-modified-asphalt also has been used in Nebraska, Tennessee, Texas and New Mexico, but with the exception of Nebraska, it appears that these were one-time applications. It remains to be seen whether these states will continue to use rubber-modified-asphalt.

Over the last two years, the amount of rubber-modified asphalt used in California has decreased dramatically. This decrease was simply caused by the prevailing budget shortfall and consequent cutback in state agency budgets. There are no technical reasons for this reduction in rubber-modified asphalt usage; California Department of Transportation (CalTrans) reduced the total amount of paving. It must also be recognized that CalTrans used an extraordinary amount of rubber-modified asphalt in 2000. Rubber-modified asphalt was used as an overlay of badly worn road surface, which is considerably less expensive than road reconstruction. If anything can be taken from the situation in California it is that rubber-modified asphalt is an excellent material to use for intermediate- to long-term road repair.

To a large extent, any large-scale increase in the use of rubber-modified asphalt is dependent upon the willingness of a state department of transportation (DOT) to accept national test results and begin its own state and local level programs. Even with some degree of acceptance by a DOT, the demand for size-reduced rubber as a result of rubber-modified asphalt applications will not expected to increase immediately. Rather, a more gradual increase over the next five years is expected.

2. Molded and Extruded Products

Ground scrap tire rubber may be formed into a set shape, usually held together by an adhesive material (typically urethane or epoxy). These bound rubber products include, but are not limited to carpet underlay; flooring material; dock bumpers; patio floor material; railroad crossing blocks, and roof walkway pads.

Ground rubber can be added to other polymers (rubber or plastic) to extend or modify properties of thermoplastic polymeric materials. Examples of this application are injection-molded products and extruded goods. There appears to be a significant market potential for this application due to the continuing research and development of products using a surface-modified rubber.

3. New Tire Manufacturing

Limited quantities of finely ground scrap tire rubber can be used in some components of new tires. The quantities used in new tires likely will not exceed five percent by rubber weight in the tire types and models that contain recycled content, since the addition of recycled content in new tires decreases the tire's performance in critical areas, including safety.

Recently, Continental Tire North America, Inc. announced its findings from a research project conducted in conjunction with the state of North Carolina that studied the feasibility of incorporating up to 13 percent recycled content in tires (both recycled tire rubber and other non-tire recycled materials). This report showed negative tire performance implications associated with the addition of this percentage of recycled content, including lower tread wear life, lower wet traction, longer wet stopping distance, lower snow traction and higher rolling resistance. Continental has discontinued this research project due to the unacceptability of the negative performance implications and the unavailability of acceptable source material.

Continental's recent experience in this area illustrates that while increased levels of recycled content rubber can be added to new tires, doing so does not provide any additional durability to the tire. Further, recycled content introduction can come at the cost of other desired tire performance characteristics. No engineering benefit (as defined by durability and/or performance) and in fact, some negative performance implications, are likely to keep the recycled content of tires, where used, to the 0.5 to three percent levels that have been traditionally used.

4. Athletic and Recreational Applications

This market segment has been one of the fastest growing markets for ground rubber over the last two years. Examples of this market segment include, but are not limited to the use of rubber in running track material, in grass-surfaced playing areas, in stadium playing surfaces, for playground surfaces, in horse arenas, and as a turf top dressing.

The incorporation of rubber into these sport surfaces provides one of two benefits: increased safety and/or performance enhancement. This is a function of the properties of the rubber. In the case of playgrounds, where loose rubber, rubber mats or a coagulated rubber emulsion is laid, rubber surfacing has the highest impact attenuation level of any material tested and/or commonly used. The same feature is also displayed when rubber is used in running tracks: the impact on the surface is absorbed largely by the rubber-modified surface, not by the body.

When rubber is used to modify grass playing surfaces or synthetic playing surfaces (i.e., soccer field, football field) the rubber provides resiliency, softens the fall impact and protects the grass. This market has increased dramatically in the U.S. and Europe.

5. Horticultural Applications

Larger-sized rubber chips, typically one-half inch in all dimensions, are used as an artificial mulch material. This mulch material can be dyed to virtually any color, giving the tire mulch material the appearance of wood mulch. Tire mulch has been replacing conventional mulch materials for two reasons: wood chips are being used for fuel at pulp and paper mills, thus reducing supply for the mulch market, and rubber mulch does not biodegrade (lasts longer), which provides a long-term cost advantage over conventional, organic materials. There are also molded products being used in this market niche, primarily soaker hoses and edging material, made with ground rubber.

6. Animal Bedding

Coarse rubber is being used as the fill material for fabric mats that are used in the dairy industry. These mats (referred to as "cow mattresses") provide comfort for milking cows and protect the cows' udders, to help maintain the milk production capacity of these animals. These mats come in various sizes and also are available for use as bedding material for domesticated animals (dogs and cats).

7. Surface Modification

Various technologies are used to modify the surface of the rubber particle, which are designed to provide some benefit when incorporating the rubber particle into a polymer matrix (chemically or physically binding the rubber particle to another rubber particle). Examples of these technologies include, but are not limited to exposing fluoride or bromide gases over the rubber surface; de-vulcanizing rubber (severing the carbon/sulfur bonds) or exposing the rubber to a chemical bath that causes the surface to become tacky (stickiness). Once any of these processes is completed the rubber could then be mixed with another polymer (rubber or plastic) to form a new rubber product. To date, we are not aware of any of these efforts that has accounted for a large-scale use of recycled rubber.

8. Ground Rubber: Market Outlook

There have been a number of changes to the ground rubber market infrastructure over the last several years. Perhaps the most significant change has been in the production of ground rubber. There has been a consolidation of ground rubber operations: companies manufacturing this raw material are generally larger, in terms of the number of tires processed, than previous years and operate on a larger, regional basis. Several companies are attempting to develop nationwide collection/processing/marketing systems. The marketplace has also stabilized, in that there are fewer, although larger ground rubber operations.

The ground rubber marketplace has also benefited from more advanced technologies (tire processing systems). This has allowed the coarse rubber markets to expand and provide higher-quality ground and finely-ground rubber (less wire and tire fabric). These more efficient processing systems both increase production capacity and lower production costs.

While the overall consumption of ground rubber has increased since 1992, not all markets have experienced sustained increases. In general, the markets for molded products, sport surfacing and animal bedding are likely to continue to increase. Yet the use of rubber-modified asphalt has decreased primarily due to the budget conditions in California. The short-term outlook for CalTrans is that its budget will remain impacted by continued budget issues, and consequently will not be using significant amounts of rubber-modified-asphalt.

While the amount of ground rubber sold into markets has increased, so too has the ability to produce ground rubber. While the introduction of new processing technologies has alleviated the shortfall of supply for coarse rubber, there appears to be a surplus in ground rubber capacity. These excesses are having major impacts in the marketplace by driving down the prices of certain size classes (20 – 40 mesh rubber). Furthermore, processing technologies are advancing faster than the ability to incorporate the rubber into new products. This is especially prevalent in the finer mesh sizes.

The overall effect of these conditions has been to cause several ground rubber production operations to go out of business, while others are operating on a marginal basis. The final result of these conditions could be a repeat of the conditions in the 1994 – 1996 timeframe, when a major market correction took place.

Unless there are dramatic increases in existing markets for ground rubber or new markets are created, the production infrastructure for ground rubber could face another difficult period. Another possible means of resolving the oversupply situation is for ground rubber producing companies to change from simply being a producer of a raw material to a consumer of the raw material. Vertically integrating their operations could allow companies to take advantage of the supply situation while transforming their operations.

D. Cut, Punched and Stamped Rubber Products

There was more information supplied on this market segment in 2003 than in any previous year. From the information obtained it appears that the number of tires that are cut/punched/stamped in the U.S. is approximately six and one-half million tires a year. While this does represent a decrease from the previous rate (8 million in 2001) it is uncertain whether this decrease occurred over the last two years or whether previous editions of this report did not detect such a decrease in previous reporting periods.

The process of cutting, punching or stamping products from scrap tire carcasses is one of the oldest methods of reusing of old tires. This market encompasses several dozen, if not hundreds of products, all of which take advantage of the toughness and durability of tire carcass material. The basic process uses the tire carcass as a raw material. Small parts are then die-cut or stamped, or strips or other shapes are cut from the tires.

A limitation of this market is that it generally uses only bias-ply tires or fabric bodied radial tires. Historically, this market has consumed primarily medium truck tires. However, the steel belts and body plies in an increasing percentage of medium truck radial tires are not desirable in these applications. Larger bias-ply tires may provide another possible raw material for this market, which could offset some of the decrease in supply for this market caused by the trend toward steel-belted radial medium truck tires. Thus it may provide a reuse opportunity for some of the large off-the-road tires that otherwise pose waste management challenges.

Because of the constant demand in this market, virtually all of the scrap bias-ply medium truck tires that are collected by major truck casing dealers find their way to a cutting or stamping operation. This demand is expected to remain constant. This market has reached capacity, since the supply of bias-ply tires is limited. In fact, if no new supply of bias-ply tires can be secured, it is likely that this market segment will decrease slightly over the next two years as the supply of bias-ply tires diminishes.

E. Civil Engineering Applications

Civil engineering markets are continuing to gain wider acceptance with annual usage increasing to 56.4 million tires. In the past two years, leading applications in this market were lightweight fill, drainage layers for landfills, and aggregate for septic tank leach fields. For these applications, scrap tires are processed into tire-derived aggregate (TDA) with a range between two and 12 inches. The driving forces for market growth are the beneficial properties of TDA including light weight, high permeability, ability to attenuate vibrations, and good thermal insulating properties. Table 4 lists the properties of tire rubber used in civil engineering applications.

Examples of major lightweight fill projects include the new Sabattus, Maine interchange constructed by the Maine Turnpike Authority in the summer of 2003. This is the largest project of its kind, using nearly 2 million passenger tire equivalents (PTE) processed into TDA as the embankment core for on and off ramps. The project was largely responsible for remediation of the state's last large scrap tire stockpile. In Maine and Minnesota, uses of TDA as lightweight fill have matured to the point where it is a routine solution for highway embankments constructed on weak, compressible soils. Use of TDA has expanded to new states. CalTrans constructed its first project using TDA as lightweight backfill for a retaining wall in Riverside, California. The Pennsylvania DOT also began its first tire shred embankment project near Kittanning, PA. When completed in 2004, this project will use some 750,000 PTE.

Use of TDA in a range of drainage applications continues to be strong. A large project was constructed for the Southeast County Landfill in Hillsborough County Florida. In this project more than 700,000 PTE were used as the upper portion of a leachate collection layer. In a similar, project two million PTE were used at the Crossroads Landfill in Norridgewock, Maine. Use of TDA as a replacement for stone in septic tank leach fields is continuing to grow with New Jersey and Delaware among the new states now permitting this application.

A new application is use of TDA as vibration damping layers beneath rail lines. This concept was used in San Jose, California for a new light-rail transit line. The TDA was placed beneath the stone ballast, effectively reducing annoying vibrations that travel through the ground to adjoining residences and businesses. This application used 40,000 PTE per 1000 feet of rail line.

Table 4: Properties of Tire Rubber Used in Civil Engineering Applications

Size	2 to 12 inches
Weight	1/3 to 1/2 weight of soil
Volume	1 cubic yard ≈75 tires
Drainage	10 times better than well graded soil
Insulation	8 times better than gravel
Lateral Foundation Wall Pressure	1/2 that of soil

1. Landfill Construction and Operation

Of all the uses for tire shreds, this is the fastest growing market application. Overall, there are five applications for tire shreds in landfill construction. These applications are in leachate collection systems, in gas venting systems, in cap closures, in operational liners and as a material for landfill daily cover. The use of scrap tires in landfill construction is a beneficial use of the properties of processed scrap tires and must not be considered as disposal. Scrap tire shreds can replace other construction materials that would have to be purchased.

Leachate collection systems: The most widely used application for tire shreds in landfills, this application uses a relatively clean-cut four-inch square tire shred in place of the middle layer of the three feet of sand typically used in a leachate collection system. Tire shreds are not used in the sections of the collection system that touch the geotextile separating the collection system from the municipal solid waste, due to concerns that tire wire would puncture the geotextile and cause leakage.

The main benefit of using tires in this application, aside from economic considerations, is that tire shreds appear to better allow the flow of leachate through the collection system, since once in place, tire shreds compact less than sand. Additionally, since there is more void space, the clogging potential of the leachate system is reduced. The presence of tire shreds has not been associated with any environmental stress or thermal degradation.

Gas venting systems: In this application, a clean-cut four-inch-square tire shred is placed inside the trench in which the gas venting equipment is located. The lightweight nature of tire shreds, relative to conventional fill materials, allows them to exert less pressure against the gas venting equipment. This prevents shifting or damage to the gas venting system.

Cap closures: Tire shreds are being used in lieu of clean fill in the three feet of cover material placed between the uppermost geotextile layer covering municipal solid waste and geotextile under the final cover material (typically soil). In this application, rough shreds, often taken from abatement sites, replace the middle portion of the three feet of fill material.

Operational liners: Operational layers separate municipal solid waste from landfill containment systems. Containment systems are typically a geosynthetic membrane, a geosynthetic clay liner or a compacted clay liner. Tire shreds are used in lieu of conventional material (sand or clean fill), but are not typically placed directly against the geosynthetic membranes.

Alternate daily cover: Rough shreds are mixed with clean fill (dirt) to comprise the six inches of cover material most landfills must spread across the work area of an active landfill cell at the end of the day. This application, while a very low value-added application, is utilizing large numbers of tires abated from scrap tire stockpiles, as well as residual tire material from TDF processing. This application is proving beneficial in areas where clean fill is expensive. In this application, tire shreds prove effective in keeping the municipal waste in the landfill and preventing birds or rodents from entering the landfill. Tire shreds, however, have no ability to control odor emanating from the landfill. Consequently, landfill operators are combining soil with tires in a 50-50 mixture.

2. Septic System Drain Fields

Tire shreds are used in several states to construct drain fields for septic systems. The lower density of the shredded tire material greatly reduces the expense and the labor to construct these drain fields, while the material provides performance equal to that of traditional stone backfill material. Arkansas, Delaware, Florida, Georgia, New Jersey, South Carolina and Virginia allow this application.

There are several reasons why tire shreds are fast becoming accepted by the septic field construction industry. Tire chips contain 62 percent void space, as compared to 44 percent with stone. This allows tire chips to hold more water than stone. Furthermore, tire chips are lighter than stone, which makes moving tire chips easier than moving stone during construction. While gaining favor in certain parts of the country, the acceptance of tire chips is also a function of quality. Tire chips must be clean-cut and have uniform size. While it has been clearly demonstrated that tire shreds can be used in these applications, further expansion will be a function of two factors: approval from appropriate state agencies and economics. Where and when tire shreds are less expensive than stone and where state regulations do not restrict this application, it is expected that this market niche will expand.

3. Subgrade Fill and Embankments

Maine, Minnesota, North Carolina, Vermont and Virginia have used tire shreds as a subgrade fill in the construction of highway embankments and other fill projects. The principal engineering advantage that tire shreds bring to these projects is lighter weight (one-third to one-half of conventional soil fill). Use of tire shreds allows construction of embankments on weak, compressible foundation soils. For most projects, the use of tire shreds as a lightweight fill material is significantly cheaper than alternatives, such as use of expanded shale aggregate or polystyrene insulation blocks.

Projects featuring this use of scrap tires include: the construction of two highway embankments on weak clay in Portland, Maine; construction of an interstate ramp across a closed landfill in Colorado; construction of mine access roads across bogs in Minnesota; stabilization of a highway embankment in Topsham, Maine; and reconstruction of a highway shoulder in a slide-prone area in Oregon. Scrap tire material also has been used to retain forest roads, protect coastal roads from erosion and enhance the stability of steep slopes and shoulder areas along roadways.

4. Backfill for Walls and Bridge Abutments

Several projects have been constructed using tire shreds as backfill for walls and bridge abutments. The weight of the tire shreds produces lower horizontal pressure on the wall, allowing for construction of thinner, less expensive walls. In addition, tire shreds are free- draining and provide good thermal insulation, eliminating problems with water and frost buildup behind the walls. The benefits of this application were demonstrated by a full-scale test wall constructed at the University of Maine and a bridge abutment built by Maine DOT. Recent research conducted in Maine and South Dakota also shows that the compressibility provided by a thin layer of tire shreds placed directly against a bridge abutment can significantly reduce horizontal pressures. Tire shreds can also be used in small-scale civil engineering applications, like as a drainage medium around house foundations.

5. Subgrade Insulation for Roads

One of the problems plaguing roads in northern climates is the excess water that is released when the subgrade soils thaw during the spring melt. To prevent this, tire shreds have been used as subgrade insulation on projects in Maine, Vermont, and Quebec. The insulation that is provided by a 6- to 12-inch thick tire shred layer keeps the subgrade soils from freezing throughout the winter. In addition, the very high permeability of tire shreds allows excess water to drain from beneath the roads, which prevents damage to road surfaces.

6. Civil Engineering: Market Outlook

It is likely that the civil engineering market will continue to grow. Nonetheless, there are two challenges that need to be considered. The first is that strong advocates are needed in each region of the country. This could be engineers, contractors, or scrap tire processors. Without strong advocates it is difficult to overcome the institutional inertia to just keep doing things the way they always have been done. The second is an improved ability of scrap tire processors to deliver TDA that meets project specifications in a timely manner. Without this, earthwork contractors will be frustrated by the construction delays that this causes.

F. Export of Tires

The business of exporting sound used tires continues. The 2003 questionnaire responses RMA received had more information on this market niche than any previous year's survey. Based on this information the number of tires exported is reported to be nine million tires per year. Admittedly, this information represents only the data collected. There is a significant likelihood that more tires are exported than have been reported. The obvious weakness in the reporting system is that some used tires may not have been counted in a state's questionnaire or are handled by tire collectors that do not report their activities to state agencies.

G. Agricultural and Miscellaneous Uses

Scrap tires are regularly used in a variety of agricultural applications. Used tires not legally fit for highways sometimes may be used on low-speed farm equipment. Tires are also used to weigh down covers on haystacks, over silage, or for other purposes where an easily handled weight is needed. Tires can be used to construct livestock feeding stations or to protect fence posts and other structures from wear and damage by livestock. Tires may also be used in erosion control and other land retention projects. There also is a wide variety of uses for scrap tires that do not fit neatly into any of the preceding categories, which ranges from one of the most popular uses as a scrap tire swing, to more exotic uses, limited only by imagination and necessity. Agricultural and miscellaneous uses (including baled tires) consumed approximately three million tires in 2003.

II. Regional Market Analysis

A. National Perspective

The markets for scrap tires continue to be regionally based. Therefore, to understand scrap tire management in the U.S., it is important to conduct an analysis of the market dynamics in each region. The analysis that follows looks at scrap tire markets in each of the ten EPA Regions. Appendix D contains state scrap tire data, organized and tabulated by EPA Region.

The scrap tire situation in the eastern half of the U.S. is at present in a very strong market position: tires generated in this half of the country typically go to an end- use market. In the Middle portion of the country, Illinois and Michigan have strong and major clusters of markets that pull tires from the surrounding regions. The scrap tire situation in the Western half of the country is characterized by a few states with strong markets that attract tires from adjoining states, but generally there is a weak market infrastructure characterized by isolated pockets of population surrounded by long distances. In the Pacific Northwest, a regional market has developed between Portland, Oregon and Northern California. In the Southwest, Arizona has a well-developed asphalt market, while surrounding states maintain weak markets with significant challenges.

Figure 7 illustrates the regional distribution of scrap tire markets, stockpiles, landfilled tires, and annual scrap tire generation. Figure 8 shows the percent of annually-generated scrap tires that are consumed by a scrap tire market in each EPA region. Figure 9 shows the percentage of scrap tires going into markets in each state.

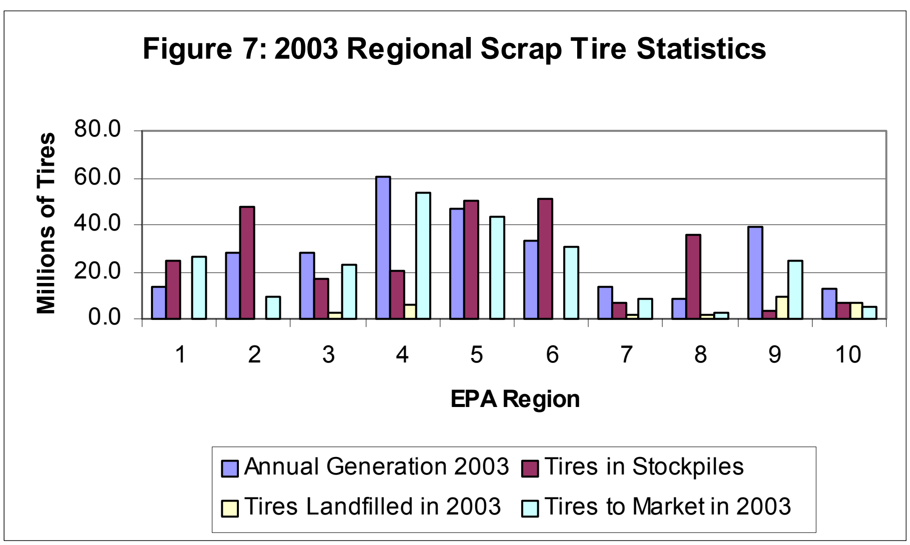


Figure 8: 2003 Regional Scrap Tire Markets - Percent of Annual Generation to Market

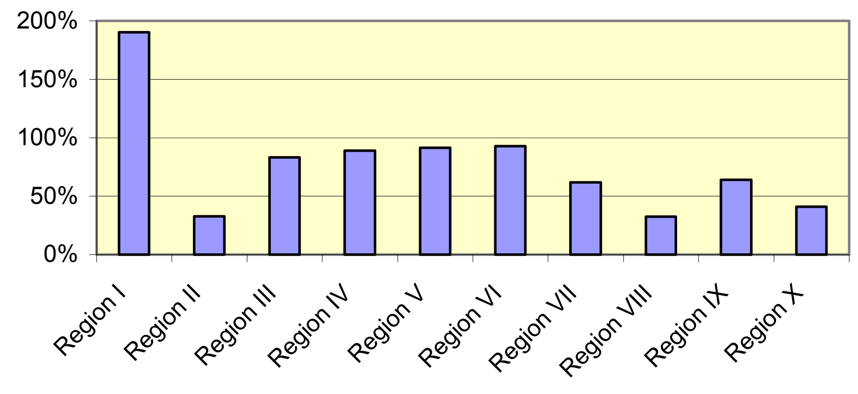
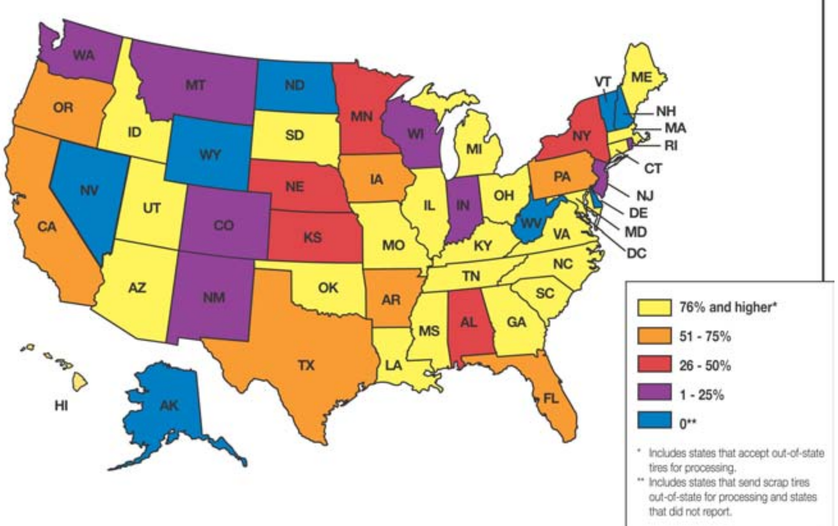


Figure 9: State Market Percentages



B. The New England Region (EPA Region 1: Maine, Vermont, New Hampshire, Massachusetts, Rhode Island and Connecticut)

The New England Region continues to maintain strong markets for scrap tires. In general, virtually all of the annually-generated scrap tires are collected and processed, then shipped to an end-use market. The major market is TDF, with three pulp and paper mill boilers in Maine using TDF and a dedicated scrap tire-to-energy facility in Connecticut. There are relatively small markets for tires in civil engineering applications (Maine) and for stamped and die-cut products (Massachusetts). There is presently a demand for some 19 million scrap tires annually. To meet that demand, scrap tires generated along the eastern corridor of New York state, including the New York City metropolitan area/Northern New Jersey, are transported to the dedicated scrap tire combustion facility. The only other market in the region includes a small amount of rubber-modified asphalt in Rhode Island.

C. The Northeast Mid-Atlantic Region (EPA Region 2: New York, New Jersey)

This region is an area where markets have not been established. There are no large-scale markets in New Jersey, although there are some tire processors in the state. Most tires in New Jersey are taken into other states. Tires in southern New Jersey are picked up and transported into Maryland, while many tires from the northern part of the state go into Connecticut or Pennsylvania.

New York state can be divided into several sections. As indicated earlier, the scrap tires generated on either side of the Hudson River and down to the New York City area are generally taken to Connecticut. Tires in the southern portion of the state are either taken into Pennsylvania or stockpiled in some of the state's larger problem piles. Scrap tires in the central portion of the state are sent to stockpiles, processed and used in landfill applications or taken to the electric arc furnace in the center part of the state. A considerable number of tires are used as alternative daily cover and in leachate drainage systems in municipal waste landfills.

D. Southern Mid-Atlantic Region (EPA Region 3: Delaware, Maryland, Pennsylvania, Virginia and West Virginia)

Region 3 has varied scrap tire programs. Maryland has an aggressive scrap tire program featuring a strong demand for TDF and the production of coarse and ground rubber. Maryland's strong TDF market is the main market for in-state tires. Additionally this market brings tires in from Virginia and Delaware. Although Delaware has no state scrap tire program, there is a major processor of coarse rubber (quarter inch, half inch, three-quarter inch sized particles) in Delaware, which supplies a good percentage of this sized material along the eastern seaboard. A significant amount of this supply comes from Maryland-generated tires.

Virginia's program has been successful due to the end-user reimbursement program. Virtually all of the annually-generated tires are going to a market. Major markets for TDF and civil engineering have been developed. There are two pulp and paper mill boilers and three industrial boilers using TDF. On the civil engineering side, both annually-generated and stockpile abatement tires are being used as alternate daily cover in landfills across the state. Some of Virginia's tires go into adjacent states, while tires from North Carolina are shipped into Virginia for processing.

Pennsylvania takes in tires along the eastern and northern sections of the state from adjoining states. Pennsylvania has moderately strong markets for tires, but they are not large enough to consume all of the tires generated in the state. West Virginia is moving along slowly, still plagued by limited markets, but has begun stockpile abatement programs.

E. Southeastern Region (EPA Region 4: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee)

A strong TDF market has been developed in this region. Several large-scale pulp and paper mill boilers and cement kilns in this region use TDF. Still, some of the annually-generated scrap tires are being landfilled or monofilled (a landfill or portion of a landfill dedicated to one material). For example, Alabama allows landfilling. This management practice tends to attract tires from adjacent areas (within about 100 miles) and affects the market by reducing the number of tires available for the marketplace and depressing tipping fees.

In this region, Florida has the most diverse and well-developed program. Florida is one of the only two states (CA is the other) where all of the major markets for scrap tires are well developed (TDF, civil engineering applications, rubber-modified asphalt and coarse rubber), and the majority of the legacy stockpiles have been abated. Florida also has used its funds to enforce its regulations, an often overlooked component of a comprehensive scrap tire program. To this end, the state has given grants to counties, allowing them to work with law enforcement agencies to "test" whether the requirements to use a licensed hauler are being followed. This action is a significant reason for the relatively low number of scrap tires being dumped within the state.

Alabama, which only recently enacted a fee-based management program, is home to two major cement kilns using TDF, an electric arc furnace using tires as a charge material and a major monofill. Tires from the panhandle of Florida are transported into Alabama for landfill disposal. In the north end of the state, tires are being processed and sold into TDF markets in Mississippi and Tennessee. Some tires from Western Georgia are transported into Alabama and are stockpiled or landfilled.

In Mississippi, two pulp and paper mill boilers are using significant amounts of TDF. The state also is looking into developing the civil engineering application market. To satisfy market demand, tires are imported from as far away as Texas.

North Carolina's program continues to allow tires to be monofilled, which consumes approximately half of the annually-generated tires. There is also a developing TDF market in the state. Some tires are processed into materials for the civil engineering market and the markets for playgrounds, running tracks and soil amendments. The state also imports one to two million scrap tires a year, which primarily are shredded and monofilled.

South Carolina has a unique situation where all of the annually-generated scrap tires go to markets, both in and out of state. The majority of South Carolina's scrap tires are collected and transported out of state, either to North Carolina or Georgia, processed, and returned to South Carolina to meet the demand for scrap tires in septic leach fields or for TDF.

Georgia also has a well-developed market infrastructure. The state's annual generation goes to feed a significant TDF market, consisting of three pulp and paper mill boilers. These markets also consume tires from South Carolina and Florida. The state has cleaned up a significant quantity of its stockpiled scrap tires.

Tennessee has a dual program: viable TDF markets along with landfilling. Due to the state's geography, the TDF markets in the South Central portion are as likely to receive tires from Georgia, Alabama and Mississippi as from in-state sources. TDF markets in western Tennessee have received tires from Alabama, Mississippi, Arkansas and Texas.

Kentucky has developed a TDF market and has tires going into civil engineering applications and reportedly has some ground rubber used to manufacture new products.

F. Midwestern Region (EPA Region 5: Indiana, Ohio, Illinois, Michigan and Wisconsin)

Over the course of the past several years, Ohio has allowed the construction of monofills, to which a significant number of tires are being shipped. In recent years Ohio has begun using tires in civil engineering applications in greater number and is slowly developing a TDF market.

Michigan has developed a significant TDF market, with several current end-users looking to expand TDF usage. No tires are used in civil engineering applications, nor are there any significant ground or coarse rubber markets. The demand for TDF in Michigan has created a demand-pull situation in the state, drawing processed tires from Ohio, Indiana and Illinois.

Illinois has developed end-use market capacity that exceeds the number of in-state tires available. Consequently, tires are brought into the state from adjacent states (Kentucky, Ohio, Indiana and Iowa) to meet market demand. Notably, tires processed in Illinois are used as TDF in both Missouri and Michigan, so the flow of tires is influenced by economics and geography.

Wisconsin's scrap tire program ended in 1996. The program supplied a subsidy for the use of Wisconsin generated tires. The program successfully cleaned up virtually all of the stockpiles, and was directly responsible for the creation of a dynamic TDF market. Virtually all the scrap tires in the state, as well as tires from Illinois and Michigan went into this market. With the end of the price support, all but one of the end-users stopped using TDF. The one remaining TDF market is reportedly supplied by a Minnesota-based operation.

Indiana has the highest number of processors in any state but is still seeking to develop in-state markets for its tires. Some tires from Indiana are shipped into Illinois and Michigan to service TDF markets, while tires that remain in the state are presumably stockpiled or landfilled.

Minnesota has a well-established infrastructure for collection, processing and transporting, which is sufficient to consume the annual generation of scrap tires. Although Minnesota's scrap tire program ended in 1996, the markets for tires continue to thrive, and no new stockpiles have been reported. A significant number of scrap tires are shipped to South Dakota and Wisconsin for TDF, while civil engineering applications use the balance of the tires in the state.

G. South Central Region (EPA Region 6: Arkansas, Louisiana, New Mexico, Oklahoma and Texas)

In Arkansas, each county, or a group of counties, is responsible for managing its tires. Consequently, tires are managed in several ways. Many tires are shredded and landfilled, while TDF markets in-state and in bordering states consume the remaining tires.

In Oklahoma, three cement kilns use TDF. The state still supports processing scrap tires and pays a price support to end-users. The state also allows civil engineering applications, primarily alternate daily cover in landfills and lightweight backfill. There is one ground rubber producer, and the industry continues to move toward using rubber-modified asphalt. It appears that few tires leave or enter the state.

Louisiana uses a subsidy program to help sustain markets. Part of the price support goes to the processor, with an increasing amount given when tire-derived materials are sold to end-users. Tires from this state are being landfilled, processed into TDF and/or transported to Alabama as TDF.

Texas has suffered from a significant amount of misunderstanding and confusion due to the termination of its subsidy program to processors of scrap tires. In actuality, the state program still exists, but the state is not collecting money from the retail vendors nor paying for the processing of scrap tires. Retailers now accept a disposal fee, which covers the costs of removal and transporting scrap tires to a processor's facility. In essence, Texas's program is basically the same as the majority of state programs: it relies on the market to set prices and move tires to the markets.

While there have been some areas in Texas that have seen a reduction in collection services, markets for scrap tires continue to be developed. The TDF markets continue to be strong, with five cement kilns using scrap tires. There are also a significant number of tires being used as alternate daily cover. The one weak point of the current situation in Texas is the existence of the stockpiled shred, a vestige from the processor reimbursement program. The state agency, while still responsible for regulations and enforcement, has funded abatement programs. Given the nature of the scrap tire situation and the size of the state, few tires are taken into or out of the state.

New Mexico has adopted a program where the majority of tires are taken to landfills where they are stored until they are baled. Once compacted, they seek to use these baled tires in civil engineering applications. The state has attempted to push the rubber-modified asphalt markets, but any movement in this direction comes from private industry's use of the material. There are no fuel markets, nor does it appear that there will be any in the near term.

H. Heartlands Region: (EPA Region 7: Iowa, Kansas, Nebraska and Missouri)

Iowa has developed a strong TDF market and is opening up a civil engineering market as well. Iowa has cleaned up most of its stockpiles. Missouri focuses on TDF and grants for the purchase of playground cover, with a significant amount of TDF coming in from Illinois. There is a strong TDF market in Missouri. On the other hand, Kansas sends most of its tires to monofills in the western part of the state, while the lone TDF market gets its supply from Missouri and Oklahoma.

Nebraska continues to focus on and limit its grants to generating ground rubber. Yet there appears to be little movement in the development of long-term, large-scale end-uses for ground rubber. The TDF market potential, while viable, has not moved forward, perhaps due to the state's policy of supporting higher end-uses for scrap tires. The end result is mounting scrap tires at processors and landfills, with little apparent likelihood of market movement in the short term.

I. Rocky Mountain/Prairie Region (EPA Region 8: Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming)

Colorado is at present looking to improve its scrap tire infrastructure (collection of fees). The markets in Colorado have been limited to one cement kiln and one processor/ manufacturer of coarse-sized particles for an array of products. Still scrap tires are accumulating at landfills. Little immediate movement is expected.

The Utah scrap tire program subsidizes end-users of Utah-generated scrap tires. Still, the intra-state market is limited to one cement kiln. Scrap tires generated in Wyoming primarily are landfilled. There is little likelihood of short-term market development.

The Montana scrap tire program is looking into the possibility of developing some markets, but at present, the vast majority of tires are also being land disposed. Montana also enacted regulations banning baled tires.

North and South Dakota have a limited scrap tire situation due primarily to demographics and geography. Both states are characterized by sparse population centers separated by great distances. In South Dakota, however, there is a large-scale end-user of TDF. To meet the demand of the Otter Tail Power Plant, tires are shipped in from Minnesota and Iowa. Most tires in North Dakota are landfilled.

J. Southwestern Region (EPA Region 9: Arizona, California, Hawaii and Nevada)

Arizona has developed strong markets for its scrap tires, primarily ground rubber for rubber-modified asphalt and products. Some tires in the western portion of the state are transported into Southern California to be monofilled. Tires in Nevada simply are landfilled.

In Southern California many tires continue to be landfilled, despite a strong market for TDF and several ground rubber producers. In central California there are some TDF markets, while civil engineering applications are being tested by the state. Rubber-modified asphalt has been used widely throughout the Southern and Central portions of the state, until recently, when usage was drastically reduced due to the budget crisis. In Northern California, tires are used for fuel at a cement kiln or are landfilled.

In Hawaii, tires generated on each island are typically managed on that island, since the cost to transport them to one central point is prohibitively expensive. There is one relatively large-scale processor on Oahu, which produces shreds for civil engineering applications and the TDF market. Tires on the other islands are typically landfilled or used for small-scale projects.

K. Northwestern Region (EPA Region 10: Alaska, Oregon, Idaho, and Washington)

A small percentage of the tires from Washington are used for TDF and some civil engineering applications, while the rest of the tires along the western corridor of the state are transported to Oregon to be land disposed. In Eastern Washington, the Idaho Panhandle and Western Montana there are a considerable number of tires baled and inventoried. Tires from Eastern Oregon, parts of Montana and central Idaho are sent to the TDF market in Eastern Oregon or central Idaho. Tires in central/south Oregon are used for ground rubber or combined with tires from Northern California for TDF in Northern California.

This region's market development efforts are stymied due to the lack of state \-funded scrap tire programs. Washington (1996), Oregon (1993) and Idaho (1996) have terminated their fee programs. New stockpiles have been identified in Washington and baled tires are being amassed at the processor's locations.

Alaska's population, relative to its size makes managing scrap tires a challenge. The majority of tires are landfilled, although there has been some interest in establishing regional collection points that would allow for the economical use of a mobile shredder. To date, there has not been any movement on these plans.

III. Land Disposal Issues

In many states, the management portfolio for scrap tires includes an option to place whole and/or processed scrap tires into landfills. In some states, landfilling scrap tires is the only viable option. Certain aspects of landfilling scrap tires must be recognized. First and foremost, landfilling tires has a profound impact upon the end-use markets for scrap tires. The cost to landfill a tire restricts the tip fees (fees paid to dispose of material) that tire processors can charge for processing tires as well as the supply of scrap tires available to them.

Second, landfilling scrap tires is not a market; it is a disposal option. Many factors, including transportation costs and limited scrap tire volumes, may make it impracticable to have substantial scrap tire markets in some locations. Landfills can compensate for a lack of available scrap tire markets or instability in scrap tire markets. Where this is the case, particularly in Western states with large land areas, difficult geography and sparse populations, it is understandable that landfilling may be the most reasonable and cost-efficient management option.

Landfills also provide two other important features for the scrap tire industry. In certain cases tires taken out of stockpiles are in such poor condition that they cannot be considered for any application. Consequently, the only viable option left is to place the material into a landfill; indeed several states that have a complete ban on tires in landfills have a stipulated exclusion for these situations.

The second example is the disposition of tire shredder residue. In this case this refers to the tire wire, fabric liner and chunks of rubber that remain on the wire. In some cases the processor does not have the equipment to further process this material into a salable material. The ability to landfill or otherwise manage the shredder residue, while not considered as a scrap tire, remains of importance to the industry.

Since 1996, the placement of shredded scrap tires in monofills (a landfill, or portion thereof, that is dedicated to one type of material) has become more prominent in some locations as a means of managing scrap tires. In some cases, monofills are being used where no other markets are available and municipal solid waste landfills are not accepting or are not allowed to accept tires. In other cases, monofills are portrayed as a management system that allows long term storage of scrap tires without the problems associated with above-ground storage.

In theory, monofilled processed scrap tires can be harvested when markets for scrap tire material improve. In practice, however, the economics of retrieving this material relative to the value this material can yield makes it unlikely that such actions will occur. Still, placing scrap tires into monofills is preferable to above-ground storage in piles, especially if the piles are not well managed.

IV. Scrap Tire Stockpiles

The issues associated with and management practices for scrap tires in stockpiles are different than those for annually-generated scrap tires. Stockpiles are the residue of past (and some current, usually illegal) methods of handling scrap tires. While its owner sometimes considers a scrap tire stockpile to be an asset, scrap tire stockpiles truly are liabilities, due to the potential for fire and vermin infestation.

Another major distinction between annually-generated tires and stockpiled tires is a matter of economics. Generally, the collection, flow and processing of annually-generated scrap tires are aided by the fees often assessed at the retail level. Typically, stockpile sites are managed such that the fees used to place tires onto stockpiles are not available to facilitate handling, processing or other remediation. Consequently, stockpiled tires tend to remain in place until state-initiated abatement programs or enforcement efforts can be implemented.

Another major issue in managing scrap tire stockpiles is developing an accurate assessment of the actual number of scrap tires in stockpiles. Initial reports estimated that between two and three billion tires were in stockpiles across the country. In its initial report on scrap tire issues in 1990, EPA estimated that one billion scrap tires were in stockpiles in the U.S. Since 1994, many state scrap tire management programs have focused on stockpile abatement. In 1994, following a survey of the states, the estimated number of scrap tires in stockpiles in the U.S. was 700 to 800 million, considerably fewer than earlier estimates.

Based on the responses from the 2003 RMA questionnaire, a reported 275 million tires were in stockpiles in the U.S. at the end of 2003. This compares with 306 million at the end of 2001. Appendix G shows RMA estimates, based on data from state regulators, of the numbers of tires remaining in stockpiles in the U.S. Estimates for each reporting state are displayed, organized by EPA Region. Figure 10 shows the reduction in the number of scrap tires in stockpiles since 1990. Figure 11 shows the number of tires in stockpiles across the U.S. in 2003.

Figure 3: Number of Scrap Tires in U.S. Stockpiles

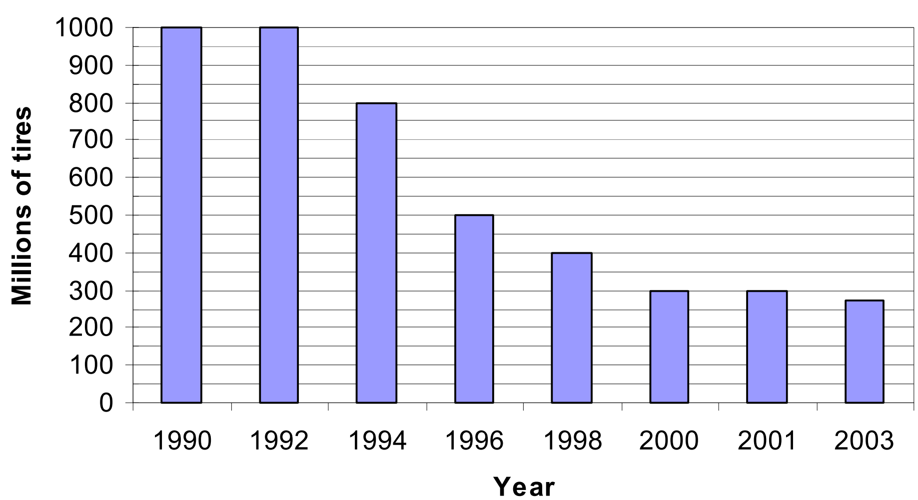
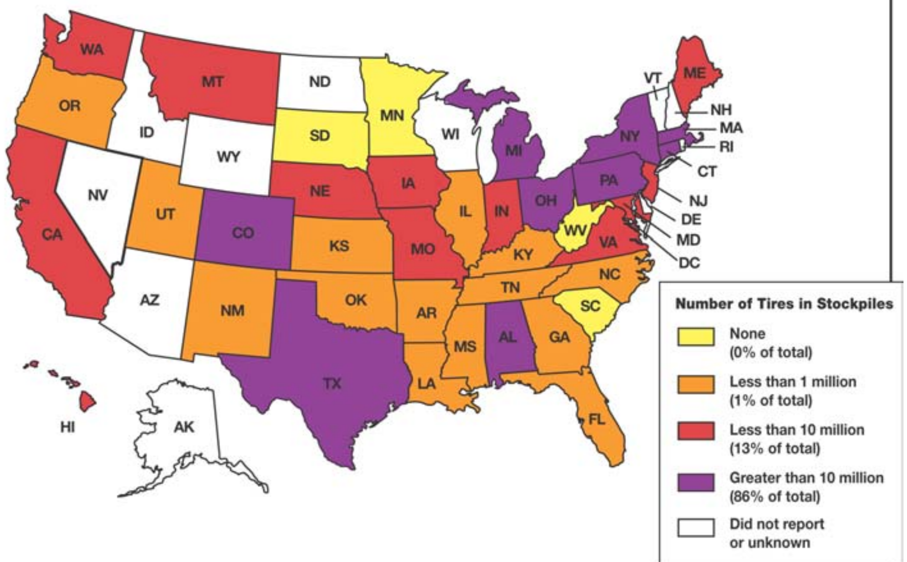


Figure 11: U.S. Stockpiles by State



From the information RMA collected in its survey of state agencies, it is apparent that scrap tire stockpiles are concentrated in a small number of states. Eighty-seven percent of all stockpiled tires in the U.S. continue to be in nine states: Alabama, Colorado, Connecticut, Michigan, New York, Ohio, Pennsylvania, Texas, and Massachusetts. With the addition of the next two largest stockpile states (New Jersey and Washington), 91 percent of the stockpiled tires in the country would be represented.

Over the course of the last two years there has been a significant amount of activity in state programs that will impact the stockpile situation. Alabama, Michigan and New York enacted legislation creating state funds for, among other things, the abatement of stockpiles. The Michigan program is focused solely on the abatement issue. Although there has been no major abatement progress in these three states, both New York and Michigan have recently begun removing tires from some of its biggest and/or oldest stockpiles. While the creation of these programs was the first step in the abatement process, both New York and Michigan must face yearly budget considerations before they know how much they have to spend on abatement projects. Consequently, optimism for aggressive abatement programs must be tempered by the political reality of state budget negotiations.

Meanwhile, the state of Texas used the last of its remaining tire funds to award abatement contracts for two of the largest stockpiles in the state. The state reports that these piles are in the process of being abated. Other states have been active in their abatement programs as well. Over the last two years Ohio, California, Florida, Illinois, Missouri and Virginia have been abating their piles actively. These states continue to reduce their stockpile inventories.

Several states now report that all of their stockpiles have been abated (West Virginia, South Dakota and South Carolina). Of the remaining states with large-scale stockpile inventories, Massachusetts is once again considering legislation that would provide funds for the abatement of its piles. Consequently, it is anticipated that within the next two years there should be a decrease of some 20 to 30 million tires from existing stockpiles.

Several states actually reported more tires in stockpiles this year than in 2001 (Washington, New Jersey, Colorado), which in part explains why it appears that there were not as many tires abated as there actually were. It also demonstrates what occurs in states that do not have scrap tire market development programs.

V. A History of the Modern Scrap Tire Market

Typical scrap tire management before 1985 consisted of sending whole scrap tires to landfills for burial. Another means of managing scrap tires was for someone to collect scrap tires from retailers and place them onto a pile. Since there were no laws restricting how scrap tires could be managed or any programs seeking to encourage other uses for scrap tires, these two management practices were used because they were the lowest-cost management practices available.

In 1985, Minnesota enacted the first legislation specific to scrap tires. At that point, states began to look into the possibility of changing the way scrap tires were being managed. In 1986, Oregon was the second state to enact scrap tire legislation and regulations. By 1990, all but two states (Alaska and Delaware) had enacted regulations and/or developed a specific management program.

A. The Early Marketplace

Historically, the uses in the U.S. for scrap tires were limited to punched and stamped products, dock bumpers, swings and assorted functions on farms. TDF use in the cement industry began in Germany in 1975, in response to the spike in energy prices caused by the embargo of petroleum by the Organization of Petroleum Exporting Countries (OPEC). Japan also used TDF in cement kilns beginning in the 1970's.

In 1979, Waste Recovery, Inc. (WRI) began processing and selling tire-derived fuel (TDF) to the pulp and paper industry in Washington State in the first commercial use of scrap tires. From 1979 to 1985, WRI remained the only substantial commercial processor of scrap tires. WRI expanded its operations during that period to include a facility in Texas.

From 1979 to 1992, TDF was the dominant market application for scrap tires. In 1985, Oxford Energy, Inc. constructed dedicated a tire-to-energy power plant. In 1990, 25 million tires were consumed as fuel. By 1991, Oxford Energy was operating two dedicated tire-to-energy facilities (Sterling, Connecticut and Westley, California). In addition, cement kilns began to use scrap tires as a supplemental fuel. By 1992, some 57 million of the 68 million scrap tires that went to an end-use market were consumed as TDF.

B. The Ground Rubber Mandate and Its Effects

In 1991, the U.S. Congress enacted the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which contained a provision mandating the use of ground tire rubber in a prescribed percentage of highways that were funded by the federal government. ISTEA required that, starting in 1993, five percent of all federally-funded highways must contain 20 pounds of scrap tire rubber per ton of hot mix asphalt laid. ISTEA also mandated that by 1994, ten percent of all federally-funded highways must contain 20 pounds of scrap tire rubber per ton of hot mix asphalt laid. The ISTEA mandate further required that the rates be increased to fifteen percent in 1995 and ultimately 20 percent in 1996 and thereafter. ISTEA mandated that any state that did not meet these goals would lose a corresponding amount of federal funds for any given year.

The mandate caused angst and exuberant optimism in the paving and scrap tire industries, respectively. In general, state departments of transportation and the paving industry were opposed to this unfunded mandate, while entrepreneurs and scrap tire processors were talking about how the demand for ground rubber had the potential to consume every scrap tire in the U.S.

In 1991, the demand for ground rubber was still being met, almost exclusively, by tire buffings, the part of the tire that is removed when tires are being prepared for a new tread (hence the term "retreading," also referred to as "recapping"). Tire buffings were collected, cleaned and shipped to specialized grinding facilities that processed these long, tubular particles into smaller-sized particles. At this point, the ground rubber market supplied several ground rubber applications, including asphalt rubber, bound rubber products and brake liners. No whole tires were being processed into ground rubber, not only because of the supply of buffings, but also because the equipment to process whole tires into ground rubber was in its developmental stages.

Still, from 1992 through 1995, a surge of companies entered the business of processing scrap tires into ground rubber in hope of capturing a share of the anticipated demand caused by ISTEA. Additionally, several states conducted asphalt rubber testing programs that led to an increase in activity and a sense of market potential among some ground rubber producers. Meanwhile, most states refused to comply with the mandate, and the Federal Highway Administration (FHWA) issued a memo, which indicated that it was unlikely to monitor or punish states that did not comply with the mandate. Consequently, very little tire rubber was used in highway paving as a result of the ISTEA mandate. In 1993, Congress repealed the section of ISTEA referring to the use of tire rubber in highway paving.

The results of the FHWA memo and later the Congressional action were immediate, permanent and devastating to ground rubber producers. The rush to build processing capacity coupled with virtually no increase in demand not only caused the marginal ground rubber producers to go out of business, but weakened the larger, more established producers. This was a direct result of the downward price pressure caused by the oversupply of ground rubber. In the period of 1994 to 1996, some 20 ground rubber operations were either sold or closed.

C. The Entry of Civil Engineering Applications

1992 marked the beginning of the use of tires in civil engineering applications. To be sure, scrap tires had been used in an array of projects, ranging from swings to dock bumpers and playground castles. Yet, these varied uses were too small to be considered concentrated uses or markets for scrap tires.

One of the seemingly inadvertent side effects of ISTEA was a focus on other uses of scrap tires in highway applications. Scrap tires were the subjects of experiments at several universities in the early 1990s. These experiments typically were designed to test the properties of tires. In particular, tire shreds were use-tested in road embankments, as a lightweight backfill and as a road base foundation material. These studies generated other questions, such as concerns about chemicals leaching from tires placed in the environment. Consequently, several states began testing the leachate from scrap tires. Yet, these studies were laboratory studies, designed for specific parameters. It was not until 1996 that the first field study of tire leachate was implemented.

In December 1995, two large-scale road embankments built with scrap tire shreds in Washington State developed "hot spots" and began to heat. These incidents cast civil engineering applications in an unfavorable light. FHWA immediately distributed a memorandum to all of its field offices stating that they should not engage in new projects using tire shreds as a fill material. This action caused all ongoing and planned scrap tire civil engineering application to be halted. There were even some concerns that the asphalt road itself could have caught fire, but that was not the case.

RMA/STMC, in cooperation with the FHWA, provided technical assistance during and after the heating incidents. In addition, STMC convened an industry *ad hoc* committee to determine the factors that led to the heating, as well as to develop construction guidelines to prevent any further self-heating episodes. The Committee concluded that the two embankments at issue were significantly deeper than any previous embankment project. Embankments with tire shreds less than 15 feet deep had never developed heating situations.

The *ad hoc* committee's recommendations, which were accepted and distributed by the FHWA, stated that no tire shred fill should be greater than 10 feet in depth and listed a series of other construction guidelines as well. Once the FHWA accepted these guidelines, its restrictions on using tire shreds in civil engineering applications were lifted. While lifting the restrictions allowed this market niche to continue, it took several years before state agencies and the industry began using tire shreds at a significant level again.

D. Dynamics of the TDF Market

The TDF market, while remaining the largest single market for scrap tires, has been subject to a series of changes. From 1990 through 1996 the use of TDF expanded at a steady rate. TDF had become widely accepted in the cement and pulp and paper industries, and several large-scale and several small-scale power plants had also begun using this material.

In 1996, the cement industry began a six-year period of heightened demand caused by the economic boom the country was experiencing. Most kilns were operating in a sold-out condition, and those kilns that were using TDF as a supplemental fuel reduced or discontinued use of TDF. It was believed that using TDF, while helping to reduce production costs, also slightly reduced cement-making capacity.

At the same time, several pulp and paper companies stopped using TDF as well. The decline was based on a combination of poor quality material, pending changes to air permit requirements and company policies requiring a reduction in zinc emissions to the water effluent. In pulp and paper mills that use wet scrubbers to remove sulfur from the gas stream, TDF use causes zinc levels in water effluent to increase. While the presence of zinc did not cause these mills to exceed any permit limits, it was contrary to some company policies. Consequently, several mills stopped using TDF.

The beginning of deregulation in the utility industry followed similar trends. From 1992 through 1996, several utility boilers had begun using TDF or were in the midst of completing testing of the material. Once utilities began considering selling power-generating plants, many of these companies stopped using TDF, due to concerns that an alternative fuels program would create a disincentive to a prospective buyer. The combination of all these factors caused the number of facilities using TDF to decrease. Furthermore, many facilities that were about to begin using TDF or that were in the permitting or testing process also stopped.

E. Market Trends

As described above, TDF was the first large-scale market for scrap tires. However, with the entry of the ground rubber and civil engineering markets, in 1992 a shift began, albeit small, in the markets for scrap tires. TDF was no longer the only end-use market. In 1992, civil engineering applications consumed about five million tires, and some four and one-half million whole tires were processed and used as ground rubber.

From 1993 to 1994, all three major markets for scrap tires increased, including TDF, ground rubber markets and civil engineering applications. By the end of 1994, market demand for scrap tires had reached 138.5 million, with 101 million going to TDF, nine million going to civil engineering applications and four and a half million being processed into ground rubber (three million tires were used in asphalt rubber applications and one and a half million tires in other ground rubber applications). Export, agricultural and miscellaneous applications accounted for the remainder of the market uses.

From 1996 through 1998, the majority of tires used in civil engineering applications were limited to alternative daily cover in landfills. During this time frame, TDF and ground rubber markets increased dramatically. By the end of 1998, end-use markets for scrap tires had reached 177.5 million, with 114 million used as TDF, 20 million used in civil engineering applications and seven million for ground rubber. Once again, export, agricultural and miscellaneous applications rounded out the field.

From 1998 through 2001, all three major markets for scrap tires experienced further expansion. TDF use increased with the addition of several co-generation boilers and several cement kilns, while civil engineering applications expanded beyond road embankments. Tire shreds were widely used in various landfill construction applications. The use of ground rubber increased dramatically, beyond the historical markets of asphalt rubber, tire manufacturing and molded and extruded products. New applications, such as playground surfaces, soil amendments, horticultural applications and horse arena flooring combined to push the demand for ground rubber to new heights. These markets are more fully explained in the text ahead.

The 2001 – 2003 timeframe was a period of continued expansion of the same major markets that expanded in the 1998 – 2001 timeframe. As a general statement, these markets expanded for the same reasons as in the last reported timeframe. There were two events in 2003 that are anticipated to have long-term impacts on the scrap tire industry. The first is the introduction of a new market application for scrap tires in the U.S. – the use of tires as a “charge” material in electric arc furnaces. The second event was the creation of a government/industry partnership called the Resource Conservation Challenge (RCC), developed by EPA.

VI. The Resource Conservation Challenge

In late 2002, EPA created the Resource Conservation Challenge (RCC) as a major national program to find flexible, yet protective, ways to conserve our national resources. The RCC seeks to expand markets for secondary materials by removing the barriers that impede entry to market for these materials through voluntary stakeholder initiatives and public/private partnerships The RCC challenges all Americans to prevent pollution and promote recycling and reuse of materials, reduce the use of toxic chemicals and conserve energy and materials. To achieve these goals, the RCC has enlisted many partners and continues to solicit the involvement of additional stakeholders.

The RCC is comprised of voluntary programs and projects with a materials management and resource conservation focus geared towards producing results. The ideas advanced by the RCC also may include innovative regulatory approaches that allow material recycling and reuse, while protecting human health and the environment. In addition, through education and outreach, the RCC focuses on shaping consumer purchasing and disposal decisions to conserve natural resources, save energy, and preserve the environment.
One RCC focus area is scrap tire management. The RCC Tires Partnership has set two goals: (1) diverting 85 percent of newly-generated scrap tires to reuse, recycling or energy recovery and (2) reducing the number of tires in existing stockpiles by 55 percent by 2008 from the 2001 baseline. The RCC Tire Partnership has task groups that are

assigned the responsibility of (1) identifying the obstacles that are impeding further market development and (2) devising a list of possible solution scenarios to resolve these obstacles. The task groups focus on several areas, including: (1) goals, (2) TDF, (3) rubber-modified asphalt, (4) other ground rubber products, (5) civil engineering applications, and (6) stockpiled tires. Stakeholders involved in the RCC Tires Partnership include EPA headquarters and various EPA Regions, several states, the Federal Highway Administration, the tire industry, the cement industry, recyclers and other interested parties.

VII. Conclusions

In 2003, markets for scrap tires consumed approximately 233.3 million, or 80.4 percent, of the 290.2 million annually-generated scrap tires. In addition to the number of tires going to a market, another 27 million tires were legally managed through placement in landfills or monofills, raising the number of managed scrap tires to nearly 90 percent of the total scrap tires generated annually.

Two of the major market sectors (TDF and civil engineering) experienced growth in the 2001 – 2003 timeframe. Of concern, however, is the decreased use of ground rubber, for asphalt rubber in particular. This report also concludes that the number of tires reported to be exported and punched/stamped into new products was lower than in previous years. It is uncertain whether this represents a new trend or merely reflects more accurate data provided by the states.

In the TDF market, increased use in the pulp and paper industry was significant. Additionally, growth in TDF use in the cement and pulp and paper industries is anticipated over the next two years. The data also strongly suggest that there could be a surge in the use of TDF in industrial boilers and some smaller-scale utility boilers.

Growth in the use of tire shreds in civil engineering applications continued, not at the tremendous rate of the 1999 – 2001 timeframe, but still at a very impressive rate of 25 percent. These applications offer the possibility of large-scale usage for relatively large-sized tire shreds. While these shreds do offer certain advantages and benefits for engineering purposes, their acceptance and use is normally a function of economics, which is a concern to the processing sector of the industry. While processing costs for this material are relatively low, so is the return on investment, which makes it difficult for most processors to adequately fund operations and remain financially solvent.

State and local regulations continue to impact the economic stability and expansion potential of the civil engineering market for scrap tires. In situations where tire shreds are a marginal material and the landfill or construction manager is faced with an increased regulatory burden, tire shreds typically will not be considered. To encourage this market, state regulatory agencies should develop flexibility in tire storage regulations that would allow tire shreds to be stored and used at construction sites. And facilitate communication and coordination among government officials on civil engineering projects.

Additionally, in some regions, civil engineering applications compete with other markets for available scrap tires. In those regions where TDF is going to pulp and paper mills, the return on investment is greater for high quality TDF than for civil engineering applications. Consequently, the flow of tire material will go to the higher value-added application. In South Carolina, for example, the demand for TDF limited the supply of tire chips destined for septic field drainage medium. Until recently, tire chips for septic fields had been the largest market in the state.

In the ground rubber market, acceptance and use of coarse rubber products showed a significant increase from the last reporting period. This appears to be a function of several factors: more efficient processing systems; more companies producing quality coarse rubber; an expanded library of informational material and the recognition of the performance benefits of the material. However, with heightened visibility comes increased scrutiny, both from potential customers and the competition.

The use of ground rubber in the manufacturing of molded and extruded products appears to be on the rise as well. An increasing number of companies are making products, although not all of them process ground rubber feedstock internally. The data indicate continued growth in this market segment over the next two years, although the amount of increase is difficult to predict.

Many state scrap tire programs are expected to continue advocacy for the increased use of ground rubber in asphalt. Unfortunately, there is little evidence that this state support will actually impact the marketplace. A key to increasing the amount of ground rubber used in asphalt paving projects is to provide technical education and training for state and local DOT officials and paving contractors. Another important factor in this market is the status of state budgets. States experiencing a budget shortfall commonly reduce budgets for public works projects, including road construction.

Paving of roads is a major expense often targeted for budget reductions, as is the case in California. When state departments of transportation conduct fewer paving projects, the companies supplying raw materials to the paving industry also suffer. Given the fact that about half of the states are in a budget shortfall situation, the number of paving contracts awarded will undoubtedly be reduced. This in turn will have a negative impact on the future of asphalt rubber, and the ground rubber that would be supplied.

The situation regarding state budgets has another direct impact on the scrap tire industry. To date, 16 states have diverted money from state scrap tire funds, even in some cases where the funds supposedly were "dedicated" to state scrap tire management programs. Where this has occurred, state scrap tire programs have often had to reduce services provided. Georgia has reduced the number of scrap tire inspectors, Iowa has had to trim its market development program and extend the time schedule for abating its remaining stockpiles. It is unclear whether this trend will continue in the future.

In some states, legislation was enacted that placed a so-called fee on the sale of new tires for the express purpose of raising funds for the general budget (e.g., New York and Alaska). This is a troubling trend because while fees are collected under the guise of scrap tire management, only a portion of the funds (New York) or no funds (Alaska) in fact are spent to create scrap tire programs. Without state programs, state agencies cannot enforce scrap tire regulations, which leads to some processors retaining more inventory than permitted and unlawful dumping of scrap tires increases. In many states, when a legal scrap tire processor declares bankruptcy, its scrap tire inventory becomes part of the state scrap tire stockpile rolls.

When a state ends its scrap tire management fee program, existing problems will remain unresolved and over time, the infrastructure crumbles. For example, in Texas the 53 million tires in stockpiles will remain there because the state no longer can raise stockpile abatement funds. Likewise, in Washington, after its program expired, the number of tires in stockpiles has increased dramatically over the past several years. Further, in Wisconsin, only one of eight end-users previously operating remains after the state price subsidy program was eliminated. The one remaining facility in Wisconsin using TDF receives its supply from sources in Minnesota and Illinois. The three scrap tire processors in the state have not been able to create any markets on their own, and are reportedly stockpiling scrap tire material.

In the effort to reduce scrap tire stockpiles, several states have made great progress. West Virginia and Virginia have cleaned up a significant amount of tires the last two years. Several states reported all of their piles abated (South Carolina, South Dakota, Minnesota and West Virginia). While the overall number of scrap tires in stockpiles was reduced by 41 million tires from the 1999-2001 timeframe, several states reported increased numbers of stockpiled tires. The increased stockpiles reported offset some of the stockpile abatement successes achieved in other regions.

Three of the states that have large numbers of tires in stockpiles (New York, Alabama and Michigan) enacted legislation in 2003 designed to address scrap tire stockpile abatement. As many as 30 million tires could be abated in these states if these programs are adequately funded and markets are established. It also appears that Ohio is making progress in scrap tire stockpile reduction. Whether any of the other major stockpile states will be able to develop abatement programs anytime in the next two years is very uncertain.

The addition of tires going to electric arc furnaces and the involvement of the EPA through the RCC process were developments not anticipated in any previous market report, but are clearly welcome additions to the industry's efforts to resolve the scrap tire situation.

Overall, growth potential for scrap tire markets appears to be, overall, positive for the next two years. As stated in previous reports, the ability to maintain and increase markets for scrap tires requires a concerted effort sustained by all involved. The forces of competition, government programs and changing technology will continue to challenge this industry for the foreseeable future.

Appendix A: Factors Impacting the Major Scrap Tire Markets

Charging Material in Electric Arc Furnaces:

Positive Factors

- Recycling the carbon and steel portions of the tires
- Can use larger-sized tires and tires on rims

Challenges

- Limited number of mills
- Mill locations often removed from population centers

Tire-Derived Fuel:

Positive Factors

- Development of ASTM specifications
- Increased importance of NO_x reduction and other air emissions advantages
- Cost competitiveness
- Increasing energy prices
- Increased acceptance as a standard alternative fuel

Challenges

- Potential air emissions issues
- Competition from natural gas
- Increasing opposition by opponents to new TDF uses

Ground Rubber Applications:

Positive Factors

- Expanding use of coarse rubber products
- Safety advantages when rubber is used as playground cover
- Better availability of information on playground issues

Challenges

- Supply/demand imbalances
- Challenges by competitors
- Decreasing state/county budget impacts the use of rubber-modified asphalt

Civil Engineering Applications:

Positive Factors

- Acceptance by regulatory agencies and industry on use of tire chips in septic fields
- Acceptance by regulatory agencies and industry on use of tire chips in landfills
- Cost competitiveness
- Development of ASTM specifications
- Increased information in the public domain
- Long-term field studies of leachate

Challenges

- State regulations that inhibit storage of large inventory for civil engineering projects
- Abundance of competing materials
- Competing markets for tires

Appendix B: Scrap Tire Market Data 1990 - 2003

U.S. SCRAP TIRE MANAGEMENT SUMMARY (Millions of Tires)

	1990	1992	1994	1996*	1998	2001	**2003**
Tire derived fuel:							
cement kilns	6.0	7.0	37.0	34.0	38.0	53.0	**53.0**
pulp/paper	13.0	14.0	27.0	26.0	20.0	19.0	**26.0**
electricity/utility	1.0	21.0	22.0	39.0	40.0	29.0	**40.7**
dedicated TTE (tire to energy)	4.5	15.0	15.0	16.0	16.0	14.0	**10.0**
Total Fuel Usage	24.5	57.0	101.0	115.0	114.0	115.0	**129.7**
Electric arc furnaces	N/A	N/A	N/A	N/A	N/A	N/A	**0.5**
Ground rubber (w/o asphalt)	0.0	5.0	1.5	7.5	7.0	21.0	**18.2**
Rubber-modified asphalt	N/A	N/A	3.0	5.0	8.0	12.0	**10.0**
Punched/stamped products	N/A	N/A	8.0	8.0	8.0	8.0	**6.5**
Civil engineering	N/A	5.0	9.0	10.0	20.0	40.0	**56.4**
Export			12.5	15.0	15.0	15.0	**9.0**
Agricultural use and miscellaneous	N/A	1.0	3.5	4.0	5.5	7.0	**3.0**
Total Scrap Tire Markets	**24.5**	**68.0**	**138.5**	**164.5**	**177.5**	**218.0**	**233.3**
Total Scrap Tires in Stockpiles	**1000**	**1000**	**800**	**500**	**400**	**300**	**265**

* 1996 fuel use estimates vary from those previously reported. Previous 1996 estimates were based on permitted levels, rather than actual usage. The 1996 numbers reported here are based on actual fuel use, consistent with the data reported for all other years.

2003 U.S. Scrap Tire Markets - Alphabetically by State

(in millions of tires)

State	Electric Arc Furnaces	Tire-Derived Fuel	Civil Engineering	Ground Rubber	Exported	Punched / Stamped	Baled	Agricultural and MISC	TOTAL Tires to Market	Landfilled Tires	Stockpiled Tires	Scrap Tires Generated	% in Markets	Notes
Alabama	0.20	2.00	0.00	0.00					2.20	3.00	20.00	4.40	50.00%	Majority of in-state tires are still landfilled.
Alaska		0.00	0.00	0.00					0.00	0.00	- DNR -	0.60	0.00%	Most tires are landfilled.
Arizona		0.00	0.00	4.00					4.00	0.00	- DNR -	4.00	100.00%	Some tires sent to a landfill in CA.
Arkansas		0.60	0.80	0.00			0.46		1.86	0.00	0.30	2.60	71.54%	Few tires come into/go out of state.
California		6.00	4.00	6.00	4.00				20.00	8.50	2.00	33.00	60.61%	
Colorado		0.00	0.30	0.50			0.05		0.85	0.00	35.00	4.00	21.25%	
Connecticut*		10.00	0.00	0.00	2.00				12.00	0.00	20.00	3.40	352.94%	Imports tires from surrounding states.
Delaware		0.00	0.00	0.00					0.00	0.00	- DNR -	0.70	0.00%	Most tires go into Maryland for processing.
Florida		5.20	3.00	5.00	1.00				14.20	1.50	0.10	19.00	74.74%	
Georgia*		7.00	1.00	0.05					8.05	0.00	0.28	8.00	100.56%	
Hawaii		0.80	0.20	0.00					1.00	0.00	1.33	1.00	100.00%	
Idaho		1.00	0.00	0.00					1.00	0.00	- DNR -	1.20	83.33%	
Illinois*		12.12	1.50	1.20					14.82	0.00	0.04	12.00	123.50%	
Indiana		0.00	0.20	0.00					0.20	0.00	5.50	6.00	3.33%	Most tires go into Illinois or Michigan.
Iowa		0.84	0.69	0.05					1.58	0.00	1.00	3.00	52.80%	Some tires sent to MN for processing.
Kansas*		0.50	0.00	0.00			0.40		0.90	1.40	0.16	2.60	34.62%	
Kentucky		2.00	2.00	0.00		1.00			5.00	0.00	0.05	5.00	100.00%	Abated 4 million tires in 2003.
Louisiana*		7.00	3.00	0.00					10.00	0.00	0.05	6.00	166.67%	
Maine*		7.00	2.00	0.00					9.00	0.00	1.00	1.27	708.66%	Imports tires from New England states.
Maryland*		6.00	0.42	1.00	2.00				9.42	0.00	1.70	6.00	157.00%	
Massachusetts		0.00	0.00	0.00		5.00			5.00	0.00	10.00	6.35	78.74%	Virtually all annually generated tires go into CT or ME: 3.5 million bias ply are imported.
Michigan*		14.00	1.50	0.00					15.50	0.00	25.00	10.00	155.00%	Abated 2 million tires in 2003.
Minnesota		0.00	2.00	0.00					2.00	0.00	0.00	4.00	50.00%	Many tires sent to SD or WI as TDF.
Mississippi		2.00	0.00	1.00					3.00	0.00	0.03	3.00	100.00%	
Missouri		4.00	0.50	0.50					5.00	0.00	4.00	5.00	100.00%	
Montana		0.00	0.04	0.00					0.04	0.70	1.00	0.80	5.00%	
Nebraska		0.00	1.00	0.00			0.19		1.19	0.00	2.00	3.00	39.53%	300,000 tires are exported to MN for TDF.
Nevada		0.00	0.00	0.00					0.00	1.00	- UNK -	1.00	0.00%	
New Hampshire		0.00	0.00	0.00					0.00	0.00	- DNR -	1.24	0.00%	Virtually all tires are sent to CT or Maine.
TOTALS	**0.50**	**129.68**	**56.44**	**28.17**	**9.00**	**6.50**	**2.18**	**0.83**	**233.30**	**26.92**	**274.86**	**290.19**	**80.39%**	

* Numbers adjusted from those reported by state to reflect tires imported from another state and used for TDF.

UNK = Unknown; DNR = Did not report.

2003 U.S. Scrap Tire Markets - Alphabetically by State

(in millions of tires)

State	Electric Arc Furnaces	Tire-Derived Fuel	Civil Engineering	Ground Rubber	Exported	Punched / Stamped	Baled	Agricultural and MISC	TOTAL Tires to Market	Landfilled Tires	Stockpiled Tires	Scrap Tires Generated	% in Markets	Notes
New Jersey		0.00	0.00	2.00					2.00	0.00	8.00	8.40	23.81%	Most tires taken to PA/MD or CT.
New Mexico		0.00	0.00	0.00			0.40		0.40	0.00	0.70	1.80	22.22%	
New York	0.30	0.00	6.00	1.00					7.30	0.00	40.00	20.00	36.50%	
North Carolina		3.00	3.00	3.50					9.50	0.00	0.10	9.60	98.96%	
North Dakota		0.00	0.00	0.00					0.00	0.00	- DNR -	0.65	0.00%	
Ohio		0.00	8.00	0.00		0.50			8.50	0.00	20.00	10.00	85.00%	
Oklahoma		2.28	0.85	0.03					3.16	0.00	0.66	3.40	92.85%	
Oregon		0.47	0.54	1.71			0.19		2.90	2.72	0.03	5.60	51.84%	2 kilns; 1 pulp and paper mill.
Pennsylvania		8.40	0.35	0.18					8.93	0.15	12.00	12.00	74.38%	Removed 2.5 million tires from stockpiles. Most went to CE, the rest were landfilled.
Rhode Island		0.00	0.00	0.10					0.10	0.00	- DNR -	1.00	10.00%	Virtually all tires are sent to CT or Maine
South Carolina*		6.00	1.85	0.05					7.90	0.00	0.00	6.50	121.46%	All stockpiles are reported to be abated. All annually generated tires go to a market.
South Dakota		2.40	0.00						2.40	0.00	0.00	0.75	320.00%	
Tennessee*		3.25	1.50						4.75	1.25	0.30	5.00	95.00%	
Texas		12.00	2.20					0.83	15.03	0.00	53.00	24.00	62.61%	Abating two of their largest piles.
Utah		0.90	1.00						1.90	0.00	0.06	2.00	95.00%	Abated 216,000 tires in 2003.
Vermont		0.00	0.00						0.00	0.00	- DNR -	0.60	0.00%	Virtually all tires are sent to CT or Maine.
Virginia		1.64	6.50	0.22					8.36	0.00	3.20	7.33	114.05%	Removed 1.8 million tires from piles in 2003.
Washington		0.28	0.50	0.10			0.50		1.38	4.00	6.29	5.50	25.00%	
West Virginia		0.00	0.00						0.00	2.00	0.00	2.00	0.00%	Reported to have abated all tires. All abated tires went to landfills or monofills.
Wisconsin		1.00	0.00						1.00	0.00	- DNR -	5.20	19.23%	TDF markets supplied from MN & IL.
Wyoming		0.00	0.00						0.00	0.70	- DNR -	0.70	0.00%	Understand that most tires are landfilled.
TOTALS	**0.50**	**129.68**	**56.44**	**28.17**	**9.00**	**6.50**	**2.18**	**0.83**	**233.30**	**26.92**	**274.86**	**290.19**	**80.39%**	

* Numbers adjusted from those reported by state to reflect tires imported from another state and used for TDF.

UNK = Unknown; DNR = Did not report.

Appendix D: 2003 U.S. Scrap Tire Markets by EPA Region

(in millions of tires)

State	Electric Arc Furnaces	Tire-Derived Fuel	Civil Engineering	Ground Rubber	Exported	Punched / Stamped	Baled	Agricultural and MISC	TOTAL Tires to Market	Landfilled Tires	Stockpiled Tires	Scrap Tires Generated	% in Markets
REGION I													
Connecticut*	0.00	10.00	0.00	0.00	2.00	0.00	0.00	0.00	**12.00**	0.00	**20.00**	3.40	**352.94%**
Maine*	0.00	7.00	2.00	0.00	0.00	0.00	0.00	0.00	**9.00**	0.00	**1.00**	1.27	**708.66%**
Massachusetts	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	**5.00**	0.00	**10.00**	6.35	**78.74%**
New Hampshire	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	**- DNR -**	1.24	**0.00%**
Rhode Island	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	**0.10**	0.00	**- DNR -**	1.00	**10.00%**
Vermont	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	**- DNR -**	0.60	**0.00%**
TOTALS	**0.00**	**17.00**	**2.00**	**0.10**	**2.00**	**5.00**	**0.00**	**0.00**	**26.10**	**0.00**	**31.00**	**13.86**	**188.31%**
REGION II													
New Jersey	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	**2.00**	0.00	**8.00**	8.40	**23.81%**
New York	0.30	0.00	6.00	1.00	0.00	0.00	0.00	0.00	**7.30**	0.00	**40.00**	20.00	**36.50%**
TOTALS	**0.30**	**0.00**	**6.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**9.30**	**0.00**	**48.00**	**28.40**	**32.75%**
REGION III													
Delaware	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	**- DNR -**	0.70	**0.00%**
Maryland*	0.00	6.00	0.42	1.00	2.00	0.00	0.00	0.00	**9.42**	0.00	**1.70**	6.00	**157.00%**
Pennsylvania	0.00	8.40	0.35	0.18	0.00	0.00	0.00	0.00	**8.93**	0.15	**12.00**	12.00	**74.38%**
Virginia	0.00	1.64	6.50	0.22	0.00	0.00	0.00	0.00	**8.36**	0.00	**3.20**	7.33	**114.05%**
West Virginia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	2.00	**0.00**	2.00	**0.00%**
TOTALS	**0.00**	**16.04**	**7.27**	**1.39**	**2.00**	**0.00**	**0.00**	**0.00**	**26.71**	**2.15**	**16.90**	**28.03**	**95.27%**
REGION IV													
Alabama	0.20	2.00	0.00	0.00	0.00	0.00	0.00	0.00	**2.20**	3.00	**20.00**	4.40	**50.00%**
Florida	0.00	5.20	3.00	5.00	1.00	0.00	0.00	0.00	**14.20**	1.50	**0.10**	19.00	**74.74%**
Georgia*	0.00	7.00	1.00	0.05	0.00	0.00	0.00	0.00	**8.05**	0.00	**0.28**	8.00	**100.56%**
Kentucky	0.00	2.00	2.00	0.00	0.00	1.00	0.00	0.00	**5.00**	0.00	**0.05**	5.00	**100.00%**
Mississippi	0.00	2.00	0.00	1.00	0.00	0.00	0.00	0.00	**3.00**	0.00	**0.03**	3.00	**100.00%**
North Carolina	0.00	3.00	3.00	3.50	0.00	0.00	0.00	0.00	**9.50**	0.00	**0.10**	9.60	**98.96%**
South Carolina*	0.00	6.00	1.85	0.05	0.00	0.00	0.00	0.00	**7.90**	0.00	**0.00**	6.50	**121.46%**
Tennessee*	0.00	3.25	1.50	0.00	0.00	0.00	0.00	0.00	**4.75**	1.25	**0.30**	5.00	**95.00%**
TOTALS	**0.20**	**30.45**	**12.35**	**9.59**	**1.00**	**1.00**	**0.00**	**0.00**	**54.59**	**5.75**	**20.85**	**60.50**	**90.23%**
REGION V													
Illinois*	0.00	12.12	1.50	1.20	0.00	0.00	0.00	0.00	**14.82**	0.00	**0.04**	12.00	**123.50%**
Indiana	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	**0.20**	0.00	**5.50**	6.00	**3.33%**
Michigan*	0.00	14.00	1.50	0.00	0.00	0.00	0.00	0.00	**15.50**	0.00	**25.00**	10.00	**155.00%**
Minnesota	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	**2.00**	0.00	**0.00**	4.00	**50.00%**
Ohio	0.00	0.00	8.00	0.00	0.00	0.50	0.00	0.00	**8.50**	0.00	**20.00**	10.00	**85.00%**
Wisconsin	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	**1.00**	0.00	**- DNR -**	5.20	**19.23%**
TOTALS	**0.00**	**27.12**	**13.20**	**1.20**	**0.00**	**0.50**	**0.00**	**0.00**	**42.02**	**0.00**	**50.54**	**47.20**	**89.03%**

Appendix D: 2003 U.S. Scrap Tire Markets by EPA Region

(in millions of tires)

State	Electric Arc Furnaces	Tire-Derived Fuel	Civil Engineering	Ground Rubber	Exported	Punched / Stamped	Baled	Agricultural and MISC	TOTAL Tires to Market	Landfilled Tires	Stockpiled Tires	Scrap Tires Generated	% in Markets
REGION VI													
Arkansas	0.00	0.60	0.80	0.00	0.00	0.00	0.46	0.00	**1.86**	0.00	**0.30**	2.60	**71.54%**
Louisiana*	0.00	7.00	3.00	0.00	0.00	0.00	0.00	0.00	**10.00**	0.00	**0.05**	6.00	**166.67%**
New Mexico	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	**0.40**	0.00	**0.70**	1.80	**22.22%**
Oklahoma	0.00	2.28	0.85	0.03	0.00	0.00	0.00	0.00	**3.16**	0.00	**0.66**	3.40	**92.85%**
Texas	0.00	12.00	2.20	0.00	0.00	0.00	0.00	0.83	**15.03**	0.00	**49.00**	24.00	**62.61%**
TOTALS	**0.00**	**21.88**	**6.85**	**0.03**	**0.00**	**0.00**	**0.86**	**0.83**	**30.44**		**50.71**	**37.80**	**80.54%**
REGION VII													
Iowa	0.00	0.84	0.69	0.05	0.00	0.00	0.00	0.00	**1.58**	0.00	**1.00**	3.00	**52.80%**
Kansas*	0.00	0.50	0.00	0.00	0.00	0.00	0.40	0.00	**0.90**	1.40	**0.16**	2.60	**34.62%**
Missouri	0.00	4.00	0.50	0.50	0.00	0.00	0.00	0.00	**5.00**	0.00	**4.00**	5.00	**100.00%**
Nebraska	0.00	0.00	1.00	0.00	0.00	0.00	0.19	0.00	**1.19**	0.00	**2.00**	3.00	**39.53%**
TOTALS	**0.00**	**5.34**	**2.19**	**0.55**	**0.00**	**0.00**	**0.59**	**0.00**	**8.67**	**1.40**	**7.16**	**13.60**	**63.75%**
REGION VIII													
Colorado	0.00	0.00	0.00	0.50	0.00	0.00	0.05	0.00	**0.85**	0.00	**35.00**	4.00	**21.25%**
Montana	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	**0.04**	0.70	**1.00**	0.80	**5.00%**
North Dakota	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	**- DNR -**	0.65	**0.00%**
South Dakota	0.00	2.40	0.00	0.00	0.00	0.00	0.00	0.00	**2.40**	0.00	**0.00**	0.75	**320.00%**
Utah	0.00	0.90	1.00	0.00	0.00	0.00	0.00	0.00	**1.90**	0.00	**0.06**	2.00	**95.00%**
Wyoming	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.70	**- DNR -**	0.70	**0.00%**
TOTALS	**0.00**	**3.30**	**1.04**	**0.50**	**0.00**	**0.00**	**0.05**	**0.00**	**5.19**	**1.40**	**36.06**	**8.90**	**58.31%**
REGION IX													
Arizona	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	**4.00**	0.00	**- DNR -**	4.00	**100.00%**
California	0.00	6.00	4.00	6.00	4.00	0.00	0.00	0.00	**20.00**	8.50	**2.00**	33.00	**60.61%**
Hawaii	0.00	0.80	0.20	0.00	0.00	0.00	0.00	0.00	**1.00**	0.00	**1.33**	1.00	**100.00%**
Nevada	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	1.00	**- UNK -**	1.00	**0.00%**
TOTALS	**0.00**	**6.80**	**4.20**	**10.00**	**4.00**	**0.00**	**0.00**	**0.00**	**25.00**	**9.50**	**3.33**	**39.00**	**64.10%**
REGION X													
Alaska	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	**- DNR -**	0.60	**0.00%**
Idaho	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	**1.00**	0.00	**- DNR -**	1.20	**83.33%**
Oregon	0.00	0.47	0.54	1.71	0.00	0.00	0.19	0.00	**2.90**	2.72	**0.03**	5.60	**51.84%**
Washington	0.00	0.28	0.50	0.10	0.00	0.00	0.50	0.00	**1.38**	4.00	**6.29**	5.50	**25.00%**
TOTALS	**0.00**	**1.74**	**1.04**	**1.81**	**0.00**	**0.00**	**0.69**	**0.00**	**5.28**	**6.72**	**6.32**	**12.90**	**40.92%**

* Numbers adjusted from those reported by state to reflect tires imported from another state and used for TDF.

UNK = Unknown; DNR = Did not report.

Appendix E: U.S. Cement Kilns Using Scrap Tires as Fuel

Location	*Company*	*Plant*	*Whole Tires?*	*Kiln Type*	*No. Of Kilns*
AL	Holcim	Theodore	PT	PHPC	1
AL	Lehigh	Leeds	WT	SPH	1
AR	Ash Grove	Foreman	WT	LSW	3
CA	California Portland	Colton	WT	LSD	2
CA	Lehigh	Redding	WT	PHPC	1
CA	Mitsubushi	Ontario	WT	PHPC	1
CA	National	Lebec*	WT	LSD	1
CO	Holcim	Portland*	PT	LSD	2
FL	Cemex	Brooksville	WT	SPH	1
FL	ESSROC	Brooksville	WT	PHPC	1
FL	FL. Rock Industry	Newberry	WT	PHPC	1
GA	Cemex	Clinchfield	WT	SPH	1
GA	Lafarge	Atlanta*			1
IA	Holcim	Mason City	PT	LSW	2
ID	Ash Grove	Incom	WT	LSW	2
IL	Lafarge	Joppa*	WT	PHPC	1
IL	Lone Star	Oglesby	WT	LSD	2
KS	Monarch	Humboldt	WT	PHPC	2
MD	ESSROC	Fredrick	WT	LSW	2
MD	Lehigh	Union Bridge	WT	LSD	4
MD	St. Lawrence	Hagerstown*	WT	LSW	1
MI	Holcim	Dundee	WT	PHPC	1
MO	Holcim	Clarksville	PT	LSW	1
MO	Lone Star	Cape Girardeau	PT	PHPC	1
OK	Holcim	Ada	WT	LSW	2
OK	Lafarge	Tulsa	WT	LSD	2
OR	Ash Grove	Durkee	WT	PHPC	1
PA	ESSROC	Bessemer	WT	LSW	2
PA	Lafarge	Whitehall	WT	SPH	2
PA	Lehigh	Allentown	WT	LSD	2
SC	Lafarge	Harleville	WT	PHPC	1
TN	Cemex	Knoxville	WT	PHPC	1
TX	Ash Grove	Midlothian	WT	LSW	3
TX	Capital Aggregates	San Antonio	WT	LSW	1
TX	Cemex	Balcones	WT	PHPC	1
TX	Cemex	Odessa	WT	SPH	2
TX	Holcim	Midlothian	PT	PHPC	2
TX	Texas Industries	Hunter	PT	SPH	1
TX	Texas Lehigh	Buda	WT	PHPC	1
UT	Holcim	Devils Slide	PT	PHPC	1
WA	Ash Grove	Seattle	WT	PHOC	1
WA	Lafarge	Seattle	PT	LSW	1
WV	Capitol Chemical	Martinsburg	WT	LSW	2
	Totals:	**43**			**64**

WT whole tires
PT processed tires
PHPC Preheater/precalciner
LSW Long straight wet
LSD Long straight dry
SPH Short Preheater
* did not use TDF for the entire year in 2003

Appendix F: Boilers Using Tires as Fuel

State	*City*	*Name*	*Boiler Type*
AL	Cortland	International Paper	Pulp & Paper Mill
AL	Stevenson	Mead Container	Pulp & Paper Mill
CA	Stockerton	Air Products	Co-Generation Boiler
CT	Sterling	Exeter Energy	Dedicated Tire-to-Energy
FL	Auburndale	Ridge Energy	Industrial Boiler
GA	Brunswick	Georgia Pacific	Pulp & Paper Mill
GA	Rome	Inland	Pulp & Paper Mill
GA	Dublin	Southeast Paper	Pulp & Paper Mill
HI	Oahu	AES	Industrial Boiler
IL	Decatur	Archer Daniels Midland	Industrial Boiler
KY	Owensboro	Owensboro Municipal Utility	Power Utility Boiler
KY	Butler	Dravo	Lime Kiln
LA	Bastrup	International Paper	Pulp & Paper Mill
LA	Manesfield	International Paper	Pulp & Paper Mill
MD	Aberdeen	Hartford County Resource Recovery	Resource Recovery Facility
MD	Joppa	Waste Energy Partners	Industrial Boiler
ME	Woodland	Georgia Pacific	Pulp & Paper Mill
ME	Bucksport	International Paper	Pulp & Paper Mill
ME	Rumford	Mead Paper	Pulp & Paper Mill
MI	Wyandotte	Wyandotte Power	Power Utility Boiler
MI	Hilman	Hilman Power	Cogeneration
MI	Grayling	Grayling Energy	Industrial Boiler
MI	Filer City	TES	Cogeneration
MI	Lincoln	Viking Energy	Industrial Boiler
MI	McBain	Viking Energy	Industrial Boiler
MO	Port du Sioux	Ameron	Power Utility Boiler
MO	Joplin	Empire District Electric	Power Utility Boiler
MO	Sibley	Utilicorp United	Power Utility Boiler
NC	Jackson	Jackson Paper	Pulp & Paper Mill
NC	Roxboro	Cogentrix	Cogeneration
NC	Lumberton	Cogentrix	Cogeneration
NC	Elizabethtown	Cogentrix	Cogeneration
NC	Eden	Trigen Biopower	Industrial Boiler
OR	Newberg	Southern Paper	Pulp & Paper Mill
SC	Rockhill	Bowater	Pulp & Paper Mill
SC	Georgetown	International Paper	Pulp & Paper Mill
SC	Eastover	International Paper	Pulp & Paper Mill

Appendix F: Boilers Using Tires as Fuel

State	City	Name	Boiler Type
SD	Big Stone	Otter Tail Utilities	Power Utility Boiler
TN	Calhoun	Bowater	Pulp & Paper mill
TN	Memphis	Tennessee Valley Authority (Allen Plant)	Power Utility Boiler
VA	Bedford	Georgia Pacific	Pulp & Paper mill
VA	Richmond	Bennett Materials	Industrial Boiler
VA	Richmond	Cogentrix	Cogeneration
VA	Norfolk	Southeastern Public Service Authority	Resource Recovery Facility
WI	Beloit	Wisconsin Power & Light (Alliant Energy)	Power Utility Boiler
WV	Willows Island	Allegany	Power Utility Boiler

Appendix G: State Scrap Tire Stockpiles by EPA Region

States in bold contain 91% of the scrap tires in stockpiles in the U.S.

State	# Stockpiled 2003	# Stockpiled 2001	Comments	Clean up Program Status
EPA Region 1				
Connecticut	**20,000,000**	**20,000,000**	**1 pile/tire pond.**	**None**
Maine	1,000,000	1,000,000		Active
Massachusetts	**10,000,000**	**10,000,000**	**No program.**	**None**
New Hampshire	DNR	750,000	Presumed to be very low.	None
Rhode Island	DNR	None reported	Presumed to be very low.	None
Vermont	DNR	200,000	Presumed to be very low.	None
EPA Region 2				
New Jersey	**8,000,000**	**7,000,000**		**Grants to counties for some clean up**
New York	**40,000,000**	**40,000,000**	**Legislation passed; abatement program to start April 2004.**	**None**
EPA Region 3				
Delaware	DNR	3,500,000		None
Maryland	1,700,000	None reported		
Pennsylvania	**12,000,000***	**13,000,000**	**Tire funds used for mass transit.**	**Lack of progress**
Virginia	3,200,000	7,500,000	Abatement on track to be completed in 2004.	Very Active
West Virginia	0	12,000,000	Reports that all stockpiles have been abated. All abated tires went to landfills or monofills.	Very Active
EPA Region 4				
Alabama	**20,000,000**	**25,000,000**	**Legislation enacted; program to start in 2004.**	
Florida	100,000	DNR		Active
Georgia	280,000	250,000	Program stopped due to loss of funds.	
Kentucky	50,000	500,000		
Mississippi	25,000	35,000		Active
North Carolina	100,000	100,000		Active
South Carolina	0	145,000		
Tennessee	300,000	Unknown		
EPA Region 5				
Illinois	40,000	1,800,000	Should be completed on 2004.	Active
Indiana	5,500,000	1,500,000		Limited
Michigan	**25,000,000**	**25,000,000**	**Abatement program to start in 2004.**	
Minnesota	0	None reported		
Ohio	**25,000,000**	**40,000,000**	**Finding ways to abate piles**	
Wisconsin	DNR	None reported	3 processors with large accumulations and limited markets.	None
EPA Region 6				
Arkansas	300,000	None reported		
Louisiana	50,000	35,000		Limited
New Mexico	700,000	240,000		None
Oklahoma	664,000	560,000		Limited
Texas	**53,000,000**	**58,000,000**	**Largest piles being abated.**	**No more funds left.**
EPA Region 7				
Iowa	1,000,000	1,750,000		Active
Kansas	158,000	100,000		Limited
Missouri	4,000,000	3,600,000		
Nebraska	2,000,000	1,200,000		None

Appendix G: State Scrap Tire Stockpiles by EPA Region

States in bold contain 91% of the scrap tires in stockpiles in the U.S.

State	*# Stockpiled 2003*	*# Stockpiled 2001*	*Comments*	*Clean up Program Status*
<u>EPA Region 8</u>				
Colorado	**35,000,000**	**28,000,000**		**None**
Montana	1,000,000	None reported		None
North Dakota	DNR	200,000		None
South Dakota	0	50,000	Reported all piles abated.	
Utah	60,000	300,000		Active
Wyoming	None reported	None reported	No program; nearly all landfilled.	None
<u>EPA Region 9</u>				
Arizona	DNR	0	Understood to be very low.	None
California	2,000,000	2,000,000	Finding new piles.	Active
Hawaii	1,326,000	2,000,000		Active
Nevada	UKN	230,000		None
<u>EPA Region 10</u>				
Alaska	None Reported	None reported		None
Idaho	DNR	500,000		None
Oregon	25,000	100,000	All tire funds taken.	None
Washington	**6,290,000**	**300,000**	**No funds available.**	**None**